

# Hidden Wealth

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## Abstract

I propose a method to measure hidden wealth using historical archives. Applying this to England, 1920-1992, it is revealed that elites conceal, at minimum, around 20% of their inherited wealth. Among dynasties, this hidden wealth, independent of declared wealth, predicts appearance in the *Offshore Leaks Database* of 2013-6, house values in 1999, and Oxbridge attendance, 1990-2016. Accounting for hidden wealth eliminates one-third of the observed decline of the top 10% wealth-share over the past century. I find 8,839 dynasties that are hiding at least £7.4 Billion.

JEL: N00, N33, N34, D31, H26

Keywords: hidden wealth; inequality; economic history; big data; tax evasion

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# 1 Introduction

The 20th century's 'Great Equalization' of wealth in Europe and the United States was the result of the decline of the top wealth-shares. In England the wealth-share of the top 1% transformed from over 75%, in 1900, to less than 20% by 1970. New wealth created by the post-war 'Golden Age' of economic growth grew faster than net-of-taxes returns on capital (Piketty (2014), p.362-3).

We base this stylized fact primarily upon *observed*, or *declared*, wealth. But the incentive to hide wealth exploded over the 20th century. In the 1950s, the top rate of estate tax was around 80%. Is the 'Great Equalization' of wealth an illusory characterization of the wealth distribution? A simple result of an increased tendency for elites to hide their riches?

Declared wealth-at-death data is the primary source for our understanding of the 20th century wealth distribution in England (Atkinson and Harrison, 1978; Atkinson et al., 1989; Atkinson, 2013; Alvaredo et al., 2018). Since 1858, the individual details of wealth-at-death have been centrally recorded in the *Principal Probate Registry Calendars*. Using a 100% sample of this data, 1892-1992, this paper presents a method to estimate hidden wealth.<sup>1</sup>

I define 'hidden' wealth as wealth missing from the perspective of the probate calendars, and therefore the tax authorities. This holistic definition of 'hidden' wealth does not necessarily correspond to wealth that is illegally concealed. However it is motivated by the fact that the empirical characterization of the English wealth distribution in the 20th century is in the main, based upon wealth-at-death data.<sup>2</sup> The *Probate Registry Calendars* represent the most comprehensive, population-wide source of consistently collected wealth-at-death estimates. A portion of 'hidden' wealth will be legal portfolio re-arrangement to tax-exempt trusts, inter-vivos bequests, charitable donations, gifts to non-family members, and a portion will *potentially* be illegal tax evasion.

The method is a simple accounting exercise that exploits the nominal, individual level data. The first key identifying assumption is that wealth declared before 1920 was a more accurate measure of the 'true' wealth of a dynasty than declared wealth after 1920. The incentives suggest that this is reasonable; taxes on wealth before 1920 were a tiny fraction of taxes after 1920. The second key assumption is that this 'true' wealth grew at the average net-of-taxes rate of return to wealth.

During the low tax era, 1892-1920, I sum declared wealth at death, by dynasty. I then calculate an expected flow of inherited wealth that should show up in those same dynasties after 1920. This estimate incorporates war-time, the specific amount of inheritance tax paid, capital income tax and the real rate of return on wealth.

For most, wealth after 1920 is in excess of that predicted by the inheritance flow from 1892-1920. This is newly created wealth. However, for certain dynasties, declared wealth is systematically below expected wealth from inheritance. This is hidden wealth.<sup>3</sup>

Let us take the Axxxxxxx family as a concrete case study to illustrate the method (I have anonymised the name).<sup>4</sup> In the 1881 census of England and Wales, there are 39 people with the

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<sup>1</sup>For specific details on this wealth measure, which are valuations of a deceased's estate, see Cummins (2019); Rubinstein (1974, 1981); Harbury (1962); Harbury and Hitchens (1979).

<sup>2</sup>If wealth is missing, or 'hidden', from the Probate calendars, it is also missing from analyses using related sources, for example from (Atkinson and Harrison, 1978; Atkinson et al., 1989; Atkinson, 2013; Alvaredo et al., 2018). These authors use aggregated summary data from the Inland Revenue for their estimates.

<sup>3</sup>Figures A.4c and A.4d report the declared wealth of 2 'hiding' dynasties over the sample period, 1892-1992. Figure A.4e on the other hand reports the declared wealth of a dynasty creating new wealth. One of these dynasties is that of a former primeminister.

<sup>4</sup>The Axxxxxxxs are an English aristocratic family that traces its ancestors to the 10th century. A google search reveals connections to the Royal family and many MPs of that name. I illustrate other surnames dynasties in this way in appendix figure A.4.

surname Axxxxxxx. Between 1892 and 1920 I observe 4 probated deaths. The sum of the wealth of the Axxxxxxx's in this period is £12.4 Million (in £2015). Post 1920, I expect this amount of capital to generate a flow of wealth that should show up in the probate records of the Axxxxxxxs. This flow is calculated based on the rate-of-return of wealth in the economy, net of inheritance and capital income tax. All of these elements are separately calculated, as is wartime destruction of wealth.

As figure 1.1 illustrates, the declared wealth of the Axxxxxxx dynasty is far below what we would expect from that observed before 1920. The difference between the expected flow of inherited wealth and that actually declared is hidden wealth. In the period 1980-1992, this amounts to over £3m. The Axxxxxxxs *could* be hiding about 94% of their inherited wealth. Despite the fact that there are only 96 Axxxxxxxs in England in 2002, the name appears in the *Offshore Leaks database* (International Consortium of Investigative Journalists (2019)).

This paper finds thousands of dynasties that appear to be hiding wealth such as the Axxxxxxxs. Specifically I can name 8,839 dynasties hiding at least £7.4 Billion (£2015). I show that this hidden wealth estimate predicts a dynasty's appearance in the *Offshore Leaks Database*. I further show that hidden wealth is correlated with postcode house-value in 1999, and attendance at Oxford and Cambridge Universities, 1990-2016. These hidden wealth effects are apparent even when controlling for observed wealth.

A crucial clarification is due: for any one dynasty, the categorization of the missing wealth as hidden is a *probability*. The random hazards of marriage choices, mad inheritors, disastrous investments, betrayal, theft, stupidity and chance can dilute and destroy even the grandest of fortunes. For any specific dynasty, I apply an unrealistic wealth trajectory that ignores the composition of assets, and further, that uses only two series for the aggregate return on wealth, from Jordà et al., 2019 and Piketty, 2014, and one series for capital income tax (Atkinson as reported by Piketty, 2014).

Reality is, of course, far more complex. Each dynasty will have its own idiosyncratic mix of land and property, stocks and bonds, cash and other movables, art collections, and a multitude of other assets, all appreciating, or depreciating, at different rates. The method I apply here is not meant to be an accurate point estimate of the precise wealth for any one dynasty. It is designed to estimate a plausible minimum; at the group level, we can get use it to estimate a minimum amount of inherited wealth that is hidden. In addition to these calculations at a macro-level, I also show that this hidden wealth, at the surname level, is highly correlated with contemporary outcomes.

In this paper, I show that for Victorian elites, the richest 1,500 dynasties of the 1892-1920 period (of which the Axxxxxxx are members), wealth is systematically hidden.

For the analysis, I select only rare surnames of English origin, who have less than 100 people observed in the 1881 census, and track these rare surname dynasties in the Probate Calendars from 1892-1992. Formally, I compare *estimated* wealth calculated using the net-of-taxes rate-of-return on wealth on observed dynastic capital during the low-tax prewar years with that later *actually observed* in the high-tax post war era. I incorporate wartime destruction and all death-taxes paid into this estimate of 'true' inherited-wealth. Figure 1.2 illustrates the concept for calculating hidden inherited wealth.

At the aggregate, this estimate is lower than observed wealth as new wealth is being created by non-inheriting surname dynasties. Figure A.2 reported in the appendix, illustrates how newly created wealth is captured. However, for the richest English dynasties, the Victorian Elite of 1892-1920, it is clear that at least 9-24% of all elite wealth is hidden by their descendants, 1950-1992.

At the individual surname level, this hidden wealth estimate, and the proportion of wealth hid-

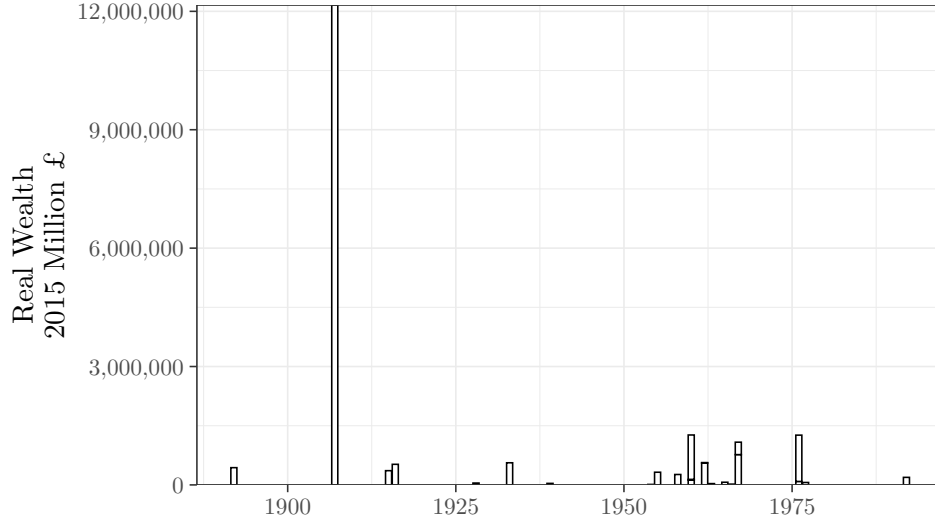


Figure 1.1: The Wealth at Death of Members of the Axxxxxxx Dynasty

Source: 100% PPR Calendar Sample.

den, strongly predict the appearance of a surname in the recent *Offshore Leaks Database* (International Consortium of Investigative Journalists 2019). This suggest that a proportion of inheritance taxation is potentially being evaded. Further, the richer the dynasty, the greater is the proportion of wealth hidden.

Using the locations of 31 Million UK voters from the *electoral roll* of 1999, and the complete *price paid* data for house sales 2017-8, I show that hidden wealth is associated with more expensive postcodes. Hidden wealth boosts contemporary consumption and living standards of hiding dynasties. Further, I show that their children are more likely to attend the elite universities of Oxford and Cambridge, 1990-2016.

The fact that the estimates of dynastic hidden wealth correlate strongly with contemporary outcomes, are robust to different formulations (including a different rate of return to wealth), and are highly statistically significant, is supportive of the validity of the method introduced by this paper.

Incorporating this elite hidden wealth into a recalculation of the top decile wealth share shows that the decline of the ‘true’ wealth share is significantly more muted than that for observed wealth. The richest decile hold an extra 10% of the ‘true’ wealth distribution, equivalent to a 33% reversal of the observed decline.

This paper relates to existing work on the English wealth distribution Piketty (2014), Lindert (1986), Harbury (1962); Harbury and McMahon (1973); Harbury and Hitchens (1976, 1977); Atkinson and Harrison (1978); Harbury and Hitchens (1979); Lindert (1986); Atkinson et al. (1989); Atkinson (2013); Alvaredo et al. (2018) and of course the titanic contributions of Piketty (summarized in Piketty (2014)).

Of more immediate relevance to hidden wealth is the recent work of Gabriel Zucman: Zucman (2013), analyzing systematic anomalies in the foreign assets and liabilities of countries, estimates

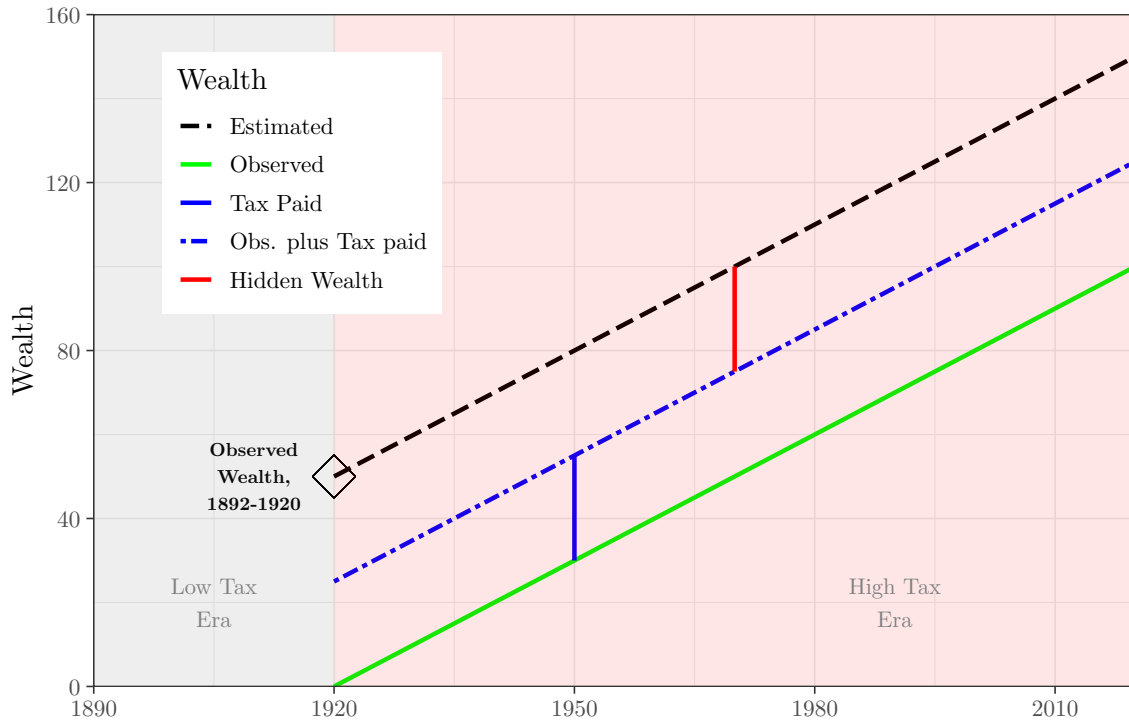


Figure 1.2: The Concept

*Note:* To estimate hidden inherited wealth, I project observed dynastic capital during the low-tax era forward using the net-of-taxes rate-of-return on wealth. I subtract inheritance tax paid. Hidden wealth is the difference between this expected wealth and that actually observed. I assume that wealth observed during the low-tax era is a much better approximation of true dynastic wealth than wealth observed during the high-tax era.

that 8% of household wealth is held unrecorded in offshore tax havens. Alstadsæter et al. (2019), also using off-shore banking leaks and micro-data, from Norway, Denmark and Sweden, claim that “the 0.01% richest households evade about 25% of their taxes”.

This paper presents a simple method, combining historical and contemporary data, to estimate hidden wealth at the surname level. This method produces a set of surnames that are potentially hiding a large amount of wealth. Tax authorities could use this information to investigate potential evasion.

Internationally, the pattern of a low-tax pre-war era followed by a high-tax post-war period is almost universal; applying the method presented in this paper to other historical wealth data from other countries could lead to the uncovering of vast sums of hidden wealth.

The implications of incorporating hidden wealth into the top wealth shares are of profound importance. Changes in wealth inequality were the largest equalizing force in the 20th century (Piketty, 2014). This paper shows that the true top-wealth share did indeed decline but not by as much as that observed in the reported data. This finding is important for our empirical understanding of the true evolution of inequality over the last century and is crucial for attempts to understand the causal forces behind the ‘Great Equalization’. It also highlights the need for further research on hidden wealth, both contemporary and historically, in the UK and elsewhere.

The data for analysis are presented in section 2, the methodology in section 3, results in section 4 (surname-group level) and section 5 (individual surname level). In section 6, I replicate the method and the empirical analysis using an alternative series for the rate of return to capital during the 20th century. Section 7 reports an adjusted top 10% wealth share that accounts for hidden wealth, 1920-1992, and section 8 concludes.

## 2 Data

This paper exploits several newly constructed and existing datasets.

### 2.1 The Principal Probate Registry Calendar entries, 1892-1992

All estates of the deceased in England and Wales, above a threshold, require an act of probate for inheritors to legally execute a will. I use the complete individual level wealth-at-death records from the the *Principal Probate Registry (PPR) Calendar* entries, 1892-1992, to track English dynastic wealth.<sup>5</sup> This source records all decedents in England and Wales with wealth above the threshold (currently £5,000).<sup>6</sup> Name, address, date of death, the name of the executor and an estimate of estate value were consistently recorded. The original printed volumes were digitized and algorithmically parsed and formed into a database suitable for economic analysis, in a process described in Cummins (2019), who investigates in depth the quality of the resulting data, 15 million individual level wealth-at-death observations.

As Wedgwood (1928) states: “generally speaking, the probate valuations are restricted to property within the free disposition of the deceased ... at the time of his death” (p.42). Table 2.1 reports the type of wealth included and the major changes 1858 to 1992. It should be noted that it

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<sup>5</sup>Existing research directly using the individual probate valuations includes Wedgwood (1928), Harbury (1962), Perkin (1978), Rubinstein (1977a,b, 1981) Nicholas (1999), Rothery (2007), Turner (2010), Clark and Cummins (2015a) and (2015b).

<sup>6</sup>The probate threshold during the period 1858-1900 was £10, 1901-1931: £50, 1932-1964: £100, 1965-1974: £500, 1965-1974: £500, 1975-1984: £1,500, 1984 onwards: £5,000 Cummins, 2019, table 1.

Years	Valuation
1858-1898	Unsettled Personalty + Let Freeholds
1898-1925	” + Unsettled realty
1925→	” + Settled Land

Table 2.1: The Probate Valuations

*Notes:* Based on information from Rubinstein (1974, 1977a); Turner (2010). ‘Unsettled refers to cash from the sale of an asset where as ‘settled’ refers to assets that are unsold but held in trust for successive beneficiaries (see <https://www.gov.uk/guidance/inheritance-tax-manual/section-8-settled-property> for more details on the legal definitions). This table is also reported in Cummins, 2019.

is only after 1898 that unsettled realty is included, and only after 1925 when settled realty is part of the estate valuation. This will bias the hidden wealth estimates presented later downwards, as inherited realty is counted only after 1925 and not before. This supports the argument that the hidden wealth estimates of this paper are a lower-bound.

Estates were valued at market prices. The wealth information is imperfect; the biggest consistent omission is ‘unsettled personalty’ - for example trust funds (Rubinstein (1974)). p.70). Also, there is no information on inter-vivos gifts, nor on transfers to spouses, or to charity (these were never subject to inheritance tax). In addition, age at death is not reported.<sup>7</sup> Pension entitlements and annuities that end with death are completely omitted from the valuations, as is the cash value of joint bank accounts. There are more omissions and weaknesses, as detailed in Cummins (2019). However, even considering these numerous, major flaws, the PPR Calendar valuations remain the best and most consistent, systematically collected estimates of individual English wealth-holding over the 20th century.

The wealth-share estimates of the top percentiles from the PPR Calendars match closely existing estimates from Atkinson and Harrison (1978); Atkinson et al. (1989); Atkinson (2013) and Alvaredo et al. (2018), who use aggregated returns reported by the Inland Revenue. Figure 2.1a compares the PPR percentile shares of the English wealth at death distribution with those from Alvaredo et al. (2018).<sup>8</sup> The PPR Calendar data also matches well with estimates of aggregate non-pension wealth, as reported by Blake and Orszag (1999), and illustrated in figure 2.1b. The empirical base for historical wealth estimates are limited so there are very few studies to compare with the PPR data. However, Lydall and Tipping (1961), who used the 1954 Oxford Savings Surveys to calculate a representative estimate of the individual wealth distribution below £2,000. Above £2,000, they used estate duty returns. In figure 2.1c I compare their estimates with those from the PPR Calendars. There is a striking correspondence.

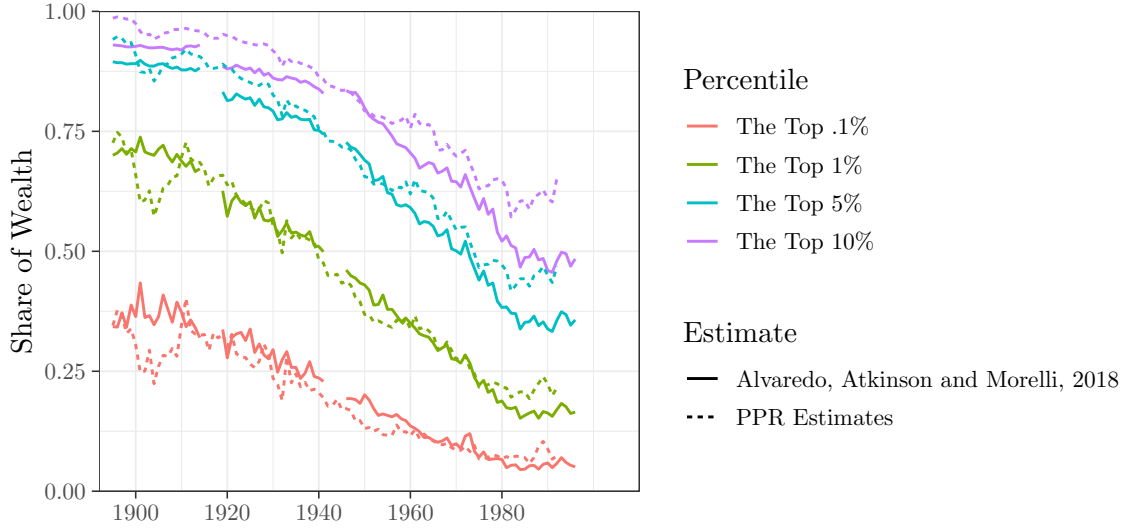
The evidence from existing studies support the credibility of the PPR Calendar wealth data.

## 2.2 Taxes Due at Death

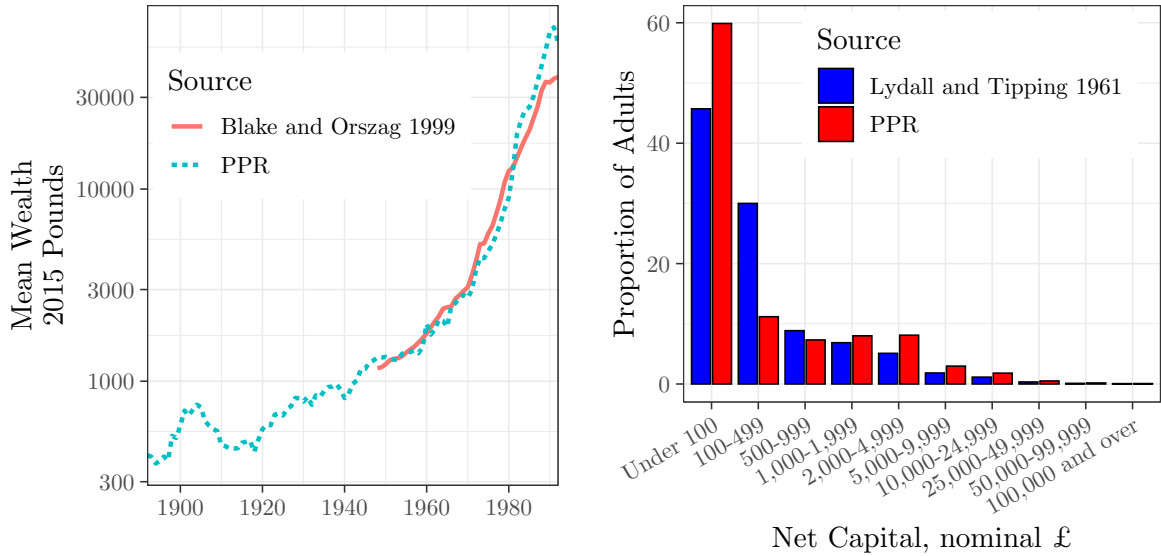
Death duties are complicated taxes made up of different time-varying components. All death duties, composed of legacy, succession, estate duties (1892-1974), capital transfer tax (1974-1986),

<sup>7</sup>As the dead are not a random sample of the general population, this is a possible source of bias. However, Alvaredo et al. (2018), who use a related source, aggregated summary tables from the Inland Revenue, show in their figure 6 (p.18), that there is no substantive difference in the level or trend of wealth inequality when adjusting by age at death.

<sup>8</sup>I use the estimates reported in Table D1 of the working paper version, Alvaredo et al. (2017). See the appendix for a comparison of average wealth per adult.



(a) Comparing Different Estimates of Top Wealth Shares, England 1892-1992



(b) Comparing Average Wealth with Blake and Orszag (1999) (c) Comparison of Net Capital with Lydall and Tipping (1961), by Wealth Band, 1950s

Figure 2.1: The PPR Calendar Wealth Data, Compared with Existing Estimates

Notes: See Cummins (2019) for a detailed account of the source, construction and validation of the PPR data. Sources: PPR wealth data, Alvaredo et al. (2017) table D1, Blake and Orszag (1999, Table 12) (sum of columns 'net financial wealth', 'housing wealth' and 'consumer durable assets'). These aggregate sums were converted to a per adult measure using population data from Office for National Statistics (2018). Source for figure c: Lydall and Tipping (1961, p.89). Note that the PPR covers England, the Lydall and Tipping (1961) estimates cover Great Britain. Both estimates exclude pension wealth. These figures are also reported in Cummins, 2019.



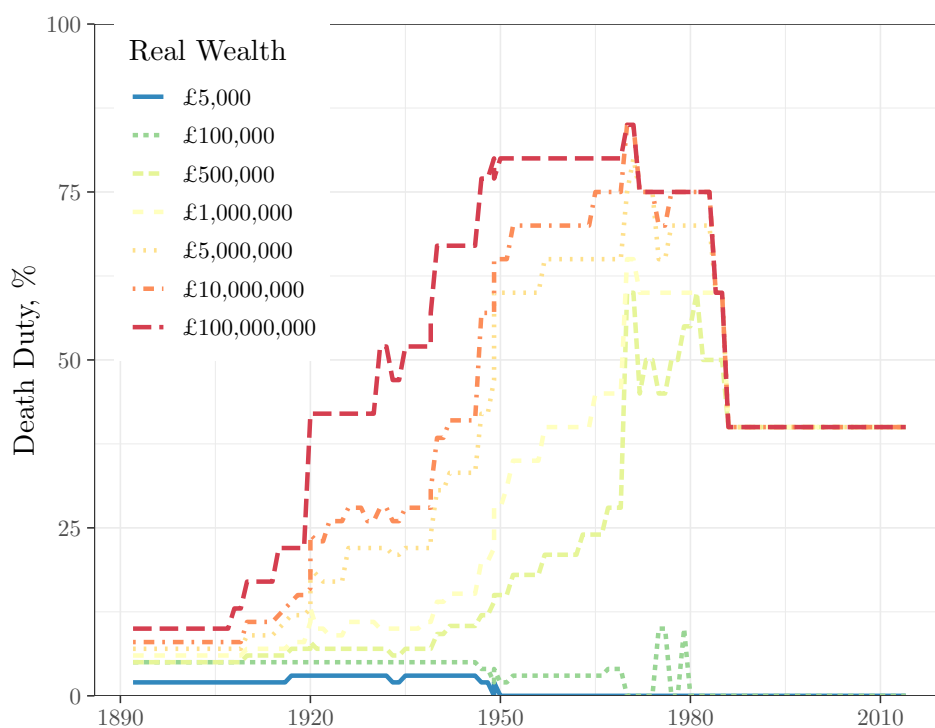


Figure 2.2: Death Duties, 1892-2015

**Notes:** £2015. Inspired by similar figure in Nicholas (1999). *Source:* HM Revenue & Customs (2005) and Institute for Fiscal Studies (2007).

and inheritance tax (1986 and after) were collected: HM Revenue & Customs (2005) reports the schedules 1894 to 1974.<sup>9</sup> Capital transfer tax replaced estate duty in 1975 and was itself replaced by inheritance tax in 1986. Inheritance tax is a flat 40% above the nil-rate threshold (reported by HM Revenue and Customs). The Institute for Fiscal Studies ((2007)) collected the historical series for both inheritance tax and capital transfer tax (1986 to today; available at <https://www.ifs.org.uk/uploads/publications/ff/iht.xls>).

Figure 2.2 reports the total rate of death duties due by a set of estate values (in £2015), 1892-2015. By combining the tax and probate data it is simple to calculate tax paid. Table 2.2 reports the largest tax payers in England, 1892-1992.<sup>10</sup>

<sup>9</sup>Available at <https://uk.practicallaw.thomsonreuters.com/>.

<sup>10</sup>Note that the Grosvenor family famously invested the majority of their family fortune in a trust thus avoiding inheritance tax (See for example this story from *The Times*: [link](#)). The richest English women in the data, Eleanor Countess Peel, established a well endowed charitable trust with her estate ([peeltrust.com](http://peeltrust.com)). This will count as ‘hidden’ wealth in this analysis.

	Year	Name	County	Real Wealth	Death Duties, %	Tax Paid
1	1933	Sir John Reeves Baronet Ellerman	London	1,257,371,575	52	653,833,219
2	1974	Charles Cross	Hampshire	288,513,883	75	216,385,412
3	1935	TRH James Woolavington	Cornwall	345,796,993	52	179,814,437
4	1957	James Armand De Rothschild	Buckinghamshire	183,395,206	80	146,716,165
5	1958	William Stone	London	147,904,760	80	118,323,808
6	1940	TRH Marmaduke Furness	Leicestershire	139,121,970	67	93,211,720
7	1940	Jack Bamato Joel	London	138,382,028	67	92,715,959
8	1929	Bernhard Baron	East Sussex	213,606,754	42	89,714,837
9	1974	James Henry Bryan	West Midlands	119,247,477	75	89,435,608
10	1935	Arthur Stanley-Wills	North Yorkshire	169,260,470	52	88,015,445
11	1946	William Johnston Yapp	Kent	128,326,006	67	85,978,424
12	1953	Hugh Richard Grosvenor*	Cambridgeshire	105,630,735	80	84,504,588
13	1921	TRH Sir Ernest Joseph Cassel	London	199,628,495	42	83,843,968
14	1949	TRH Eleanor Countess Peel	Scottish Borders	102,871,973	80	82,297,579
15	1948	TRH Gerald Berkeley	Lincolnshire	105,111,626	77	80,935,952

Notes: 2015 prices. “TRH” = “The Right Honourable”. \* 2nd Duke of Westminster. Source: 100% PPR Calendar Sample.

Table 2.2: The 15 Largest Taxpayers, 1892-1992

## 2.3 The Return on Wealth and Capital Income Tax

The rate of return on wealth ( $r$ ) for the UK 1896-2015 is taken from Jordà et al. (2019) (website), who calculate  $r$  as a weighted average of bonds, bills, equity, and housing returns. For 1892-5, I use the average  $r$  1896-1899. This annual return on wealth reflects both capital gains and yields, so I transform  $r$  to decadal moving averages, centered on the year of death of the decedent. The goal here is to use  $r$  to best-guess the rate of growth of inherited fortunes; an individual’s financial assets are unlikely to be liquidated annually, so a decadal moving average gives a more realistic estimate of the likely gains or losses to the inheritance.

Decadal moving averages for the UK series of this real return on wealth are plotted, along with real GDP growth in figure 2.3. I calculate the net-of-taxes  $r$ ,  $r^*$ , as  $r^* = r - t$ , where  $t$  is the highest rate of tax on capital income estimated by Atkinson for the UK, 1908-1992, and reported by Piketty (2014)<sup>11</sup>. Before 1908 I use a value of 2.9%. Where the return on wealth is estimated as negative,  $r < 0$ , I set  $t = 0$ , as taxes are not due on negative capital income. These calculations of  $r$  and  $r - t$ , is plotted alongside  $g$ , the growth rate of the economy, in figure 2.3.

## 2.4 Offshore Leaks

The *Offshore Leaks Database* by the International Consortium of Investigative Journalists (ICIJ) (International Consortium of Investigative Journalists (2019)) contains detailed information on individuals connected to one or more of 785,000 offshore companies, foundations and trusts, from four recent data leaks; the Paradise Papers (2017 and 2018, principally from the law firm Appleby), the

<sup>11</sup>The original sources are Sabine (1966) and the Annual Reports of the Commissioners of the Inland Revenue.

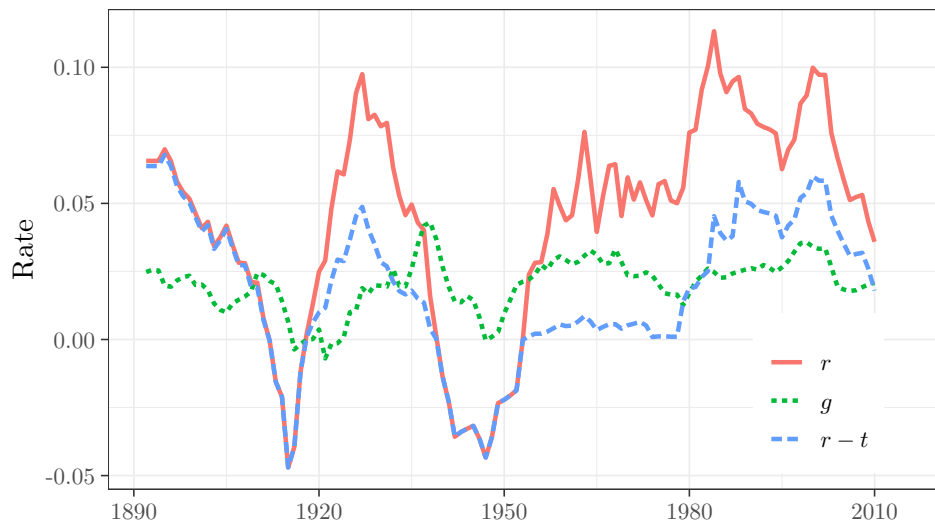


Figure 2.3: The Net-of-Taxes Rate of Return to Wealth

Source: The real return on wealth,  $r$ , and the real GDP growth,  $g$ , Jordà et al. (2019), website. (For 1892-5, I use the average  $r$  1896-1899.) The highest rate of tax on capital income,  $t$ , Piketty (2014) <http://piketty.pse.ens.fr/files/capital21c/en/xls/>, spreadsheet Chapter14TablesFigures.xlsx, sheet “DetailsTS14.1UK”, *Detailed series on UK top income tax rates (data provided by A.B. Atkinson, September 2011)*. Where  $r < 0$ ,  $t$  is set at 0, as taxes are not due on negative capital income. The figure plots decadal moving averages for visual clarity, annual figures are used in the analysis.

Panama Papers (2016, the law firm Mossack Fonseca), the Bahamas Leaks (2016, official corporate registry) and the Offshore Leaks (2013, Portcullis Trustnet and Commonwealth Trust Limited). Once cleaned and filtered, there are 298,015 names of individuals behind these Offshore entities and I utilize these names in my analysis.<sup>12</sup>

It is of course not illegal to be a director or owner of a foreign entity. However, the presence, or not, of elite inheritors in these lists is useful for our understanding of the destination of some of this hidden wealth.

## 2.5 Contemporary Outcomes: House Prices and Oxbridge Attendance

For contemporary outcomes by surname I collected individual nominal data on locations, house prices, and Oxford and Cambridge University attendance.

All voters in the UK are listed in the *electoral roll*. I extracted the records of the 1999 UK *electoral roll* from a CD-ROM entitled UK-Info Disk (2000). 1999 was the last year that the complete, pre opt-out, electoral roll was available. This resulted in 31,551,398 observations of forename, surname, specific address, and postcode.<sup>13</sup>

I then link the individual addresses from the electoral roll of 1999 to house price data by postcode in 2017 (from the land registry)<sup>14</sup>. There are 1,758,312 postcodes in the UK so this is a highly specific estimate of house values.

Attendance at Oxford and Cambridge Universities is sourced from official publications and email directories (see Clark and Cummins (2014); Clark et al. (2014); Clark and Cummins (2015a, 2018)).

In addition to the these data, this paper also uses the complete count of the 1881 Census of England and Wales, the Complete Death Register, 1892-2007 and multiple other ‘Big’ datasets summarized in Cummins (2018, 2019).

## 3 Methodology

The data allow me to observe all declared probated wealth 1892-1992. From the sum of this wealth for surname ‘dynasties’, 1892-1914, I can estimate the flow of ‘expected wealth’, 1920-2018. By comparing estimated with observed wealth, and accounting for taxes; I can estimate how much of English wealth is ‘hidden’.

This section details my methodology for defining surname ‘dynasties’, calculating wartime destruction, estimating expected wealth and measuring surname representation in the *ICIJ Offshore Leaks Database*.

### 3.1 Tracking Surname ‘Dynasties’

I use rare surnames to track dynastic wealth over time. In England, surnames are hereditary and are typically passed down through the male line just as the non-recombining region of the

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<sup>12</sup>I combined the “Officer” field in all 4 databases and manually cleaned out companies and organizations.

<sup>13</sup>Extracting the data from the 20 year-old CD-Rom interface was a technical challenge as only 250 records per individual search could be returned with a upper limit of 2,000 for any search criteria. Automation via jitbit Macro Recorder (<https://www.jitbit.com/macro-recorder/>) over several months resulted in apx. 31m duplicate free records. This represents a sample of apx. 70% (where 100% is 44m). The sample is complete for rarer names but incomplete for common names due to the 2,000 results per query hard limit.

<sup>14</sup>‘Price paid’ data was downloaded from <http://prod.publicdata.landregistry.gov.uk.s3-website-eu-west-1.amazonaws.com/pp-complete.txt>(HM Land Registry, 2018).

Y-chromosome. Thus surnames generally mark clusters of genetically related men (and can be deduced from human genomes (Gymrek et al., 2013), finding current utility in modern forensics).

The probability of co-ancestry of two individual men sharing a surname is dependent on the number of founders of a surname, the incidence of non-paternities and genetic drift. Rare surnames are significantly more likely to indicate co-ancestry (surname counts under 5,000 (King et al., 2006; King and Jobling, 2009)). Here rare surnames, defined as a count of less than 100 people in the 1881 census, are employed under the assumption that the holders of that name are highly likely to not only share some co-ancestry but can be thought of as part of the same surname ‘dynasty’. Under the assumption of positive assortative mating, I also include women.

The wealth-shares of the top-percentiles of the wealth distribution, 1892-1992, calculated at both the individual and rare-surname level are reported in figure 3.1. At the individual level, the top 10% have about 99% of all English wealth in 1900 - At the rare surname level the top decile have about 80% of all wealth. In 1992, the top 10% of individuals have over 60% of wealth whilst the top 10% of surname dynasties have just under 50%.

Despite these level differences, the time trends in the individual and rare surname series are remarkable similar (compare figure 3.1a with figure 3.1b and 2.1a). This suggests that the rare-surname level grouping captures the changing dynamics of the 20th century wealth distribution.

Harbury and McMahon (1973) note:

some observers contend that the decline in the share of the richest percentiles in the wealth distribution may be quite misleading, and reflect merely a rearrangement of wealth within families, rather than a redistribution of wealth from rich to poor families (p.810)

Figure 3.1 indicates that the ‘Great Equalization’ of English wealth is reflected at the surname-dynasty level and not only the individual level. Therefore rearrangement of wealth within families cannot explain the decline in the wealth share of the top 10%. (If it were, this would show up as no change in the rare surname level wealth-shares 1900 to 1992.) Table 3.1 reports the distribution of English surnames, population in 1881 and population in 2002, by surname count ranges.<sup>15</sup> Rare surnames are both more likely to go extinct, or increase far more rapidly than common surnames. There are 36,719 surnames that are held by less than 100 people in 1881. I define this group as the universe of English rare names.<sup>16</sup> It represents 1,049,250 individuals in 1881 and 2,133,793 in 2002.

I define a ‘Victorian rare elite’ as the top 1,500 richest wealth-holding surnames from 1892 to 1920, for those surnames held by 2-100 people in the 1881 census (I drop surname counts of 1).<sup>17</sup> Individuals holding these surnames die on average 420% richer than the average person, 1892 to 1992. By following these rare surnames in the PPR data, I can observe dynastic wealth. Table 3.2 also details the distribution of English surnames, population in 1881 and population in 2002, by surname count ranges. for this Victorian rare elite.<sup>18</sup>

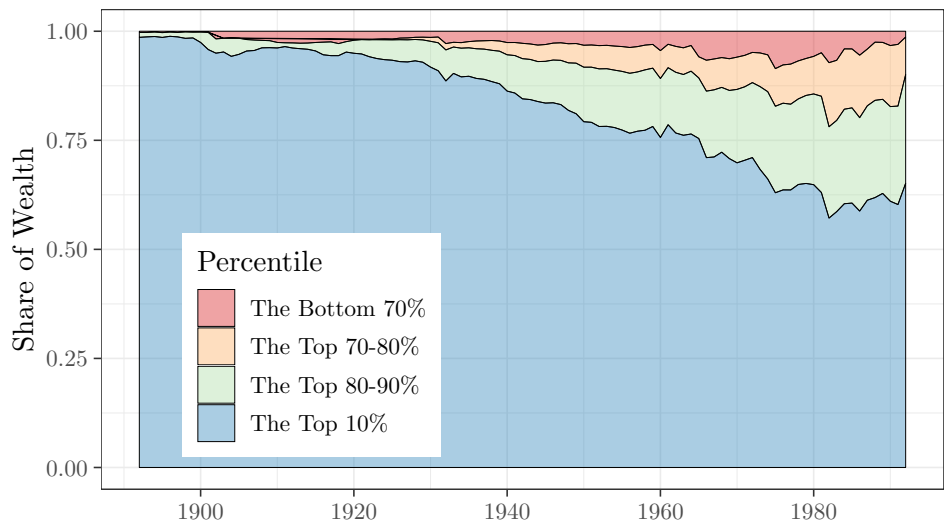
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<sup>15</sup>Ethnicity was assigned to every observed surname using ONOMAP name classification software (<http://www.onomap.org/>) provided to me by Paul Longley and Oliver O’Brien (Both Department of Geography, University College London).

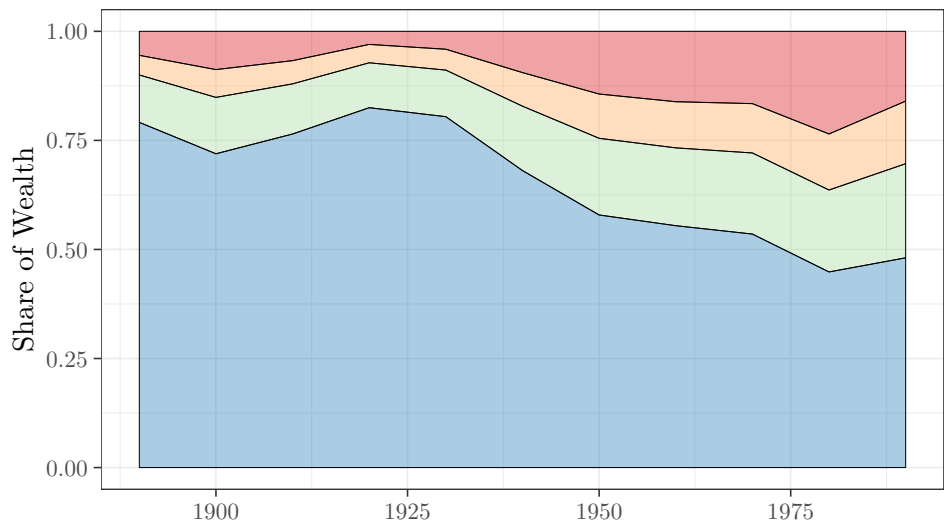
<sup>16</sup>Of these 36,719 names, 18,921 appear at one time in the PPR calendar between 1892 and 1920. I track these 18,921 names in the analysis.

<sup>17</sup>Queen Victoria died on 22 January 1901, so consider the name a nominal convenience and not a iron-clad definition. (As an aside; the monarch is not subject to probate (Nash (2017) p.128)).

<sup>18</sup>The two tables we can immediately rule out differential fertility as a potential channel behind the dilution of elite wealth. By comparing the growth rate of rare names in the population, 1881-2002 to names in the Victorian



(a) Individual Level



(b) Rare Surname Level

Figure 3.1: Observed Wealth Shares, Individual and Rare Surname Level, 1892-1992  
 Source: 100% PPR Calendar Sample.

Table 3.1: English Surname Extinction, 1881-2001

N Range, 1881	N, Surnames	N, 1881	N, 2001	Prop. Extinct	Ratio
1	1,791	1,791	38,330	0.15	21.40
2-5	3,442	10,151	80,365	0.14	7.92
5-10	5,212	36,103	142,200	0.10	3.94
10-20	7,402	104,419	269,520	0.07	2.58
20-50	11,306	363,995	675,159	0.05	1.85
50-100	7,566	532,791	928,219	0.02	1.74
500-2,000	3,734	3,557,709	6,278,178	0.00	1.76
>2,000	1,680	13,607,051	24,335,967	0.00	1.79

*Note:* Calculated from the 1881 census (Schurer and Woollard (2000) and National Statistics (2002)

Table 3.2: English Surname Extinction, 1881-2001, Victorian Elite Dynasties

N Range, 1881	N, Surnames	N, 1881	N, 2001	Prop. Extinct	Ratio
2-5	26	93	539	0.08	5.80
5-10	68	458	2,054	0.12	4.48
10-20	173	2,525	5,866	0.07	2.32
20-50	542	18,547	32,733	0.03	1.76
50-100	691	50,295	84,922	0.00	1.69

*Note:* Calculated from the 1881 census (Schurer and Woollard (2000) and National Statistics (2002)

In addition a ‘middling’ Victorian wealth grouping, ranked 8,740-10,239 out of a rare lineage universe of 18,921 and a Victorian ‘bottom’ grouping, the bottom ranked 5,000 wealth holders, out of the same 18,921 surnames.

### 3.2 Wartime Destruction

To estimate the destruction of capital due to the World Wars I look at the sum of rare dynastic wealth in the 5 years before and after the wars. Wartime destruction,  $w_d$  of wealth,  $W$ , for surname  $j$  is calculated as

$$W_{wd} = \frac{\sum_{t=WarStart-5}^{WarStart} w_{jt} - \sum_{t=WarEnd}^{WarEnd+5} w_{jt}}{\sum_{t=WarStart-5}^{WarStart} w_{jt}} \quad (1)$$

where  $WarStart$  is the start year of the war (either 1918 or 1939) and  $WarEnd$  is the end of the war (1918 or 1945). This will be an imperfect measure of the true wealth destruction of the

top-one-percent, it can be seen that if anything elite fertility acted against wealth dilution. At every range, the growth rate of the ‘Victorian Elite’ is lower (or only marginally higher in the 5-10 count range) than that of the general population. Surname extinction rates of the Victorian elite are also lower (again apart from the 5-10 count range).

war: Younger deaths during war will give the appearance of larger wealth destruction because of lost life-course wealth accumulation. Acting against this will be the reduced possibility to move wealth around to avoid the taxation of bequests. For simplicity, I take the simple ratio of equation 1.

### 3.3 Estimating ‘Expected’ Wealth, 1920-2018

Using the PPR calendar probate micro-data, I estimate *expected* wealth,  $W^*$  at year  $t$  of of rare surname  $j$

$$W_{j,t}^* = \frac{\sum_{1892}^{1920} W_j}{28} (1 + r_{1920}^{net})(1 + r_{1921}^{net}) \dots (1 + r_{t-1}^{net}) \quad (2)$$

where  $W$  is observed real wealth (2015 pounds) in any year, 1892-1920, growing at the net-of-taxes rate of return on wealth,  $r^{net}$ , where taxes are the maximum tax rate on capital income ( $T^K$ ), estimated as

$$r^{net} = r - T^K \quad (3)$$

The Jordà et al. (2019) estimates of  $r$  incorporate the negative returns to wealth during World War II.<sup>19</sup> I divide the initial capital estimate by 28 to estimate the subsequent, expected annual flow of wealth (1920 – 1892 = 28).

The major weakness of my approach is that it cannot measure *new* wealth creation by elite inheritors (although new wealth creation by non-inheritors is observed, see equation 8 below). This is of course an unrealistic assumption. However, the purpose of the exercise is to estimate a *lower* bound for the amount of wealth hidden by the English elite. Any new elite-inheritor wealth creation will make  $W^*$  an underestimate of their ‘true’ dynastic wealth.<sup>20</sup>

A further weakness in the method is that it assumes that the wealth portfolios of the elite generate the same aggregate rate of return on wealth as that calculated for the economy as a whole by Jordà et al., 2019. It could be that the elite disproportionately invest in assets that have a low return, such as agricultural land in this period (Clark, 2010; Jadevicius et al., 2018). Details of the composition of a deceased’s assets are not reported in the PPR Calendars so estimating a more precise return is not possible. There is also the chance that the elite disproportionately donate to charity or that they are more likely to live, and die, abroad (and thus not appear in the PPR

<sup>19</sup>In section 6 I estimate expected wealth,  $W^*$ , using an alternative rate of return on capital from Piketty (2014). As this series does not incorporate the capital destruction of the World Wars (see figure 6.1), I adjust this series of expected wealth to account for wartime destruction. The observed Wartime destruction of wealth, reported in table 4.2), by wealth grouping, is applied to  $W^*$  in 1945 to account for World War II.

<sup>20</sup>Acting against this will be the possible consumption of inherited wealth. If wealth is systematically spent on consumption and not invested, then my estimate of ‘hidden’ wealth is not truly concealed wealth but simply a measure of lost wealth due to consumption. At the dynastic level, I assume that the propensity to consume wealth and the propensity to add to dynastic wealth through income, result in a zero net gain or loss to the sum of inherited wealth. Supporting this assumption is the remarkable stability in the ranking of English dynasties, at the rare surname level, documented by Clark and Cummins (2015a). That study, using a subsample of the PPR calendar data used in this paper, estimate the intergenerational correlation of dynastic wealth at .7-.75. Over the sample period, Elite English dynasties regress towards the mean, but at a glacial pace. Further, there was no evidence for the very rich to regress to the mean faster than the not-so-rich, the average or the poor (Clark and Cummins (2015a), a finding that tends to get overlooked in the literature).



Calendars). On the other hand, there is also the possibility that the elite earned a higher rate of return on their wealth than the population average. This could be due to information from social networks on which assets to buy and sell.<sup>21</sup> Further, the elite could be more likely to appear in the PPR Calendars despite living abroad because they would be more likely to own English assets (from inheritance).

One test of whether the assumption, that elite wealth grows at  $r^{net}$ , is valid, is to inspect the expected versus observed wealth after 1920, but before the high post World War II inheritance tax era. As figure 4.1 (b) shows, the method produces a close correspondence with that reported in the PPR Calendars.

To estimate a lower bound on the amount of wealth hidden by the elite lineages, I apply the following logic: If death taxes, denoted as  $T^D$ , are close to zero, then there is no financial incentive for the rich to make arrangements to avoid paying taxes upon death. When  $T^D > 0$ , we can expect rational agents with bequest motives to avoid (legal) and perhaps evade (illegal) paying death taxes. This can be done by inter-vivos bequests and transferring assets between classes (for example trusts and offshore companies). Suppose family  $j$  has total wealth  $W$

$$W_j = \alpha(W_j) + (1 - \alpha)W_j \quad 0 \leq \alpha \leq 1 \quad (4)$$

where  $\alpha$  is the propensity to avoid/evade, and is an increasing function of the tax rate and other factors that make it easier or harder to hide wealth ( $Z$ )<sup>22</sup>:

$$\alpha = f(T^K, T^D, W, Z) \quad (5)$$

When taxes are 0, the observed estate at death is the true underlying wealth,  $W_j$ . This is the case in England before WWI. After WWI, observed wealth at death is the second component of equation 4. Death taxes ( $T^D$ ) are substantially lower before WWI than after. For the super-wealthy, the maximum death duty is  $\approx 10\%$ , 1894-1910. From 1945-1958, the maximum  $\approx 70-80\%$  (HM Revenue & Customs (2005), and plotted in appendix figure A.1d). Pre-War the PPR records reveal ‘true’ family wealth,  $W_j$ .<sup>23</sup> After they reveal  $(1 - \alpha)W_j = W_j^{obs}$ .<sup>24</sup>

Cumulative tax paid ( $T^p$ ) is calculated as

$$T^p = \sum_{1920}^t T_t^D * W_{j,t}^{obs} \quad (6)$$

where as before death taxes are  $T^D$  and  $W^{obs}$  ( $= (1 - \alpha)W$ ) is observed wealth from the PPR calendars.

Where estimated wealth is greater than reported wealth inclusive of cumulative death-taxes paid, I calculate the difference as hidden wealth ( $HW$ ). I divide cumulative taxes paid by 30 so that death taxes are effectively charged once per generation. Again this is to estimate the expected annual flow as equation 4.

<sup>21</sup>For example, see Cassis, 1994 on the close integration of London bankers and the aristocracy, 1890-1914.

<sup>22</sup>These may include legal changes, technology, culture and so on. See Alstadsæter et al. (2019) for recent evidence on the positive relationship between wealth and the propensity to evade tax.

<sup>23</sup>In the analysis I use 1920 as the cut-off for observing ‘true’ wealth. This is due to the structural break in the trend of the top 1% in apx. 1920 as revealed in figure A.1a.

<sup>24</sup>One could argue that privacy concerns might motivate some to conceal their true wealth. But that will still make wealth observed when tax = 0 a much more accurate estimate of family wealth than when tax is significantly greater than 0.

$$HW_{j,t} = W_{j,t}^* - \left[ W_{j,t}^{obs} + \frac{TP}{30} \right] : W_{j,t}^* > W_{j,t}^{obs} + \frac{TP}{30} \quad (7)$$

Note that by construction,  $HW$  must be greater than zero. Observed wealth that is in excess of that predicted by the level of inherited wealth, I calculate:

$$HW_{j,t} = \left[ W_{j,t}^{obs} + \frac{TP}{30} \right] - W_{j,t}^* : W_{j,t}^* < W_{j,t}^{obs} + \frac{TP}{30} \quad (8)$$

which by construction gives negative  $HW$ , which is newly created wealth.

Next I estimate the ‘true’ wealth,  $W$ , of English dynasties, 1920-2018. This is done in 2 parts, for wealth inheritors and for those creating new wealth. Inheritors  $W$  is calculated as:

$$W_{j,t} = W_{j,t}^* - \left[ \frac{TP}{30} \right] \quad (9)$$

And for new wealth creation dynasties, wealth in excess of that predicted by inheritance,  $W$  is calculated by

$$W_{j,t} = \left( \frac{1}{1-\alpha} \right) W_{j,t}^{obs} \quad (10)$$

Newly created wealth is incorporated by adjusting upwards observed wealth ( $W^{obs}$ ) by the implied population degree of tax avoidance,  $\alpha$ .<sup>25</sup> This is initially given a value of  $\alpha = .0$  for simplicity but is varied in section 7 when calculating wealth shares (see tables 4.3 and 5.2 for the empirical estimates).

Finally I calculate the proportion of wealth hidden,  $\alpha$ , as

$$\alpha_{j,t} = \frac{HW_{j,t}}{W_{j,t}} \quad (11)$$

By construction,  $\alpha$  ranges from  $-1$  (all wealth observed is newly created wealth) to  $+1$  (all wealth is hidden).

Table 3.3 summarizes the sources for estimating the elements of equations 1 to 11.

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<sup>25</sup>For a proportion of the surname-generation level estimates (8,469/56,937), the estimate of newly created wealth is *greater* than that observed ( $HW > W^{obs}$ ). This happens for dynasties where new wealth is being created that is in excess of that predicted by observed dynastic capital pre-1920. The case can be illustrated with a specific lineage (anonymized). The XXXXXX dynasty (97 people counted in the 1881 census, 129 in 2002) report £1,052,781 in wealth 1950-1980. Their estimated wealth, assuming no deaths taxes, for 1950-80 is £595,229, and when this is compared with that observed *plus* taxes-paid factored back in ( $W^{obs} + £826,353 = £1,879,134$ ), their implied newly created wealth ( $-HW$ ) is £1,283,904. (All in 2015 pounds.) The problem is that the method returns a value for newly created wealth that is *greater* than that observed. Their inheritance, accounting for tax paid is negative ( $W^* - TP/30 = -£231,124$ ). Common sense would indicate that best estimate of their true wealth is their observed wealth. Therefore, for these cases, I assign all wealth observed as new wealth ( $HW = -W^{obs}$ ) and the proportion of hidden wealth is assigned as  $-1$  (all wealth is new).

Name	Variable	Source	Eq.
<i>Directly Observed</i>			
‘True’ Lineage Wealth	$W$	Probate Valuations 1892-1920	
Death Taxes	$T^D$	IR Tables, Figure 2.2	
Reported Wealth	$W^{obs} = (1 - \alpha)W$	Probate Valuations 1920-92	
<i>Taken from Other Studies</i>			
Return on $K$	$r$	Jordà et al. (2019)	
Tax on $K$ income	$T^K$	Piketty (2014)	
<i>Calculated</i>			
Taxes Paid	$T^p$	$T^D(1 - \alpha)W$	6
Net return on $K$	$r^{net}$	$r - T^K$	3
Expected Wealth	$W^*$	$(1 - \alpha)W(1 + r^{net})$	2
Hidden Wealth	$HW$	$[W^* - (W^{obs} + T^p)] > 0$	7
New Wealth	$-HW$	$(W^{obs} + T^p) - W^* < 0$	8
‘True’ Wealth, Inheritors	$W$	$W^* - T^p$	9
‘True’ Wealth, Non-Inheritors	$W$	$\frac{1}{1-\alpha}W^{obs}$	10
Proportion Hidden	$\alpha$	$HW/W$	11

*Notes:* Estimated for rare surname  $j$  and time  $t$ . Summary terms for illustration, see text for detailed equations.

Table 3.3: Summary Table of Sources, Identities and equations for Estimating Lineage Wealth

## 4 Results

### 4.1 Wartime Destruction of Dynastic Wealth

Tables 4.1 and 4.2 report the wartime destruction of English wealth, calculated as in equation 1 for all, and the dynasty groupings. Wartime wealth destruction is far greater in World War I than World War II, 35% versus 17% respectively.

However, the lineage analysis reveals that this destruction is entirely limited to the pre-war elites. Nearly 60% of Victorian Elite dynastic wealth is wiped out during the Great War. The middling and bottom lineages get richer after the war.

World War II also sees more destruction of Victorian elite wealth but this time it is about half as damaging at 26%. Further, the Second World War was more egalitarian in its wealth destruction and thus less of an equalizing force than the Great War, at least as far as this dynastic evidence suggests.

Table 4.1: Wartime Destruction of Wealth, World War I

Victorian Wealth	Pre-War Wealth	Post-War Wealth	Prop. Destroyed	N	N, Lineages
All	63,987	39,532	0.382	342,614	34,259
Elites	2,148	891	0.585	2,395	990
Middling	35	56	-0.590	894	570
Bottom	13	109	-7.285	1,643	1,261

*Note:* Wealth is in Millions, £2015. *Source:* 100% PPR Calendar Sample.

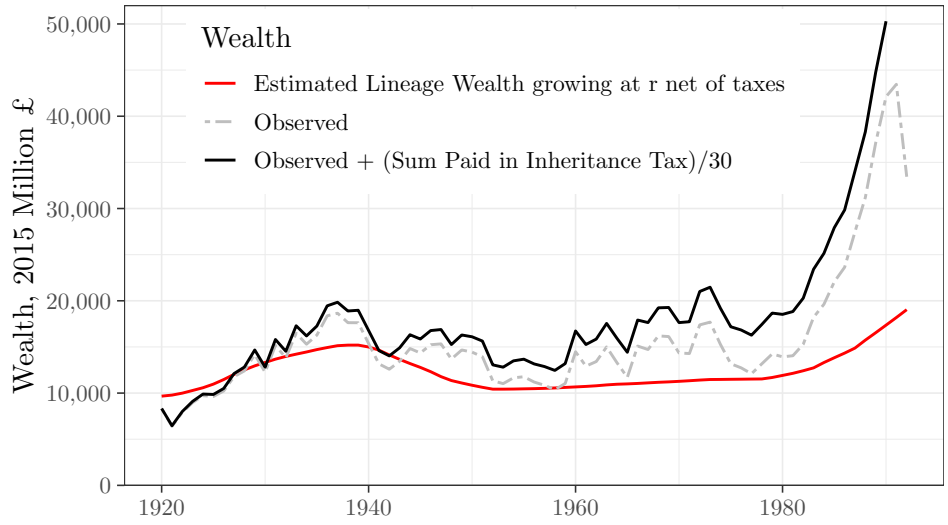
Table 4.2: Wartime Destruction of Wealth, World War II

Victorian Wealth	Pre-War Wealth	Post-War Wealth	Prop. Destroyed	N	N, Lineages
All	90,516	76,019	0.160	623,136	53,181
Elites	1,501	1,111	0.259	4,521	1,153
Middling	213	187	0.123	2,639	996
Bottom	314	316	-0.007	5,285	2,514

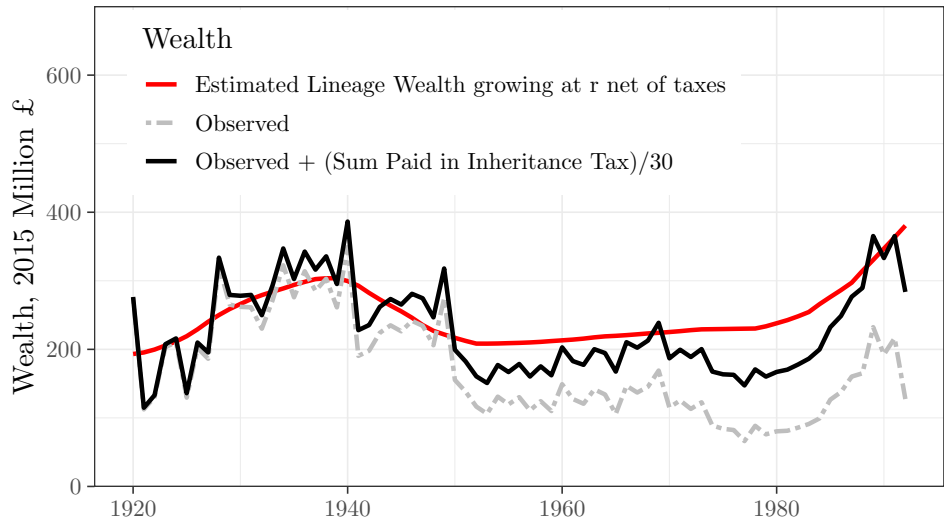
*Note:* Wealth is in Millions, £2015. *Source:* 100% PPR Calendar Sample.

### 4.2 Estimated and Observed Lineage Wealth Accumulation

Figure 4.1 reports three series: estimated lineage wealth (equation 2), observed wealth  $((1 - \alpha)W)$  and observed wealth plus taxes paid ( $T^p$ ), accumulating at  $r^{net}$ , for all wealth holders, 1920-1992. At this aggregate, the *positive* difference between the estimated and observed series is new wealth creation (see also figure A.3 in the appendix which compares estimated wealth with observed for the middling and bottom wealth holding groups). However, when the exercise is executed for the ‘Victorian rare elite’ lineages, as in figure 4.1b, the pattern is different. The first observation to note



(a) All



(b) Victorian Elite Lineages

Figure 4.1: Estimated and Observed Lineage Wealth, with taxes paid, all and Victorian top 1% Lineages

Source: 100% PPR Calendar Sample.

is the close correspondence of estimated and observed wealth from 1920 to 1950.<sup>26</sup> This suggests that using the methodology is suitable for tracking the wealth portfolio of this Victorian Elite. To formally assess this I run a simple regression with observed wealth (plus inheritance taxes paid) as a function of estimated wealth. Before 1950, the coefficient on estimated wealth as a predictor of observed wealth, plus inheritance tax paid, is 1.04 (with a standard error of .035).<sup>27</sup>

After 1950, reported wealth at death is consistently and systematically below the level of wealth we would expect. This is hidden wealth. From 1950 to 1985, this coefficient on estimated wealth as a predictor of observed wealth, plus inheritance tax paid, is .81 (.016). This implies that about 19% of wealth is hidden, on average, over this period.<sup>28</sup> The emergence of systematically hidden elite wealth is coincident with a large uptick in the levels of inheritance tax applied to estates of £5-10 Million (2015 prices), as reported in figure 2.2.

Precisely, how much wealth, as a lower bound, is being hidden by these Victorian elites?

### 4.3 What is the Propensity to Hide Wealth?

Table 4.3 reports the sum of hidden wealth by decade (as equation 7) and the mean value of  $\alpha$  (the proportion of ‘true wealth’ hidden) for the Victorian rare elite lineages, 1920-1990. The results indicate that a *lower* bound of 9-24% of inherited wealth is hidden for this elite grouping, post 1950. The proportion hidden,  $\alpha$ , falls after the 1970s, coincident with the reduction of the extremely high death duties of the earlier post-War era.

Table 4.3: Hidden Wealth and the Propensity to Hide, the Victorian Rare Elite, England 1920-1990

Decade	‘True’ Wealth	Observed Wealth	Observed + Paid in Inheritance Tax	Hidden Wealth	Prop. Hidden
1920	2,203	2,035	2,102	100	0.046
1930	2,894	2,787	3,040	-147	-0.051
1940	2,597	2,379	2,771	-174	-0.067
1950	2,106	1,242	1,714	392	0.186
1960	2,189	1,377	1,990	199	0.091
1970	2,292	962	1,748	544	0.237
1980-92	3,845	1,796	3,296	549	0.143

*Note:* Wealth is in Millions, £2015. *Source:* 100% PPR Calendar Sample.

<sup>26</sup>Note also that reported wealth plus taxes paid is higher than expected wealth for most of the late 1940s. This may reflect a desire for the very rich to contribute to the financing of the war or a lag in adjusting their behavior to the new high-tax regime. After 1950, this abruptly disappears. Note also the rise in reported wealth plus tax after 1980. This corresponds with the aggregate rise and the lowering of the extreme death tax levels to 40%. Figure A.3 in the appendix reports the same estimates for the Victorian mid and bottom Lineages.

<sup>27</sup>The details of this regression are reported in table A.2 in the appendix.

<sup>28</sup>As before, details are reported in appendix table A.2.

## 5 Surname Level Analysis

As opposed to looking at lineage groups of 1,500 names, in this section I use all 18,921 rare surnames. I report the pattern of hidden wealth by decile and the predictive power of hidden wealth and the proportion of wealth hidden for appearance of a specific surname in the ICIJ *Offshore Leaks Database*. The impact of hidden wealth on contemporary outcomes; housing and elite education is estimated. Finally I recalculate the top 10% wealth-share, incorporating hidden wealth.

Table 5.1: Summary Statistics, Rare Surname Level

Statistic	N	Mean	St. Dev.	Min	Median	Max
Generation	56,763	2	.82	1	2	3
N, Probated	56,763	7.70	8.20	0	5	149
N, 2002	56,763	78.92	72.84	0	58	597
Inferred Wealth	56,763	.61	1.95	0	.13	110.70
Observed Wealth	56,763	.87	5.94	0	.35	1,269.79
Tax Paid	56,763	.19	3.17	0	.01	508.84
Hidden Wealth	56,763	-.38	6.02	-1,269.79	-.13	79.17
Hidden Wealth (>0)	56,763	.23	1.31	0	0	79
Proportion Hidden	56,763	-.35	.65	-1	-.6	1
Proportion Hidden (>0)	56,763	.15	.29	0	0	1
Hide Any Wealth	56,763	.26	.44	0	0	1
Victorian Elite	56,763	.08	.27	0	0	1
In Paradise Leaks	18,921	.12	.32	0	0	1
N, Paradise	18,921	.68	2.67	0	0	35
House Value, 1999	18,126	334.45	305.41	7.26	289.25	14,750.00
Oxbridge Rate	18,921	.01	.02	0	0	0

*Note:* Wealth is in Millions, £2015. House prices are thousands, £.

*Source:* 100% PPR Calendar Sample.

I aggregate all individual observations to the surname level by generation. The first generation is 1920-1950, the second is 1950-80 and the final generation is 1980-1992. Table 5.1 reports the summary statistics for the rare surname-level analysis.<sup>29</sup> The size of these dynasties varies from 0-149 people dying in generation with a median of 5. The median living population of people with these rare surnames in 2002 is 58, with a 0-597 range. 23% of the sample report wealth below what we would expect from their pre-1920 inheritance.<sup>30</sup> 12% of the names show up in the paradise papers. A striking number in table 5.1 is the minimum reported hidden wealth, -1.27 Billion. This is the newly created wealth of the Ellerman dynasty (See table 2.2).<sup>31</sup>

<sup>29</sup>Note that the paradise paper link is done for generation 3, 1980-92, only. In the 1999 electoral roll, not all rare surnames are found: 18,126 out of 18,921 names are present, 795 are not.

<sup>30</sup>There are 8,839 dynasties hiding £7.4 Billion (£2015). This is the number of unique ‘hiding’ dynasties, where hidden wealth > 0, across all 3 generations, and the sum of their maximum observed hidden wealth, as summarized in table 5.1.

<sup>31</sup>A portion of this estate was transformed in to a charitable trust and now funds the Scottish Ballet and Bumblebees (<https://ellerman.org.uk/what-weve-funded/case-studies>)

I calculate deciles based upon the observed wealth at death of a surname and also the inferred wealth, separately.

## 5.1 The Proportion of Wealth Hidden and Newly Created Wealth, by Wealth Decile

How does the tendency to hide wealth vary across the wealth distribution? Figure 5.1 illustrates the distribution of the proportion of newly created and hidden wealth, as calculated by equation 11, by inferred wealth decile and generation. The density distribution is scaled so that the maximum value is 1. This is for easy comparability across the percentile groups.

Figure 5.1 illustrates that the distribution of newly created wealth and hidden wealth is bimodal. In general, newly created wealth dominates (negative hidden wealth, as indicated by the left-side of the distribution). For the poorest group, the bottom 70%, there is also a tendency for there not to be any high proportion of either new or hidden wealth. This is because wealth itself is so low for this group. (Mechanically if wealth is estimated as zero, hidden wealth is set at zero.)

The right-side of the distribution illustrated in figure 5.1 shows the *relative* proportion of hidden wealth.

In the 1920-1950 period, the top 10% of the wealth distribution hide less wealth than everyone else. This reflects the relatively greater destruction of elite wealth during both World Wars (tables 4.1 and 4.2). For the post-War generations, there is a clear tendency for the higher wealth deciles to hide proportionally more wealth.

To get a minimum value for the proportion of wealth hidden, I calculate the proportion of hidden wealth again, this time setting all newly created wealth at zero. This can give us a lower bound on the tendency to hide inherited wealth. Table 5.2 reports these proportions. The top 10% hide 23% of their wealth, on average in 1950-80. This estimate is lower than the apx. 40% of wealth hidden by the top decile of Scandinavian wealth estimated by Alstadsæter et al. (2019) (see their figure 3 bottom panel).<sup>32</sup> The top 80-90th percentile are hiding a similar amount (23%), and the top 70th-80th, 18%.

From 1980-92 the percentage of ‘hidden’ wealth falls. But as this is a minimum, this should not be over-interpreted. This general tendency for my estimates of hidden wealth to fall over time may simply reflect the method: I calculate the share of inherited wealth from the 1892-1920 generation that is hidden. The share of newly created wealth hidden, 1920-1992, is not observed nor inferred. For this reason I consider the estimates from 1950-80 as the best guess estimate of the true hidden wealth share. The generation is not exposed to the capital destruction of a World War, economic growth is booming in Western Europe and death taxes are at their maximum. Inheritance from pre WWI is still a significant portion of all wealth. After 1980 new wealth creation means that my method loses power. In any case, at all times, my estimates are lower bounds.

In sum there is a positive relationship between the proportion of wealth hidden, and wealth. However the distribution of newly created wealth and hidden wealth is multi-modal. For the empirical analysis, I code categorical variables to capture potential non-linear associations.

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<sup>32</sup>Both estimates are lower bounds. My estimates cannot capture newly created wealth, of elite inheritors. The estimates of Alstadsæter et al. (2019) are for wealth in HSBC accounts only.



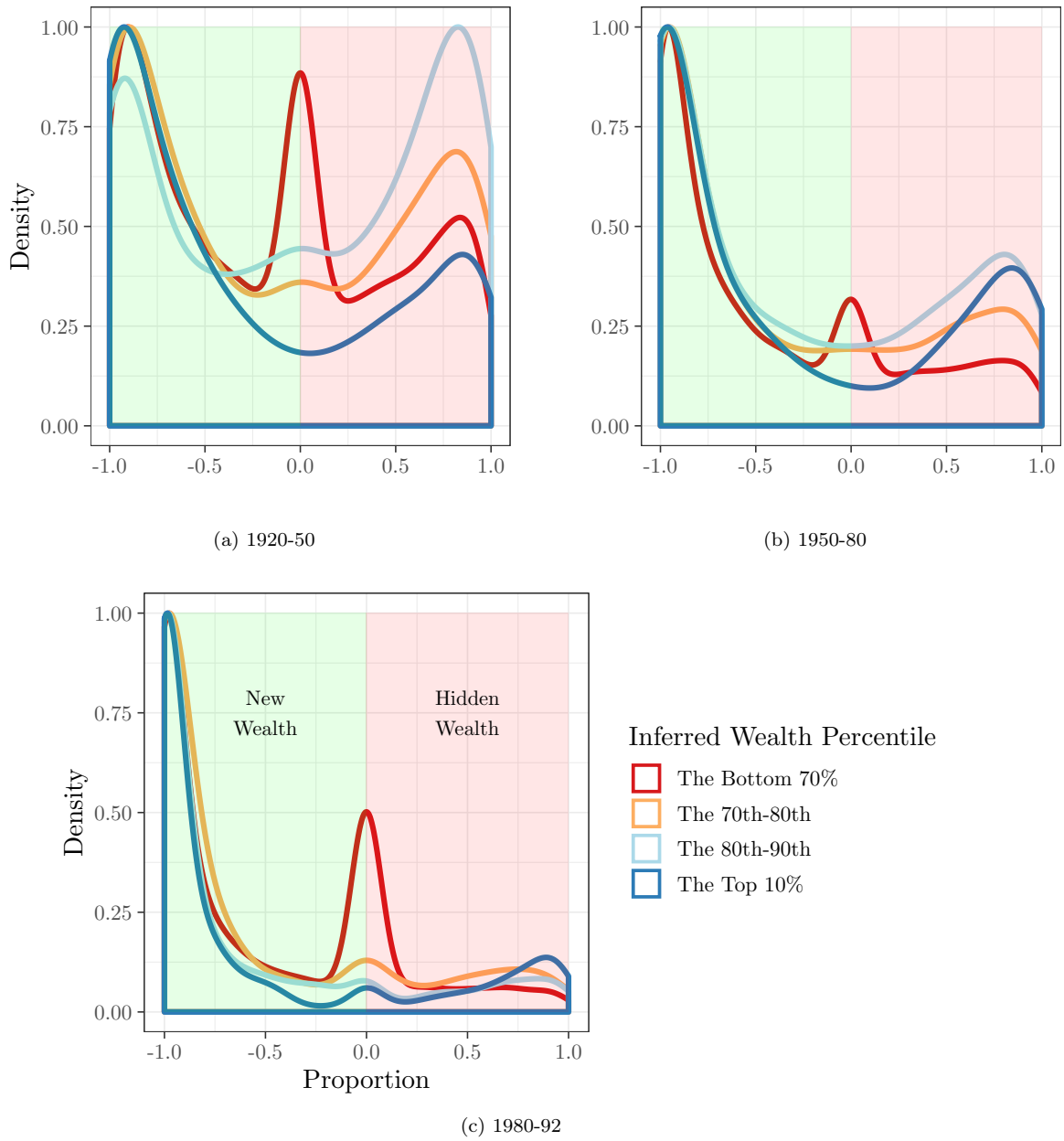


Figure 5.1: The Proportion of Newly Created Wealth and Hidden Wealth, by Wealth Percentile  
 Source: 100% PPR Calendar Sample.

Table 5.2: Mean Proportion of Wealth Hidden, Surname Level

Inferred Wealth Percentile	Generation			N
	1920-50	1950-80	1980-92	
The Top 10%	.22	.23	.14	5,550
The 80th-90th	.34	.23	.10	5,616
The 70th-80th	.27	.18	.10	5,630
The Bottom 70%	.20	.12	.06	39,497

Note: Negative hidden wealth is set at zero. Source: 100% PPR Calendar Sample.

## 5.2 Is Hidden Wealth in Offshore Tax Havens?

At the group and surname level there is evidence that a significant portion of wealth is hidden. Where is it? Offshore companies, foundations and trusts serve as potential destination for hidden wealth. Here I compare surname-level estimates of hidden wealth ( $HW$ ), with the appearance of those same surnames in the *Offshore Leaks Database* (International Consortium of Investigative Journalists (2019)).

To measure presence in the *ICIJ* data, I code a simple 0/1 variable for a surnames presence ( $D_{Paradise}$ ). As reported in table 5.1 about 12% of the sample surnames show up in the Paradise leaks (with a median equal to zero) and an average count of .7 (median also equal to zero). For the analysis only data from generation 3, 1980-1992, is used.

The general forms of the empirical models I apply to the surname level data are:

$$Y^j = c + \beta_1 \sum D_{OW}^j + \beta_2 X^j + \beta_3 \ln(N_{2002}^j) \quad (12)$$

$$Y^j = c + \beta_1 \sum D_{OW}^j + \sum \beta_{2i} D_{X^i} + \beta_3 \ln(N_{2002}^j) \quad (13)$$

$$X^j = \{D_{Hider}^j, HW^j, \alpha^j\} \quad (14)$$

$$Y^j = \{D_{Paradise}^j, H_{pcv}^j, OXB^j\} \quad (15)$$

where  $D_{OW}$  are categorical indicators for the wealth percentile observed from the PPR calendars for surname  $j$ . This set of values are one of the bottom 70% and every decile to the top 10%.  $N_{2002}$  is the count of the surname in 2002 (ONS).  $X$  represents the set of hidden wealth calculations generated by this paper. I separately model  $D_{Hider}$ , a categorical variable equal to 1 where hidden wealth is greater than zero and set to zero where no hidden wealth is estimated,  $\alpha$ , as before, is the proportion of ‘true’ wealth hidden.  $D_X$  represents a set of categorical transformations of the hidden wealth calculations, designed to capture non-linear effects. In appendix table A.8 I present estimates using exact observed wealth as a control, entered as a cubic expression, in place of the observed wealth percentile. The results are almost exactly the same.

$Y^j$  is the set of outcomes I observe at the surname level. In addition to  $D_{Paradise}$ , I estimate the same functional form for the outcomes  $H_{pcv}^j$ , the average postal-code value observed in the 1999 electoral roll and  $OXB^j$ , the attendance rate of a surname at Oxford and Cambridge Universities, 1990-2016. I use logistic regression to model the categorical dependent variable,  $D_{Paradise}$ .

The estimates are executed at the surname level, for all rare surnames. Table 5.3 reports the results for presence in the *ICIJ Paradise leaks database*.<sup>33</sup> Logistic regression coefficients (log-odds) are exponentiated to odds ratios for ease of interpretation and the regression t-statistics are reported in place of standard errors<sup>34</sup>. (The results and significance levels are not dependent on the method used, an OLS version of table 5.3 is reported in the appendix as table A.4.)

Appearance of a surname in the Paradise papers leaks is related to the number of people with that surname counted in England and Wales by the ONS in 2002. As well as an essential control variable, this also serves as a sanity check on the empirical exercise. In every specification, the top wealth decile have an odds ratio of 1.36-1.42 relative to the odds of the bottom 70%. The simple hider dummy also indicates a higher odds of appearing (1.29 times the odds of non-hiders) as does the level of hidden wealth. The effects of hidden wealth are non-linear as indicated by column 3. There, using categorical wealth groups, we see the odds of appearing in the paradise papers are 1.4 times higher for those who have an estimated lineage hidden wealth of £1m and up. All of these coefficients are statistically significant the 1% level with the top 10% dummy, the proportion of hidden wealth (column 4), and the simple hider dummy all being significant at the  $p = .001$  level.

In every column, the set of hidden wealth measures is informative of the probability of a surnames' appearance in the Paradise papers leaks. Hidden wealth matters even when controlling for observed wealth. The correlation for those with a annual hidden wealth amounting to over £1m is approximately equal to the effect of being in the top 10% of the observed wealth distribution.<sup>35</sup>

By cross-referencing the hidden wealth estimates with the *ICIJ Offshore Leaks Database* there is evidence that certain surname dynasties may be evading their taxes. Both hidden wealth and the propensity to hide wealth are statistically significant predictors of appearance in the *Offshore Leaks Database*, all the while controlling for total 'true' wealth. Figure 5.2 reports the top 50 dynasties, ordered by the amount of hidden wealth.<sup>36</sup> I have anonymized the names. While the method employed here can claim that the Victorian Elite are 'hiding' wealth, for any one lineage it is only a *probability*. The hazards of bad investments, mad inheritors, bad marriage choices, preferences for consumption over preservation of wealth and simple bad luck can easily destroy even the largest family's wealth. At the surname-dynastic level, figure 5.2 and table A.1 lists the hidiers as well as the unlucky. Without specific research into these families, we cannot say which category they belong to, hence I do not report their names.

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<sup>33</sup>All rare surnames appearing in the paradise papers were inspected by eye. Potentially misleading rare surnames that could also be confused with banking terms and jurisdictions (such as *Trust*, *Jersey* and *Pension*) were removed, as were names that were misclassified as English by Onomap. The regressions are run using the 15,975 surname observations that record at least one death 1980-92.

<sup>34</sup>I choose to report t-statistics because the confidence intervals around odds ratios are non-symmetric so therefore the approximated standard error (for example the one reported in Stata) cannot be used to calculate them.

<sup>35</sup>Investigations of the empirical models of the form in equations 12 and 13 on the count of a rare surname as dependent variable in the Paradise papers failed to generate any large or statistically significant results. Considering that hidden wealth predicts the probability of appearance, the count results imply that hidden wealth is negative associated with the count of a name in the paradise papers, once we examine variation above 0. This is confirmed by zero-inflated negative binomial models and censored OLS models (results available upon request).

<sup>36</sup>Table A.1, in the appendix, lists the top 50 dynasties, their hidden wealth, their propensity to hide, the number of them living in the UK in 2002, whether presence is recorded in the *Offshore Leaks Database* and whether they were members of the Victorian Elite.

Table 5.3: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Presence in the Paradise Papers

	Paradise Dummy				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	1.121 [1.455]	1.089 [1.091]	1.114 [1.378]	1.120 [1.446]	1.122 [1.459]
80-90	1.142 [1.698]	1.105 [1.284]	1.137 [1.639]	1.139 [1.660]	1.143 [1.705]
The Top 10%	1.434 [4.691]***	1.378 [4.231]***	1.425 [4.605]***	1.426 [4.620]***	1.434 [4.693]***
$D_{Hider}$	1.262 [3.414]***				
Hidden Wealth		1.052 [2.385]*			
$HW: 0-.2m$			1.125 [1.114]		
$HW: .2m-1m$			1.295 [2.661]**		
$HW:>1m$			1.470 [2.864]**		
Prop. Hidden, $\alpha$				1.384 [3.042]**	
$\alpha: 0-.5$					1.281 [2.601]**
$\alpha .5-.75$					1.130 [.964]
$\alpha. 75-.9$					1.318 [1.860]
$\alpha>.90$					1.399 [2.064]*
$N_{2002}$	1.004 [12.928]***	1.004 [12.786]***	1.004 [12.942]***	1.004 [12.898]***	1.004 [12.929]***
Observations	15,975	15,975	15,975	15,975	15,975
Log Likelihood	-5,704.953	-5,707.971	-5,703.599	-5,706.159	-5,704.265
Akaike Inf. Crit.	11,421.910	11,427.940	11,423.200	11,424.320	11,426.530

Note:

\* p<.05; \*\* p<.01; \*\*\* p<.001

Wealth is in 2015 Pounds, Per Annum flow

No hidden wealth and  $\alpha = 0$  are the omitted categories

Hidden wealth is calculated 1980-92, estimated via logistic regression

Odds Ratios are reported with t-stats in parantheses

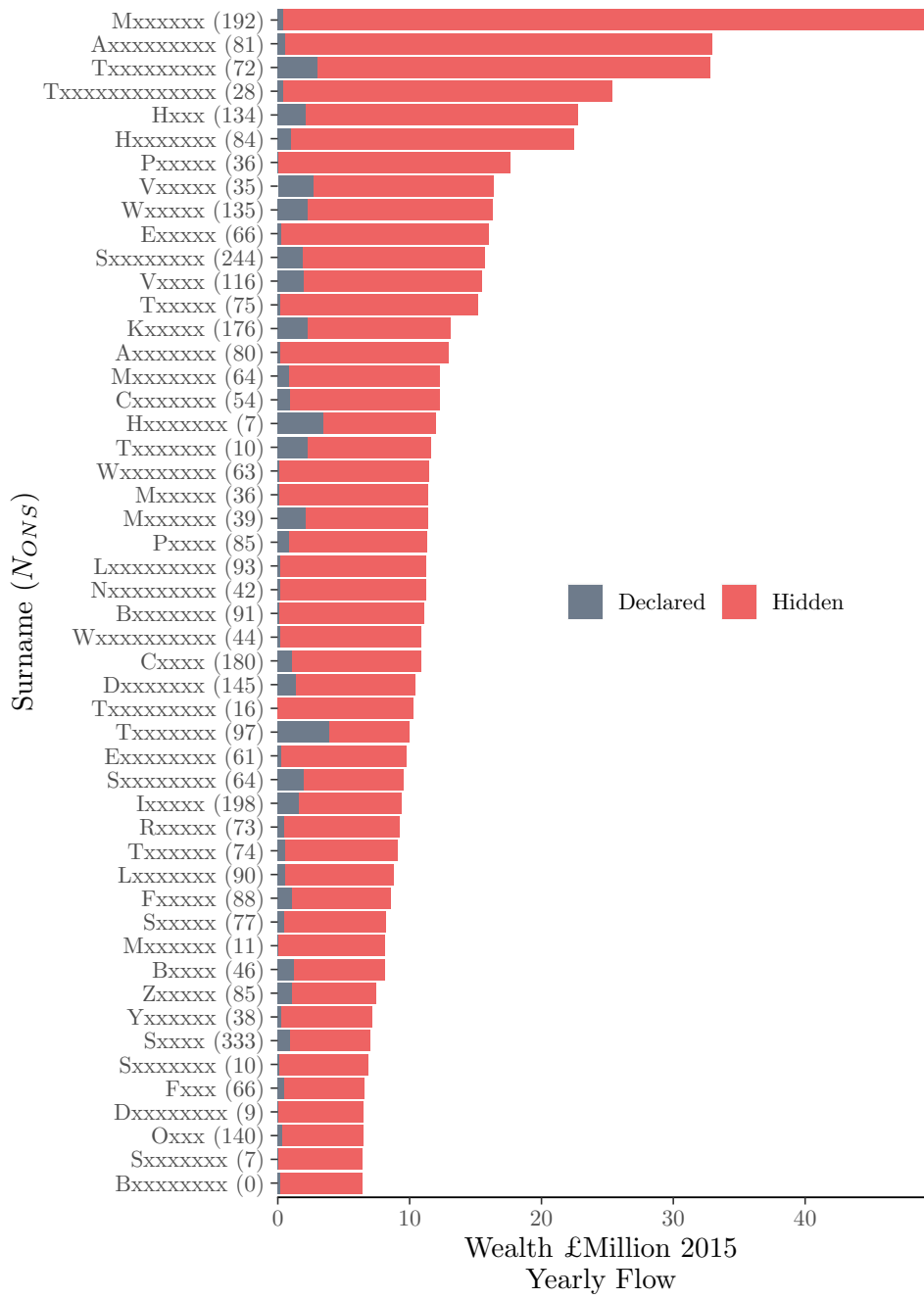


Figure 5.2: The Top 50 Hiding Dynasties, Hidden and Declared Wealth  
 Source: 100% PPR Calendar Sample.

### 5.3 Hidden Wealth and Contemporary Outcomes: Housing Value and Oxbridge Attendance

What is the impact of hidden wealth on contemporary outcomes? Tables 5.4 reports the correlations of hidden wealth, as equations 12 and 13, with average postcode house-value of a surname, observed in the 1999 electoral roll.

The top *observed* wealth percentiles live in more expensive postcodes than the bottom 70%. The top 10% live in houses that, are on average, almost £95,000 more expensive than the bottom 70%. However, even controlling for observed wealth, hidden wealth matters. Knowing that a surname has *any* hidden wealth is associated with them living, on average, in a postcode with house prices that are almost £39,000 more expensive (col. 1). Knowing that a dynasty has over £1m in hidden wealth is associated with them, again on average, living in a postcode with nearly £94,000 more expensive homes (col. 3). The effect of hidden wealth is substantial and in most cases statistically significant at the one-tenth of one-percent level.

Table 5.5 reports the same empirical formulation as before (equations 12 and 13) for wealth and attendance at the elite universities of Oxford and Cambridge, 1990-2016. Wealth has a strong effect on attending these institutions. In  $Z$  score units, where the mean is 0 and the standard deviation is 1, being a member of the top 10% of dynasties boosts Oxbridge attendance by .26 units ( $p < 0.001$ ). For Oxbridge, hidden wealth predicts attendance, even when controlling for observed wealth. The effect is large; hidden wealth over £1m boosts attendance by .15 standardized units. For the Hiding dummy, the amount of hidden wealth, wealth over £1m and the proportion of hidden wealth, the coefficients are significant at the one-tenth of one-percent level.

All of these ‘outcome’ results are insensitive to the type of wealth control used. In the appendix I substitute a cubic expression for wealth in place of the wealth deciles of equations 12 and 13. This is to capture any *within* decile wealth effects missed by the simple wealth decile dummy. Tables A.8 (paradise appearance), A.9 (post-code house price in 1999), A.10 (Oxbridge attendance) show that the results for all the variables of interest are almost exactly the same as those reported in this section. The correlations of hidden wealth and contemporary outcomes are not a product of incorrectly specified wealth controls.

### 5.4 Interpretation

The surname level analysis reveals 8,839 dynasties hiding £7.4 Billion. The amount of this wealth is correlated with appearance in the *Offshore Leaks Database*, the post-code value of where people are living in 1999 and the rate of attendance at Oxford and Cambridge Universities. Is this clear evidence that wealth is hidden?

Alternative explanations are possible. It is not illegal for an individual to be listed as a beneficiary or otherwise connected to an offshore entity. It is not necessarily hidden wealth that transforms mediocre offspring into Oxbridge high flyers. Social networks, preferences for elite education and even Oxbridge admission procedures could benefit the English elite, irrespective of their wealth. The post-code house values, being directly related to wealth, are harder to assign to alternative mechanisms, however.

The analysis demonstrates that hidden wealth is sizable even when the amounts can only be considered lower bounds of the true level of hidden wealth. If this missing wealth was not hidden in the way proposed by this paper, it could be an estimate of the dilution of great dynastic fortunes, the gap between what’s left, and what should be there, had the estate being managed competently. If this was the case, we would *not* expect to find the positive correlations with the contemporary

Table 5.4: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of House Price in 1999

	House Price				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	17.5* (7.6)	14.2 (7.6)	15.8* (7.6)	18.1* (7.7)	17.8* (7.7)
80-90	46.0*** (7.8)	42.1*** (7.8)	44.8*** (7.8)	46.3*** (7.9)	46.2*** (7.9)
The Top 10%	94.8*** (8.2)	89.5*** (8.2)	93.0*** (8.2)	94.6*** (8.2)	94.9*** (8.2)
$D_{Hider}$	39.3*** (6.6)				
Hidden Wealth		15.1*** (2.7)			
$HW: 0-.2m$			4.5 (10.0)		
$HW: .2m-1m$			47.3*** (9.6)		
$HW:>1m$			95.4*** (14.4)		
Prop. Hidden, $\alpha$				61.4*** (10.4)	
$\alpha: 0-.5$					28.5** (9.6)
$\alpha .5-.75$					51.4*** (12.0)
$\alpha. 75-.9$					60.9*** (14.9)
$\alpha>.90$					22.7 (16.6)
$N_{2002}$	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)
Observations	18,126	18,126	18,126	18,126	18,126
$R^2$	.02	.02	.02	.02	.02

Note:

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Wealth is in 2015 Pounds, Per Annum flow

House Prices are in Thousands of 2018 Pounds

No hidden wealth,  $\alpha = 0$  are the

omitted categories, OLS

Table 5.5: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Oxbridge Attendance Rate 1990-2016

	Oxbridge Attendance Rate (Z)				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	.101*** (.022)	.096*** (.022)	.098*** (.022)	.103*** (.022)	.103*** (.022)
80-90	.114*** (.023)	.108*** (.023)	.112*** (.023)	.116*** (.023)	.116*** (.023)
The Top 10%	.262*** (.024)	.253*** (.024)	.259*** (.024)	.263*** (.024)	.263*** (.024)
$D_{Hider}$	.067*** (.019)				
Hidden Wealth		.041*** (.008)			
$HW: 0-.2m$			-.007 (.029)		
$HW: .2m-1m$			.093*** (.028)		
$HW: >1m$			.167*** (.042)		
Prop. Hidden, $\alpha$				.119*** (.030)	
$\alpha: 0-.5$					.029 (.028)
$\alpha .5-.75$					.092** (.034)
$\alpha. 75-.9$					.107* (.043)
$\alpha >.90$					.091 (.047)
$N_{2002}$	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)
Observations	18,921	18,921	18,921	18,921	18,921
$R^2$	.041	.042	.042	.041	.041

*Note:* \*p<0.05; \*\*p<0.01; \*\*\*p<0.001  
Wealth is in 2015 Pounds, Per Annum flow.  
No hidden wealth,  $\alpha = 0$  are the omitted categories, OLS



outcome variables. The fact that dynastic hidden wealth correlates strongly and positively with appearance in the *Offshore Leaks Database*, the post-code value of where people are living in 1999 and the rate of attendance at Oxford and Cambridge Universities, is robust to different formulations, and highly statistically significant, supports the validity of interpreting it as truly *hidden*.

## 6 Alternative Estimates using a Different Rate of Return on Capital

The analysis uses estimates of the rate of return for wealth from Jordà et al. (2019). Here I re-do several of the main result tables and figures using an alternative series for this rate of return ( $r$ ), namely that reported by Piketty (2014). The different time-trends of  $r$  are plotted in figure 6.1, in comparison with those used in the paper by Jordà et al. (2019).

Piketty (2014) reports decadal values from 1770 to 2010 for the ‘Pure rate of return (estimate)’ to capital. These values are calculated from the capital share in national income accounts divided by an estimate for national capital stock. Piketty adjusts these numbers downwards to account for the cost of managing wealth to obtain a ‘pure’ return on capital, plotted in figure 6.1 (2014, p.205). (The underlying data for these estimates reported in Piketty comes from Piketty and Zucman, 2014 and Allen, 2007.)

As plotted in figure 6.1, the estimates for the ‘pure’ rate of return on capital by Piketty (2014) report positive returns for the war years and significantly lower returns after 1975 or so, than the series used in the paper by Jordà et al. (2019).

The expected wealth of dynasties is calculated exactly as before (as described in section 3), apart from the explicit adjustment for the wealth destruction of World War II. As figure 6.1 illustrates, the Piketty series does not incorporate wartime capital losses. I therefore apply the observed destruction of wealth, by dynastic wealth grouping, to the expected wealth of dynasties, as reported in in table 4.2.

### 6.0.1 The Amount of Hidden Wealth by Victorian Elites

Here I replicate table 4.3 which reports the estimated amount of hidden wealth for the Victorian Elite lineages for Piketty’s series for the return on capital. Table 6.1 reports this alternative set of estimates.

The Piketty series generates lower estimates of hidden wealth but there are some interesting differences. Similar to the estimates using Jordà et al. (2019), the alternative  $r$  estimates a proportion of hidden wealth close to zero in the 1920s, negative hidden wealth in the 1930s and 40s, broadly similar but lower levels for the 1950s, 60s and 70s and estimates zero wealth for 1980-92. Recall, that the estimate of hidden wealth proposed by this paper is a cautious minimum, not a precise spot estimate.

As the Jordà et al. (2019) directly estimate the rate of return on wealth, they are preferred.

## 6.1 The Predictive Power of Hidden wealth for Contemporary Outcomes

Table A.6 presents the regression results from tables 5.3, 5.4 and 5.5 with those using the alternative estimate of  $r$ . Despite the fact that the two series are very different, the choice of  $r$  does not materially affect the significance nor magnitude of any of the contemporary correlations. (Tables A.5, A.6 and A.7 reported in the appendix presents the full results using the alternative  $r$ .)

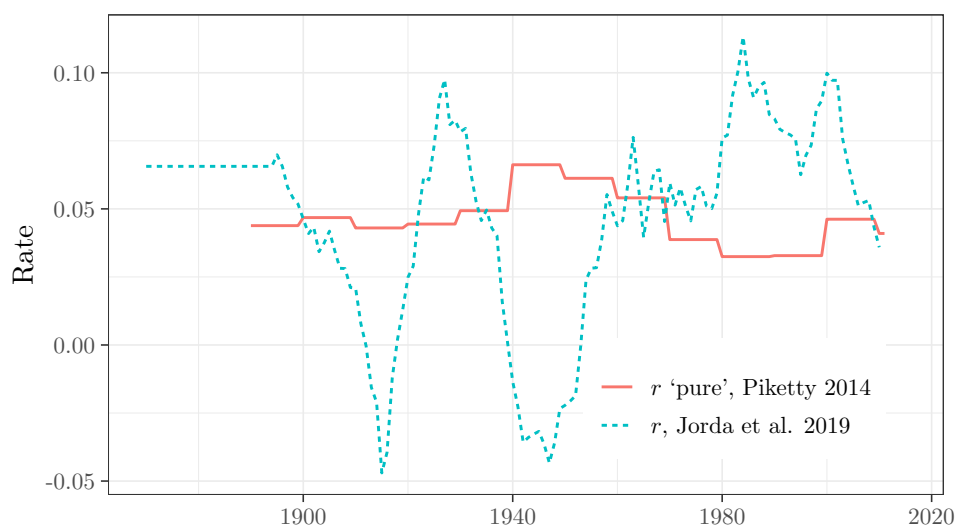


Figure 6.1: Estimates of Rate of Return to Wealth or Capital, Jorda et al. 2019 and Piketty 2014  
*Source:* Jordà et al. (2019), website. (For 1892 to 1895, I use the 1896 value.) Piketty (2014): <http://piketty.pse.ens.fr/files/capital21c/en/xls/>, spreadsheet Chapter6TablesFigures.xlsx. sheet “TS6.1”.

Table 6.1: Hidden Wealth and the Propensity to Hide, the Victorian Rare Elite, England 1920-1990, Using Piketty (2014) rate of return on capital

Decade	“True” Wealth	Observed Wealth	Observed + Paid in Inheritance Tax	Hidden Wealth	Prop. Hidden
1920	2,222	2,045	2,110	112	0.050
1930	2,675	2,801	3,043	-368	-0.138
1940	2,055	2,380	2,831	-776	-0.378
1950	2,102	1,242	1,867	235	0.112
1960	2,214	1,377	2,158	56	0.025
1970	2,301	962	1,917	384	0.167
1980-92	3,292	1,795	3,322	-30	-0.009

*Note:* Wealth is in Millions, £2015. *Source:* 100% PPR Calendar Sample.

Table 6.2: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Presence in the Paradise Papers and Contemporary Outcomes, comparison using alternative  $r$

	<i>logistic</i>		<i>OLS</i>		<i>OLS</i>	
	Paradise Dummy		House Price		Oxbridge Rate	
	Odds Ratio		000s of Pounds		Z-Score	
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>J</i>	<i>P</i>	<i>J</i>	<i>P</i>	<i>J</i>	<i>P</i>
Wealth Percentile: 70-80	1.121*** (.079)	1.089*** (.079)	17.473* (7.647)	16.864* (7.655)	.101*** (.022)	.091*** (.022)
80-90	1.142*** (.078)	1.131*** (.079)	45.971*** (7.846)	48.117*** (7.863)	.114*** (.023)	.114*** (.023)
The Top 10%	1.434*** (.077)	1.398*** (.077)	94.781*** (8.237)	94.155*** (8.243)	.262*** (.024)	.262*** (.024)
$D_{Hider}$	1.262*** (.068)	1.265*** (.070)	39.263*** (6.583)	39.411*** (6.766)	.067*** (.019)	.058** (.019)
$N_{2002}$	1.004*** (.0003)	1.004*** (.0003)	-.566*** (.035)	-.567*** (.035)	.002*** (.0001)	.002*** (.0001)
Observations	15,975	15,975	18,126	18,126	18,921	18,921
R <sup>2</sup>			.018	.018	.041	.041

*Note:*

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

*J* uses Jorda et al. (2019)  $r$  series

*P* uses Piketty et al. (2014)  $r$  series

No hidden wealth is the omitted category

Oxbridge Rate is Z-Score

House Prices are in Thousands of 2018 Pounds

## 7 ‘True’ Inherited Wealth and the Decline of Elite Wealth. Accounting for the ‘Great Equalization’

Finally, what are the implications of hidden elite wealth for our understanding of the historical evolution of the wealth distribution? As figure A.1a reports, the standard interpretation is built upon the massive decline in the *observed* relative wealth-share of the top decile, the top percentile and the top .1% (Atkinson and Harrison (1978); Piketty (2014); Alvaredo et al. (2018)). This narrative places Wartime destruction, taxes and economic growth as the causal forces behind the ‘Great Equalization.

Figure 7.1 reports a recalculated top decile wealth-share based on true wealth, incorporating hidden wealth, and compares it with the observed series. This is calculated as before over rare surnames, which, as discussed earlier, capture the secular decline in inequality over the 20th century. For this calculation I assume that true, underlying wealth is 1.3 times observed wealth. This is done on the basis of the observed proportion of hidden inherited wealth reported in tables 4.3 and 5.2.

The decline of the top wealth share is still evident but it has different characteristics. By 1980, the richest decile of dynasties hold an extra 10% of the ‘true’ wealth distribution, equivalent to a 33% reversal of the observed decline. Further, from 1940 to 1970, there is no decrease in the ‘true’ top decile share.<sup>37</sup>

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<sup>37</sup>This finding is similar to Alstadsæter et al. (2019) who find that “accounting for hidden assets erases almost half of the decline in the top 0.1% wealth share observed”.

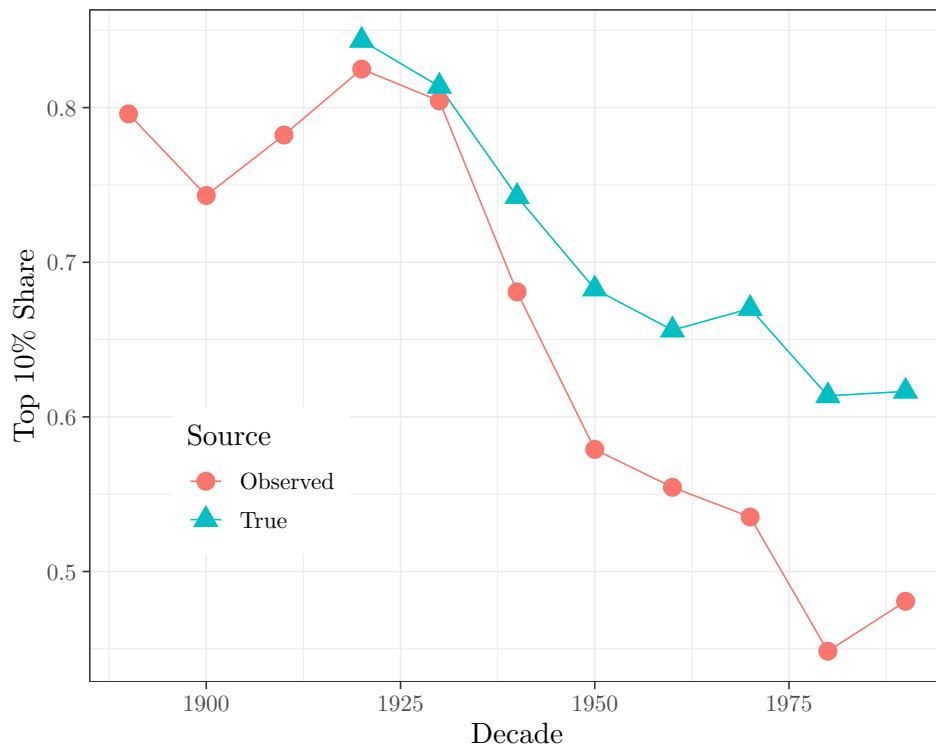


Figure 7.1: Top 10% Shares, Observed and 'True'

Notes: Calculated at the Rare Surname Level. Source: 100% PPR Calendar Sample.

## 8 Conclusion

This paper introduces a method using historical data to detect hidden wealth at the surname level. Tax authorities could use this method to investigate tax-evasion in England. Further, the method could be applied to other sources in other countries, with the potential to uncover vast amounts of hidden wealth.

In England, 1920-92, I find 8,839 dynasties that are potentially hiding at least £7.4 Billion.

The post-war era introduced wealth and death taxes sufficient to confiscate all elite wealth. Elites responded rationally. The analysis revealed that the English elites are hiding about 20-32% of their true inherited wealth. Hidden wealth, calculated from the pre-WWI era, has a strong effect on the probability of a surname appearing in the *Offshore Leaks Database* of 2013-6. Hidden wealth boosts the value of hiding dynastyies' homes in 1999, and their children's chances of attending Oxbridge, 1990-2016.

Analyses of wealth-at-death reveal a secular observed decline in wealth inequality, driven by the top 1%. However when I calculate the 'true' inherited wealth of English dynasties I find that 33% of the decline of the top 10% wealth-share can attributed to hidden wealth. This is a lower-bound estimate. Future detailed research of individual dynasties could more precisely estimate the scale of hidden wealth and, perhaps, reverse one of the great stylized facts of the 20th century.

## References

- Allen, Robert C.**, "Engel's Pause: A Pessimist's Guide to the British Industrial Revolution," Economics Series Working Papers 315, University of Oxford, Department of Economics April 2007.
- Alstadsæter, Annette, Niels Johannesen, and Gabriel Zucman**, "Tax evasion and inequality," Technical Report, American Economic Review (Forthcoming) 2019.
- Alvaredo, Facundo, Anthony B Atkinson, and Salvatore Morelli**, "Top wealth shares in the UK over more than a century," 2017.
- , **Anthony B. Atkinson, and Salvatore Morelli**, "Top wealth shares in the UK over more than a century," *Journal of Public Economics*, 2018, 162, 26 – 47. In Honor of Sir Tony Atkinson (1944-2017).
- Atkinson, Anthony B.**, "Wealth and Inheritance in Britain from 1896 to the Present," 2013.
- and **Allan J. Harrison**, *Distribution of personal wealth in Britain*, Cambridge Univ Pr, 1978.
- , **James P. F. Gordon, and Alan Harrison**, "Trends in the shares of top wealth-holders in Britain, 1923-1981," *Oxford Bulletin of Economics and Statistics*, 1989, 51 (3), 315–332.
- Blake, David and J. Michael Orszag**, "Annual estimates of personal wealthholdings in the United Kingdom since 1948," *Applied Financial Economics*, 1999, 9 (4), 397–421.
- Cassis, Yousef**, *City Bankers*, Cambridge University Press, 1994.
- Clark, Gregory**, "The Macroeconomic Aggregates for England, 1209-1869," *Research in Economic History*, 2010, 27, 51–140.

- **and Neil Cummins**, “Surnames and Social Mobility in England, 1170–2012,” *Human Nature*, Dec 2014, *25* (4), 517–537.
  - **and** – , “Intergenerational Wealth Mobility in England, 1858–2012: Surnames and Social Mobility,” *The Economic Journal*, 2015, *125* (582), 61–85.
  - **and** – , “Malthus to modernity: wealth, status, and fertility in England, 1500–1879,” *Journal of Population Economics*, 2015, *28* (1), 3–29.
  - **and** – , “The Big Sort: Selective Migration and the Decline of Northern England, 1800–2017,” 2018.
  - , – , **Daniel Diaz Vidal, Yu Hao, Tatsuya Ishii, Zach Landes, Daniel Marcin, Kuk Kuk Mo Jung, Ariel Marek, and Kevin Williams**, *The Son Also Rises: Surnames and the History of Social Mobility: Surnames and the History of Social Mobility*, Princeton University Press, 2014.
- Cummins, Neil**, “Constructing the Individual–Level ‘Big’ Data,” 2018.
- , – , “Where is the Middle Class? Inequality, Gender and the Shape of the Upper Tail from 60 million English Death and Probate Records, 1892–2016,” *Centre for Economic Policy Research Discussion Paper 13436*, 2019.
- Gymrek, Melissa, Amy L. McGuire, David Golan, Eran Halperin, and Yaniv Erlich**, “Identifying Personal Genomes by Surname Inference,” *Science*, 2013, *339* (6117), 321–324.
- Harbury, C. D.**, “Inheritance and the Distribution of Personal Wealth in Britain,” *The Economic Journal*, 1962, *72* (288), 845–868.
- **and D. M. W. N. Hitchens**, “The Inheritances of Top Wealth Leavers: Some Further Evidence,” *The Economic Journal*, 1976, *86* (342), 321–326.
  - **and** – , “Women, Wealth and Inheritance,” *The Economic Journal*, 1977, *87* (345), 124–131.
  - **and P. C. McMahon**, “Inheritance and the Characteristics of Top Wealth Leavers in Britain,” *The Economic Journal*, 1973, *83* (331), 810–833.
- Harbury, CD and DM Hitchens**, *Inheritance and wealth inequality in Britain*, Allen & Unwin (London and Boston), 1979.
- HM Land Registry**, “Price Paid Data,” 2018.
- HM Revenue & Customs**, “Scale of Estate Duty Rates Applying to deaths in Great Britain and Ireland,” Technical Report, [https://uk.practicallaw.thomsonreuters.com/6-521-4516?transitionType=Default&contextData=\(sc.Default\)&firstPage=true&comp=pluk&bhpc=1](https://uk.practicallaw.thomsonreuters.com/6-521-4516?transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhpc=1) 2005.
- I-CD Publishing**, *UK-Info Disk 2000 Standard* 2000.
- Institute for Fiscal Studies**, “Rates of Inheritance Tax since its introduction,” Technical Report, <https://www.ifs.org.uk/uploads/publications/ff/iht.xls> 2007.

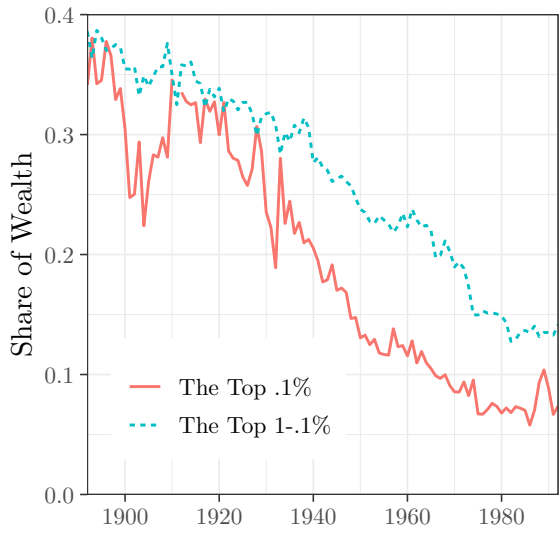
- International Consortium of Investigative Journalists**, “Offshore Leaks Database,” 2019.
- Jadevicius, Arvydas, Simon Huston, Andrew Baum, and Allan Butler**, “Two centuries of farmland prices in England,” *Journal of Property Research*, 2018, *35* (1), 72–94.
- King, Turi E. and Mark A. Jobling**, “Founders, Drift, and Infidelity: The Relationship between Y Chromosome Diversity and Patrilineal Surnames,” *Molecular Biology and Evolution*, 2009, *26* (5), 1093–1102.
- , **Stéphane J. Ballereau, Kevin E. Schürer, and Mark A. Jobling**, “Genetic Signatures of Coancestry within Surnames,” *Current Biology*, 2006, *16* (4), 384 – 388.
- Lindert, Peter H.**, “Unequal English Wealth since 1670,” *The Journal of Political Economy*, 1986, *94* (6), pp. 1127–1162.
- Lydall, H. F. and D. G. Tipping**, “The Distribution of Personal Wealth in Britain,” *Bulletin of the Oxford University Institute of Economics & Statistics*, 1961, *23* (1), 83–104.
- Nash, Michael L.**, *Royal Wills in Britain from 1509 to 2008*, Springer, 2017.
- National Statistics**, “Surnames, England & Wales,” 2002.
- Nicholas, Tom**, “Clogs to Clogs in Three Generations? Explaining Entrepreneurial Performance in Britain Since 1850,” *The Journal of Economic History*, 1999, *59* (3), 688–713.
- Office for National Statistics**, “Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland,” 2018. [www.ons.gov.uk](http://www.ons.gov.uk): link.
- Óscar Jordà, Katharina Knoll, Dmitry Kuvshinov, Moritz Schularick, and Alan M Taylor**, “The Rate of Return on Everything, 1870–2015,” *The Quarterly Journal of Economics*, 04 2019, *134* (3), 1225–1298.
- Perkin, Harold**, “The Recruitment of Elites in British Society since 1800,” *Journal of Social History*, 1978, *12* (2), 222–234.
- Pfeffer, Fabian T.**, “Multigenerational approaches to social mobility. A multifaceted research agenda,” *Research in social stratification and mobility*, 2014, *35*, 1.
- Piketty, Thomas**, *Capital in the Twenty-First Century*, Harvard University Press, 2014.
- **and Gabriel Zucman**, “Capital is Back: Wealth-Income Ratios in Rich Countries 1700–2010,” *The Quarterly Journal of Economics*, 05 2014, *129* (3), 1255–1310.
- Rothery, Mark**, “The Wealth of the English Landed Gentry, 1870-1935,” *The Agricultural History Review*, 2007, *55* (2), 251–268.
- Rubinstein, W. D.**, “Wealth, Elites and the Class Structure of Modern Britain,” *Past & Present*, 1977, (76), 99–126.
- Rubinstein, William D.**, “Probate Valuations: A Tool for The Historian,” *The Local Historian*, 1974, *11* (2), 68–72.



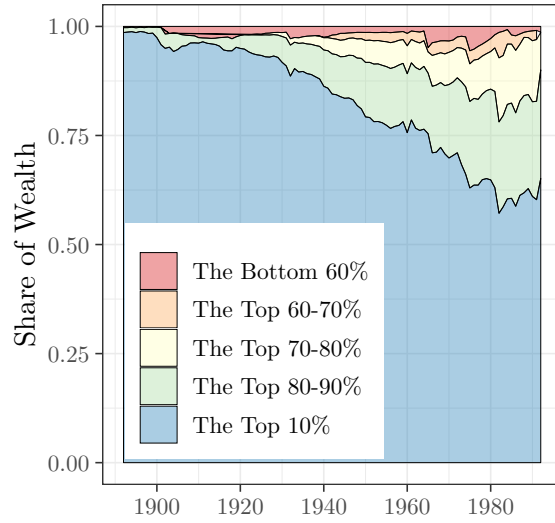
- , “The Victorian Middle Classes: Wealth, Occupation, and Geography,” *The Economic History Review*, 1977, 30 (4), 602–623.
- , *Men of property: The very wealthy in Britain since the industrial revolution*, Croom Helm London, 1981.
- Sabine, B. E. V. (Basil Ernest Vyvyan)**, *A history of income tax.*, London: George Allen & Unwin, 1966.
- Schurer, Kevin and Matthew Woollard**, “1881 Census for England and Wales, the Channel Islands and the Isle of Man (Enhanced Version) [computer file],” 2000.
- Turner, John D.**, “Wealth concentration in the European periphery: Ireland, 1858-2001,” *Oxford Economic Papers*, 2010, 62 (4), 625–646.
- Wedgwood, J.**, “The Influence of Inheritance on the Distribution of Wealth,” *The Economic Journal*, 1928, 38 (149), 38–55.
- Zucman, Gabriel**, “The Missing Wealth of Nations: Are Europe and the U.S. net Debtors or net Creditors?\*,” *The Quarterly Journal of Economics*, 2013, 128 (3), 1321–1364.

## A Supplementary Material

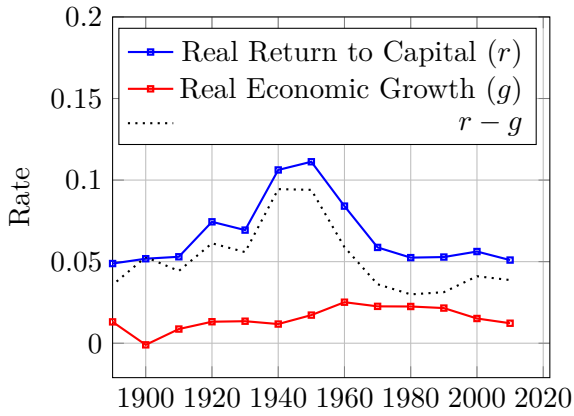
### A.1 Background Material



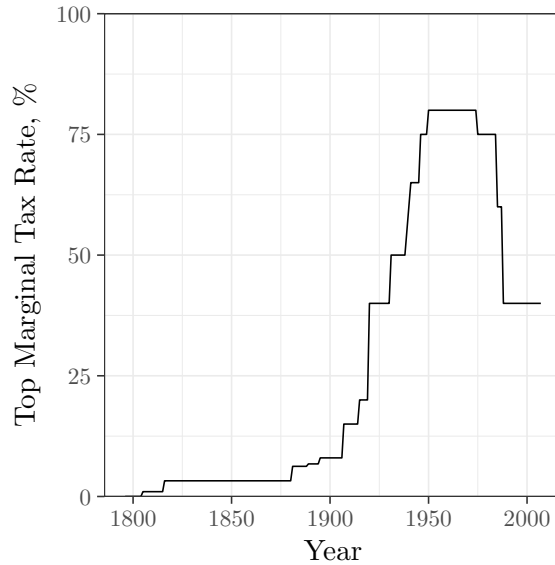
(a) The Decline of the top .1% and .1-1%



(b) The Growth of 'Popular Wealth'



(c)  $r$  and  $g$



(d) Inheritance Taxes in England

Figure A.1: Four Elements in The 'Great Equalization' of English Wealth

Source: a,b: Cummins (2019). c: Piketty Figure 6.3 (Data on the rate of return to capital available from <http://piketty.pse.ens.fr/en/capital21c2>), and GDP per capita from the Maddison Project (<http://www.ggd.c.net/maddison/maddison-project/home.htm>). Both rates are 'Real' (see Piketty p.209-11 on this point). d: Maximum inheritance tax plotted (HM Revenue & Customs (2005)).

The current narrative: The wealth share of the top 1%, reported in figure A.1a, declined because the rate of growth of the economy was greater than the real rate-of-return on capital (A.1c), net of war-time and taxes (estate taxes are illustrated for example, A.1d). In other words, new wealth created by economic growth ('popular wealth' reported in A.1b) grew faster than *net* returns on capital (Piketty (2014), p.362-3).

## A.2 Extra Results

Figure A.2 illustrates how newly created wealth is captured. Table A.1 lists the top 50 dynasties, their hidden wealth, their propensity to hide, the number of them living in the UK in 2002, whether presence is recorded in the *Offshore Leaks Database* and whether they were members of the Victorian Elite, as defined in the paper. Figure A.3 reports three series: estimated lineage wealth (equation 2), observed wealth  $((1 - \alpha)W)$  and observed wealth plus taxes paid ( $T^p$ ), accumulating at  $r^{net}$ , for the middle ranking Victorian Lineages, 1920-1992. Table A.2 reports the correlation of estimated wealth and observed wealth for the Victorian Elite lineages, 1920-1992. Figure A.4 reports the cumulative wealth of a set of random illustrative rare surnames from the PPR Calendar data. Table A.3 reports a sample of names found in the *ICIJ Offshore leak database* that have surnames that are designated as possessing significant amounts of hidden wealth by this analysis. Table A.4 reports an OLS estimation of the probability of appearance in the *ICIJ Offshore leak database*, as reported in logistic form in table 5.3.

### A.2.1 Contemporary Outcome Regressions: Using an alternative rate of return on capital

Tables A.5, A.6 and A.7 report the full results using estimated wealth using the alternative  $r$ , from Piketty (2014), for the probability of a surname's appearance in the paradise papers, it's average post code house price in 1999 and it's Oxbridge attendance .

### A.2.2 Contemporary Outcome Regressions: Alternative Wealth Controls

The wealth decile dummies used in the regressions in sections 5.2 and 5.3, allow for the wealth effect on the probability of a surname's appearance in the paradise papers, it's average post code house price in 1999 and it's Oxbridge attendance, to be non-linear. However, it is possible that this formulation could miss the effect of wealth *within* these deciles. To address this I rerun the regressions using a cubic formulation for wealth as opposed to the decile dummy as detailed in equations 12 and 13. Tables A.8 (paradise appearance), A.9 (post-code house price in 1999), A.10 (Oxbridge attendance), reported here, replicate the regressions reported previously but this time using cubic wealth as opposed to wealth decile dummy variables. The results for all the variables of interest are almost identical.

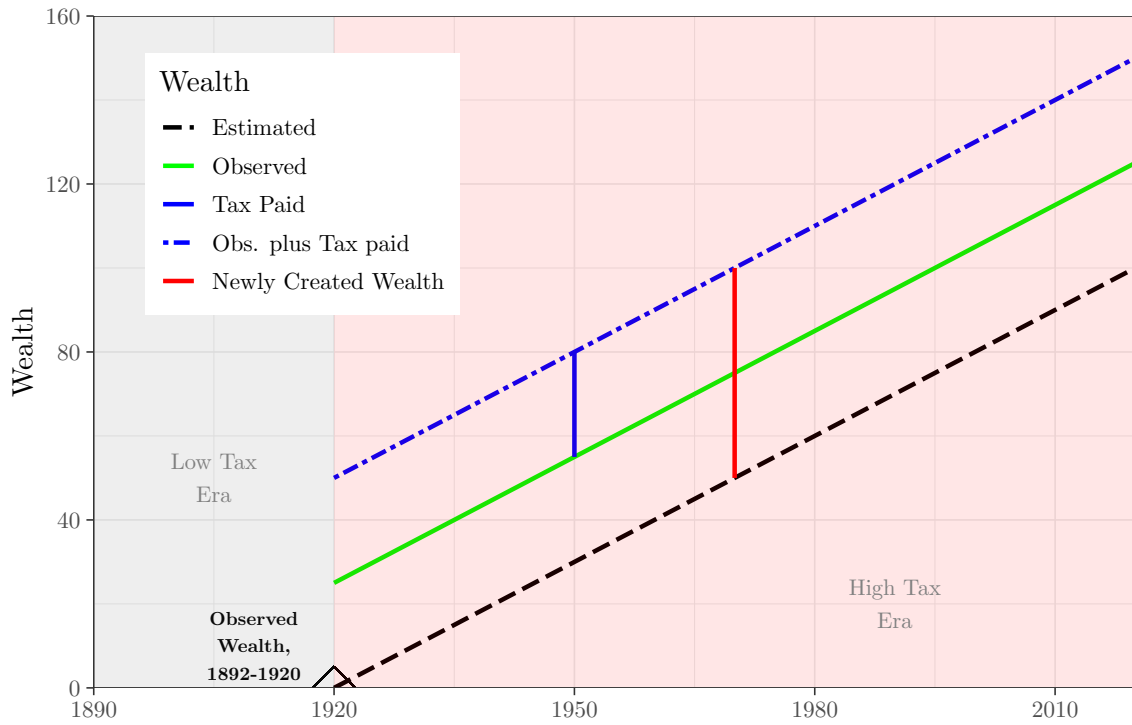


Figure A.2: The Concept for Net Wealth Creating Dynasties

Table A.1: Hidden Wealth by Lineage, the top 50

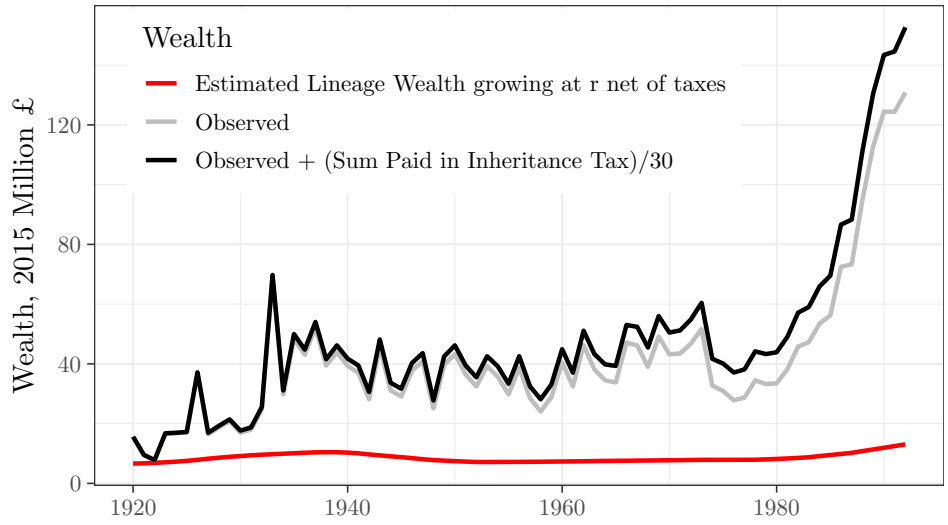
Surname	Hidden Wealth	$\alpha$	$N_{2002}$	$D_{Paradise}$	Victorian Elite
Mxxxxxx	48,596,931	0.991	192	0	1
Axxxxxxxx	32,364,087	0.983	81	0	1
Txxxxxxxx	29,795,903	0.908	72	0	1
Txxxxxxxxxxxx	24,943,397	0.984	28	0	1
Hxxxxxx	21,459,633	0.955	84	0	1
Hxxx	20,592,386	0.906	134	1	1
Pxxxxx	17,552,343	0.996	36	1	1
Exxxxx	15,684,792	0.983	66	0	1
Txxxxx	14,956,628	0.984	75	0	1
Wxxxxx	14,002,480	0.861	135	0	1
Sxxxxxxxx	13,780,881	0.879	244	1	1
Vxxxxx	13,667,064	0.833	35	0	1
Vxxxx	13,462,642	0.871	116	0	1
Axxxxxxxx	12,773,245	0.985	80	0	1
Mxxxxxxxx	11,437,369	0.931	64	0	1
Cxxxxxxxx	11,315,459	0.924	54	0	1
Wxxxxxxxx	11,299,351	0.985	63	0	1
Mxxxxx	11,269,002	0.988	36	0	1
Nxxxxxxxx	11,038,790	0.983	42	1	1
Lxxxxxxxx	11,030,274	0.982	93	1	1
Bxxxxxxxx	10,969,912	0.991	91	0	1
Kxxxxx	10,793,531	0.825	176	1	1
Wxxxxxxxxxxxx	10,672,145	0.983	44	0	1
Pxxxx	10,469,808	0.924	85	0	1
Txxxxxxxx	10,273,718	0.998	16	0	1
Cxxxx	9,750,864	0.898	180	0	1
Exxxxxxxx	9,483,045	0.969	61	0	1
Txxxxxx	9,359,925	0.803	10	1	1
Mxxxxxx	9,224,814	0.810	39	0	1
Dxxxxxxxx	9,004,444	0.868	145	0	1
Rxxxxx	8,722,020	0.944	73	0	1
Hxxxxxxxx	8,499,538	0.709	7	0	1
Txxxxxx	8,492,008	0.938	74	0	1
Lxxxxxx	8,177,418	0.935	90	0	1
Mxxxxxx	8,087,616	0.991	11	1	1
Ixxxxx	7,789,908	0.831	198	0	1
Sxxxxx	7,702,306	0.942	77	1	1
Sxxxxxxxx	7,524,564	0.788	64	0	1
Fxxxxx	7,499,516	0.874	88	0	1
Yxxxxxx	6,883,562	0.958	38	1	1
Bxxxx	6,848,883	0.846	46	0	1
Sxxxxxxxx	6,725,062	0.981	10	0	1
Dxxxxxxxx	6,428,507	0.986	9	0	1
Sxxxxxxxx	6,377,075	0.995	7	0	1
Zxxxxx	6,358,106	0.856	85	1	1
Bxxxxxxxx	6,188,910	0.971	0	0	1
Oxxx	6,097,334	0.944	140	0	1
Txxxxxx	6,087,415	0.608	97	0	1
Fxxx	6,078,306	0.929	66	1	1
Sxxxx	6,057,658	0.868	333	0	1

Wealth is in £2015. Names are withheld. Annual flow of £.

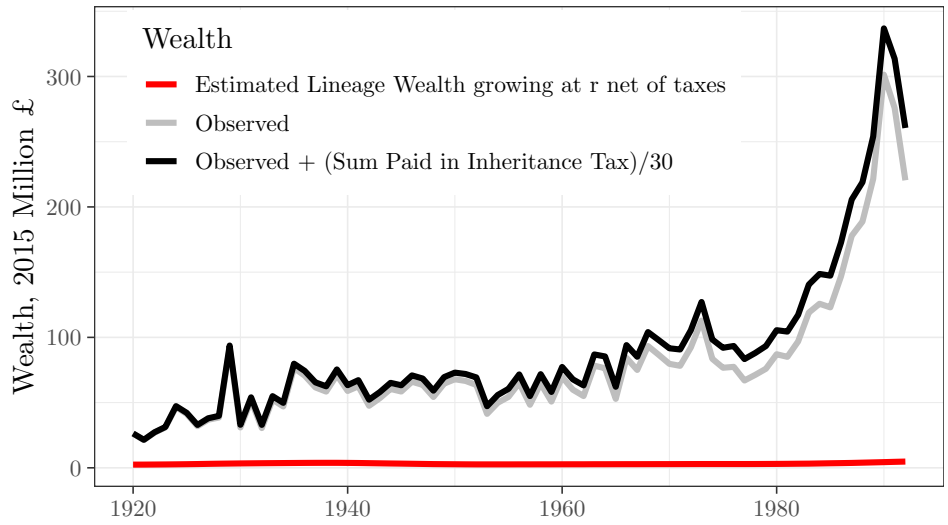
Table A.2: Observed Wealth as a function of Estimated Wealth, Victorian Elite Lineages

	Observed Wealth		
	1920-49	1950-1984	1985-92
	(1)	(2)	(3)
Estimated Wealth	1.032*** (.034)	.808*** (.016)	.958*** (.033)
Observations	30	35	7
R <sup>2</sup>	.970	.986	.993

*Note:* \*p<0.05; \*\*p<0.01; \*\*\*p<0.001  
 No Constant, OLS  
 Observed Wealth is inclusive  
 of inheritance tax paid



(a) Victorian 'Middling' Lineages

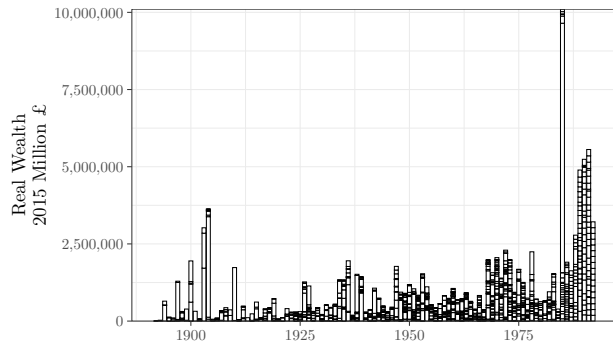


(b) Victorian Bottom Lineages

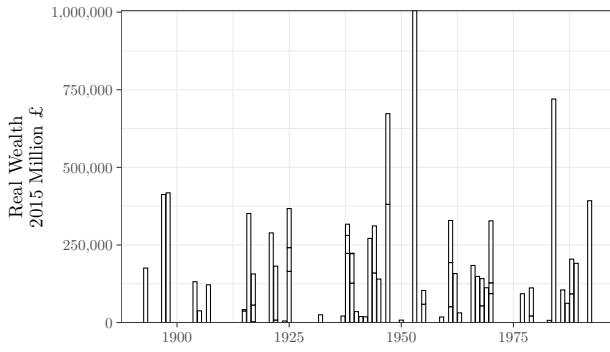
Figure A.3: Estimated and Observed Lineage Wealth, with taxes paid, Victorian mid and bottom Lineages

Source: 100% PPR Calendar Sample.

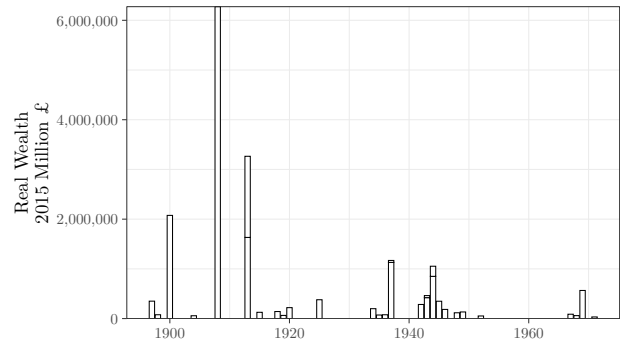




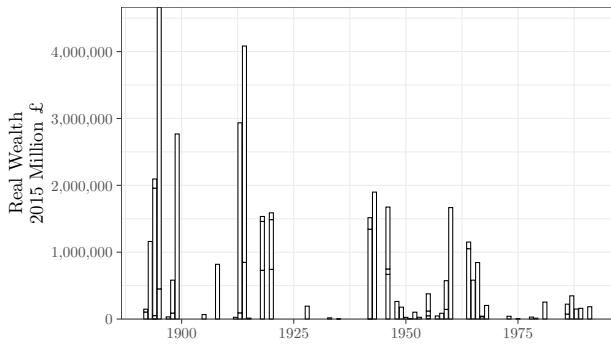
(a) Cummins's



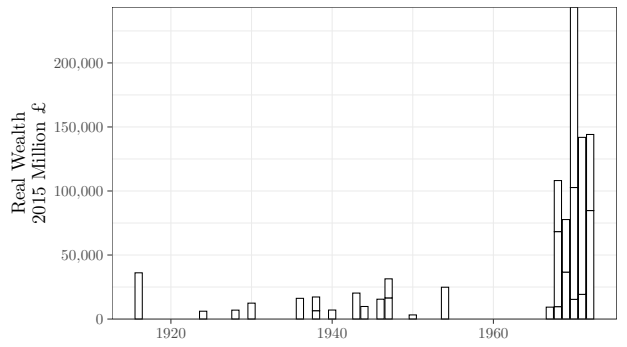
(b) Comyns's



(c) Xxxxxx's



(d) Axxxx's



(e) Dxxxxxxxx's

Figure A.4: Example of Lineage Wealth by Rare Surname

Source: 100% PPR Calendar Sample.

Table A.3: Examples of English Lineage Names Found in Paradise Papers

Name	Source	Hidden Lineage Wealth	$\alpha$	N, 2003	N, Paradise	Victorian Elite
XXXXXX XXXXXXXXXX	Paradise Papers - Samoa corporate registry	1,817,835	0.58	209	11	1
XXXXXXXX XXXX X.	Paradise Papers - Barbados corporate registry	17,366	0.16	26	1	0
XXXXXX XXXXX- XXXX	Paradise Papers - Barbados corporate registry	43,661	0.10	202	6	0
XXXX XXXXXX XXXXXXXXXX XXXXXX XXXXX	Panama Papers	2,323,661	0.70	171	3	1
XXXX XXXXXX XXXXXXXXXX XXXX XXXXXXXXXX	Panama Papers	90,745	0.08	172	11	0
XXXXXXXXXX XXXX XXXXXXXXXX	Paradise Papers - Malta corporate registry	188,947	0.74	32	2	0
XX. XXXXXX XXXXX XXXXXXXXXX XXXXXX	Panama Papers	71,170	0.92	34	1	0
XXXXXXXXXX XXXXXX XXXXXX	Paradise Papers - Barbados corporate registry	258,964	0.36	224	3	0
XXXXXXXXXX XXXXXX XXXXXX	Paradise Papers - Barbados corporate registry	258,964	0.36	224	3	0
XXXXXX, XXXXXX XXXXXX	Paradise Papers - Aruba corporate registry	131,995	0.08	110	10	0

Hidden Wealth is Annual Flow, in 2015 pounds

Table A.4: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Presence in the Paradise Papers

	Paradise Dummy				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	.008 (.008)	.005 (.008)	.007 (.008)	.007 (.008)	.008 (.008)
80-90	.009 (.008)	.006 (.008)	.009 (.008)	.009 (.008)	.009 (.008)
The Top 10%	.042*** (.009)	.038*** (.009)	.041*** (.009)	.042*** (.009)	.042*** (.009)
$D_{Hider}$	.024*** (.007)				
Hidden Wealth		.008** (.003)			
$HW: 0-.2m$			.012 (.010)		
$HW: .2m-1m$			.027** (.010)		
$HW:>1m$			.042** (.015)		
Prop. Hidden, $\alpha$				.034** (.011)	
$\alpha: 0-.5$					.025* (.010)
$\alpha .5-.75$					.013 (.013)
$\alpha. 75-.9$					.028 (.016)
$\alpha>.90$					.035* (.017)
$N_{2002}$	.001*** (.00004)	.001*** (.00004)	.001*** (.00004)	.001*** (.00004)	.001*** (.00004)
Constant	.063*** (.004)	.067*** (.004)	.063*** (.004)	.064*** (.004)	.063*** (.004)
Observations	15,975	15,975	15,975	15,975	15,975
$R^2$	.020	.020	.020	.020	.020

Note:

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Wealth is in 2015 Pounds, Per Annum flow

No hidden wealth and  $\alpha = 0$  are the omitted categories

Hidden wealth is calculated 1980-92, estimated via OLS

Standard Errors in parantheses

Table A.5: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Presence in the Paradise Papers, using alternative  $r$

	Paradise Dummy				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	1.089	1.057	1.085	1.087	1.090
	$t = 1.081$	$t = .713$	$t = 1.037$	$t = 1.049$	$t = 1.084$
80-90	1.131	1.093	1.128	1.124	1.132
	$t = 1.570$	$t = 1.141$	$t = 1.529$	$t = 1.486$	$t = 1.574$
The Top 10%	1.398	1.344	1.392	1.386	1.398
	$t = 4.343^{***}$	$t = 3.892^{***}$	$t = 4.286^{***}$	$t = 4.241^{***}$	$t = 4.346^{***}$
$D_{Hider}$	1.265				
	$t = 3.344^{***}$				
Hidden Wealth		1.064			
		$t = 2.270^*$			
$HW: 0-.2m$			1.174		
			$t = 1.530$		
$HW: .2m-1m$			1.280		
			$t = 2.511^*$		
$HW: >1m$			1.476		
			$t = 2.452^*$		
Prop. Hidden, $\alpha$				1.373	
				$t = 2.843^{**}$	
$\alpha: 0-.5$					1.270
					$t = 2.438^*$
$\alpha .5-.75$					1.217
					$t = 1.535$
$\alpha. 75-.9$					1.258
					$t = 1.478$
$\alpha >.90$					1.362
					$t = 1.757$
$N_{2002}$	1.004	1.004	1.004	1.004	1.004
	$t = 13.083^{***}$	$t = 12.948^{***}$	$t = 13.085^{***}$	$t = 13.048^{***}$	$t = 13.081^{***}$
Observations	15,975	15,975	15,975	15,975	15,975
Log Likelihood	-5,706.549	-5,709.588	-5,705.788	-5,708.081	-5,706.408
Akaike Inf. Crit.	11,425.100	11,431.180	11,427.580	11,428.160	11,430.820

Note:

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

Wealth is in 2015 Pounds, Per Annum flow

No hidden wealth and  $\alpha = 0$  are the omitted categories

Hidden wealth is calculated 1980-92, estimated via logistic regression

Odds Ratios are reported with t-stats in parantheses

Table A.6: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of House Price in 1999, using alternative  $r$

	House Price				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	16.9*	13.7	16.1*	17.0*	17.0*
	(7.7)	(7.6)	(7.7)	(7.7)	(7.7)
80-90	48.1***	44.2***	47.5***	47.6***	48.2***
	(7.9)	(7.8)	(7.9)	(7.9)	(7.9)
The Top 10%	94.2***	89.1***	93.3***	93.4***	94.2***
	(8.2)	(8.2)	(8.2)	(8.2)	(8.2)
$D_{Hider}$	39.4***				
	(6.8)				
Hidden Wealth		17.9***			
		(3.5)			
$HW: 0-.2m$			5.9		
			(10.0)		
$HW: .2m-1m$			58.6***		
			(9.7)		
$HW:>1m$			79.4***		
			(17.1)		
Prop. Hidden, $\alpha$				56.1***	
				(10.8)	
$\alpha: 0-.5$					33.5***
					(9.7)
$\alpha .5-.75$					52.5***
					(12.3)
$\alpha. 75-.9$					47.9**
					(15.5)
$\alpha>.90$					21.3
					(17.6)
$N_{2002}$	-.6***	-.6***	-.6***	-.6***	-.6***
	(.03)	(.03)	(.03)	(.03)	(.03)
Observations	18,126	18,126	18,126	18,126	18,126
$R^2$	.02	.02	.02	.02	.02

Note:

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

Wealth is in 2015 Pounds, Per Annum flow

House Prices are in Thousands of 2018 Pounds

No hidden wealth,  $\alpha = 0$  are the

omitted categories, OLS

Table A.7: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Oxbridge Attendance Rate 1990-2016, using alternative  $r$

	Oxbridge Attendance Rate (Z)				
	(1)	(2)	(3)	(4)	(5)
Wealth Percentile: 70-80	.091*** (.022)	.087*** (.022)	.089*** (.022)	.092*** (.022)	.092*** (.022)
80-90	.114*** (.023)	.109*** (.023)	.112*** (.023)	.114*** (.023)	.114*** (.023)
The Top 10%	.262*** (.024)	.254*** (.024)	.259*** (.024)	.261*** (.024)	.262*** (.024)
$D_{Hider}$	.058** (.019)				
Hidden Wealth		.048*** (.010)			
$HW: 0-.2m$			-.003 (.029)		
$HW: .2m-1m$			.072** (.028)		
$HW: >1m$			.198*** (.049)		
Prop. Hidden, $\alpha$				.093** (.031)	
$\alpha: 0-.5$					.039 (.028)
$\alpha .5-.75$					.073* (.035)
$\alpha. 75-.9$					.086 (.044)
$\alpha >.90$					.055 (.050)
$N_{2002}$	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)
Observations	18,921	18,921	18,921	18,921	18,921
$R^2$	.041	.042	.042	.041	.041

*Note:* \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$   
Wealth is in 2015 Pounds, Per Annum flow.  
No hidden wealth,  $\alpha = 0$  are the omitted categories, OLS

Table A.8: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Presence in the Paradise Papers, Alternative Wealth Controls

	Paradise Dummy				
	(1)	(2)	(3)	(4)	(5)
Observed Wealth	1.128 [3.870]***	1.109 [3.348]***	1.125 [3.768]***	1.127 [3.837]***	1.130 [3.900]***
Observed Wealth Squared	.998 [-1.398]	.999 [-.995]	.998 [-1.323]	.998 [-1.384]	.998 [-1.426]
Observed Wealth Cubed	1.000 [.671]	1.000 [.337]	1.000 [.609]	1.000 [.662]	1.000 [.696]
$D_{Hider}$	1.261 [3.415]***				
Hidden Wealth		1.053 [2.425]*			
$HW: 0-.2m$			1.126 [1.125]		
$HW: .2m-1m$			1.289 [2.624]**		
$HW:>1m$			1.476 [2.895]**		
Prop. Hidden, $\alpha$				1.391 [3.097]**	
$\alpha: 0-.5$					1.275 [2.550]*
$\alpha .5-.75$					1.125 [.931]
$\alpha. 75-.9$					1.326 [1.901]
$\alpha>.90$					1.419 [2.152]*
$N_{2002}$	1.004 [13.814]***	1.004 [13.622]***	1.004 [13.819]***	1.004 [13.775]***	1.004 [13.808]***
Observations	15,975	15,975	15,975	15,975	15,975
Log Likelihood	-5,704.411	-5,707.328	-5,703.045	-5,705.460	-5,703.624
Akaike Inf. Crit.	11,420.820	11,426.660	11,422.090	11,422.920	11,425.250

Note:

\*p<.05; \*\*p<.01; \*\*\*p<.001

Wealth is in 2015 Pounds, Per Annum flow

No hidden wealth and  $\alpha = 0$  are the omitted categories

Hidden wealth is calculated 1980-92, estimated via logistic regression

Odds Ratios are reported with t-stats in parantheses

Table A.9: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of House Price in 1999, Alternative Wealth Controls

	House Price				
	(1)	(2)	(3)	(4)	(5)
Observed Wealth	40.1*** (3.4)	37.7*** (3.4)	39.1*** (3.4)	40.5*** (3.4)	40.2*** (3.4)
Observed Wealth Squared	-1.1*** (.2)	-1.1*** (.2)	-1.1*** (.2)	-1.2*** (.2)	-1.2*** (.2)
Observed Wealth Cubed	.01*** (.002)	.01*** (.002)	.01*** (.002)	.01*** (.002)	.01*** (.002)
$D_{Hider}$	39.4*** (6.6)				
Hidden Wealth		15.1*** (2.7)			
$HW: 0-.2m$			6.2 (9.9)		
$HW: .2m-1m$			46.3*** (9.6)		
$HW:>1m$			95.0*** (14.4)		
Prop. Hidden, $\alpha$				63.9*** (10.4)	
$\alpha: 0-.5$					26.4** (9.5)
$\alpha .5-.75$					50.7*** (12.0)
$\alpha. 75-.9$					63.3*** (14.8)
$\alpha>.90$					29.0 (16.7)
$N_{2002}$	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)	-.6*** (.03)
Observations	18,126	18,126	18,126	18,126	18,126
$R^2$	.02	.02	.02	.02	.02

Note:

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Wealth is in 2015 Pounds, Per Annum flow

House Prices are in Thousands of 2018 Pounds

No hidden wealth,  $\alpha = 0$  are the

omitted categories, OLS



Table A.10: Wealth, Hidden Wealth and the Proportion of Hidden Wealth as Predictors of Oxbridge Attendance Rate 1990-2016, Alternative Wealth Controls

	Oxbridge Attendance Rate (Z)				
	(1)	(2)	(3)	(4)	(5)
Observed Wealth	.136*** (.010)	.132*** (.010)	.134*** (.010)	.138*** (.010)	.137*** (.010)
Observed Wealth Squared	-.005*** (.001)	-.005*** (.001)	-.005*** (.001)	-.005*** (.001)	-.005*** (.001)
Observed Wealth Cubed	.00003*** (0.00000)	.00003*** (0.00000)	.00003*** (0.00000)	.00003*** (0.00000)	.00003*** (0.00000)
$D_{Hider}$	.070*** (.019)				
Hidden Wealth		.040*** (.008)			
$HW: 0-.2m$			.002 (.028)		
$HW: .2m-1m$			.093*** (.027)		
$HW:>1m$			.166*** (.041)		
Prop. Hidden, $\alpha$				.131*** (.030)	
$\alpha: 0-.5$					.025 (.027)
$\alpha .5-.75$					.091** (.034)
$\alpha. 75-.9$					.117** (.042)
$\alpha>.90$					.114* (.047)
$N_{2002}$	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)	.002*** (.0001)
Observations	18,921	18,921	18,921	18,921	18,921
$R^2$	.044	.045	.045	.045	.045

Note:

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$   
Wealth is in 2015 Pounds, Per Annum flow.  
No hidden wealth,  $\alpha = 0$  are the  
omitted categories, OLS

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