Accounting for Wealth Inequality Dynamics:
Methods, Estimates and Simulations for France (1800-2014)

Bertrand Garbinti, Jonathan Goupille-Lebret, Thomas Piketty *

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Abstract. This paper combines different sources and methods (income tax data, inheritance registers, national accounts, wealth surveys) in order to deliver consistent, unified wealth distribution series by percentiles for France over the 1800-2014 period, with detailed breakdowns by age, gender, income and assets over the 1970-2014 sub-period. We find a large decline of the top 10% wealth share from the 1910s to the 1980s (from 80-90% of total wealth during the 19th century up until World War 1, down to 50-60% in the 1980s), mostly to the benefit of the middle 40% of the distribution (the bottom 50% wealth share is always less than 5%). Since the 1980s-90s, we observe a moderate rise of wealth concentration, with large fluctuations due to asset price movements. In effect, rising inequality in saving rates and rates of return pushes toward rising wealth concentration, in spite of the contradictory effect of housing prices. We develop a simple simulation model highlighting how the combination of unequal saving rates, rates of return and labor earnings leads to large multiplicative effects and high steady-state wealth concentration. Small changes in the key parameters appear to matter a lot for long-run inequality. We discuss the conditions under which rising concentration is likely to continue in the coming decades.

*We are grateful to Facundo Alvaredo, Emmanuel Saez and Gabriel Zucman for numerous conversations. Updated series are available on the WID website (World Wealth and Income Database): http://www.wid.world. Contacts: Garbinti (Paris School of Economics, Crest, and Banque de France): bertrandgarbinti@gmail.com; Goupille-Lebret (Paris School of Economics): jonathangoupille@gmail.com; Piketty (Paris School of Economics): piketty@psemail.eu. This paper presents the authors’ views and should not be interpreted as reflecting those of their institutions.
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Section 1. Introduction

Measuring the distribution of wealth involves a large number of imperfect and sometime contradictory data sources and methodologies. In turn, the lack of reliable data series has made very difficult for economists so far to test quantitative models of wealth accumulation and distribution. In this paper, we attempt to show that these measurement limitations can to some extent be overcome (using the case of France as an illustration), and that the new resulting series can be used to better understand the long-run determinants of wealth concentration.

To simplify, one can distinguish between five main categories of sources and methods (noted W1 to W5) that can be used to measure wealth and its distribution. All of them have strengths and drawbacks.

W1. Income capitalization method. This method generally uses income tax data (or other available data sources on capital income flows). The idea is to recover the distribution of wealth (capital assets) from the distribution of capital income flows, by dividing the various asset income flows by some appropriate asset-specific rates of return. One difficulty is to account for the fact that within-asset-class rates of return vary across individuals (sometime depending on portfolio size). Another problem is that some assets do not generate observable taxable asset income flows. Despite these difficulties, this method has long been one of the key methods to estimate the distribution of wealth and should continue to play a central role in the future.

W2. Estate multiplier method. This method generally uses inheritance or estate tax data (or other available date sources on wealth at death such as probate records). The idea is to recover the distribution of wealth among the living from the distribution of capital income flows, by reweighting each decedent by the inverse mortality of its age-gender cell. One difficulty is to properly account for differential mortality by wealth group. Another problem is that inheritance tax data is often limited to top groups and is polluted by a number of tax exemptions and tax optimization

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1 On the different methods that can be used to measure wealth distribution, see e.g. the surveys by Davies and Shorrocks (2000) and Davies (2009).
strategies. Despite these limitations, this method has long been the main basis for long-run studies of wealth dynamics, primarily because inheritance and estate tax data (or probate records) are the oldest existing data source on wealth in most countries (it usually goes back in time much longer than income tax data). The estate multiplier method has been used extensively since the 19th century, together with the income capitalization method, and should continue to be used in the future.

**W3. Household wealth surveys.** The key advantage of this method is that wealth surveys include detailed socio-demographic and wealth questionnaires which allow to measure broad sets of assets for a representative sample of the entire population (including tax exempt assets, and including assets owned by the bottom of the wealth distribution, which is usually not well covered in fiscal sources). The central drawback - in addition to the fact that wealth surveys were introduced in recent decades and are not available to study long-run evolutions, and generally suffer from limited sample size - is that the self-reporting methodology used in wealth surveys often leads to biased information (generally in the form of under-reporting), in particular among top wealth holders. Top groups are usually not properly covered in surveys, which is unfortunate, because they typically account for a very large part of aggregate wealth. In order to address these concerns, surveys should in our view make use of fiscal and administrative data coming from existing taxes on income, inheritance, and wealth, including administrative data on real estate as well as data on financial assets, which in many countries are routinely transmitted from financial institutions to tax administration. Some countries, e.g. France and the U.S., have started to integrate household wealth surveys with administrative and fiscal data, but at this stage this is still very preliminary. Despite their limitations, wealth surveys provide an invaluable source of information on wealth and ought to be used together with other sources.

**W4. Annual wealth tax method.** In case there exists comprehensive fiscal administrative data on the wealth of the living coming from annual taxes on wealth and property (or from wealth censuses), then this is certainly be the most direct method to measure the distribution of wealth. However such data is generally not available. Annual wealth taxes are in most countries limited to real estate property and do not cover other assets. When they exist, annual taxes on comprehensive net
wealth (including real estate, business and financial assets) often suffer from the same limitations as inheritance tax data (i.e. it is often limited to top groups and is polluted by a number of tax exemptions and tax optimization strategies). Despite these limitations, this data source - when available, which is the case in France - can provide valuable additional insights about the distribution of wealth and ought to be reconciled with findings from the income capitalization and estate multiplier methods.

W5. Billionaire lists. Given the limitations of other data sources and methods, these lists published by magazines and other organizations often provide valuable additional information on very top wealth holders. Their main drawback is that the methods used to establish these lists, as well as the concepts of wealth and family units on which they are based, are usually not made entirely explicit and are often not comparable over time and across countries. They must be used with caution, together with other data sources.

This paper has two main objectives. First, it aims to show that all these different methods and data sources can and should be reconciled and used together. We illustrate this general point using detailed data for the case of France (a particularly interesting case, especially because of the early availability of homogenous inheritance registers from 1800 onwards). In effect, we combine different sources and methods (particularly income tax data, inheritance registers, national accounts, wealth surveys) in order to deliver consistent, unified wealth distribution series by percentiles for France over the 1800-2014 period, with detailed annual breakdown by age, gender, income and assets over the 1970-2014 sub-period.

Regarding the 1970-2014 period, we favor a mixed method W1-W3 based on income capitalization and wealth surveys. The income capitalization method is in our view the most appropriate method for assets which generate taxable income flows and for certain parts of the distribution which are not well covered in surveys (particularly the top). However it needs to be supplemented with additional information coming from other methods (particularly wealth surveys) regarding certain tax-exempt assets and certain parts of the distribution (particularly the bottom). Our mixed method allows us to offer detailed wealth inequality series broken down by percentile, age, gender and asset categories for the 1970-2014 sub-period. Over the longer run, we link up our
1970-2014 series together with historical 1800-1970 series that we construct using the estate multiplier method W2 (the only data source and method available over such a long period). We show that the two methods (W1-W3 and W2) deliver consistent estimates over the 1970-2014 period, which is reinsuring and gives us confidence in the fact that we can link up the two series. As a result, our unified series offer homogenous wealth inequality series broken down by percentile covering the entire 1800-2014 period. We also offer detailed comparisons and reconciliations with W4 and W5 methods (wealth tax data and billionaire lists) for the recent period, although we do not formally use them for our benchmark series.

Our second objective is to use these new series in order to better understand the long-run determinants of wealth concentration. The two general facts that emerge from our series are, first, that wealth concentration is systematically much larger than income concentration, and next, that the exact level of wealth concentration displays strong variations over time. In particular, we confirm previous findings regarding a significant decline in the top 10% wealth share between 1914 and 1984 (from 80-90% of total wealth during the 19th century up until World War 1, down to 50-60% in the early 1980s), mostly to the benefit of the middle 40% of the distribution (the bottom 50% wealth share is always less than 5%). Since the mid-1980s, we observe a moderate rise of wealth concentration, with large fluctuations due to asset price movements. We also find wealth inequality is almost as large within each age group as for the population taken as a whole.

We discuss possible interpretations for these basic facts. We argue that in order to account for the high level of wealth concentration one needs to use a class of models combining unequal saving rates, rates of return and labor earnings, as well as large dynamic multiplicative effects over long horizons. Regarding the long-run fall of wealth inequality between 1914 and 1984, the most natural interpretation is that top wealth groups were hit by a number of very large capital shocks changes that occurred during the 1914-1945 period (destruction, depression, inflation, nationalization, etc.). The more difficult question is whether the structural policy changes that occurred after these shocks (e.g. rise of progressive taxation, social spending, financial regulation, rent control, etc., which might have contributed to reduce the inequality in saving rates and rates of return) have permanently reduced
the steady-state level of wealth inequality. While we are not able to evaluate the precise quantitative role played by each policy, we develop a simple simulation model showing that plausible changes in the inequality of saving rates and rates of return can account for the observed long-run reduction in wealth concentration over the 1914-1984 period.

Regarding the post-1984 rise in wealth concentration, we find that the reversal of the trend can be accounted for by rising inequality in saving rates and rates of return (which could itself be due to a mixture of factors, including growth slowdown, rising unemployment and labor earnings inequality, and financial deregulation). This effect tends to dominate the contradictory impact of rising housing prices (which in any case cannot continue in the very long run). We present various simulations for the coming decades and discuss the conditions under which rising wealth concentration is likely to continue, and whether this trend can go all the way toward pre-WW1 inequality levels. Our general conclusion is not that we can make predictions about the future evolution of wealth concentration, but rather than relatively small changes in the key parameters appear to matter a lot for long-run steady-state inequality of wealth. In our view, this provides an additional justification for the need to develop more transparency and better administrative and fiscal data on wealth.

We should also emphasize that the present paper is part of a broader multi-country project in which we attempt to construct “distributional national accounts” (DINA), i.e. detailed annual estimates of the distribution of income and wealth based on the reconciliation between different fiscal sources, household surveys and macroeconomic national accounts. The present paper focuses upon the wealth part of the DINA series for France. In our companion paper (Garbinti, Goupille-Lebret and Piketty, 2016), we combine tax, survey, and national accounts data in a comprehensive and consistent manner to build new series on the distribution of income in France over the 1900-2014 period. This allows to better explore the reasons for wealth inequality dynamics, including the link between the inequality in saving rates and rates of returns and the steady-state level of wealth inequality. More generally the general objective of the multi-country project is to release data series that can be used by future research to further investigate inequality dynamics and
test formal models. All updated series will be made available on the “World Wealth and Income Database” (WID) website (http://www.wid.world).

The paper is organized as follows. Section 2 relates our work to the existing literature. Section 3 presents our data sources and methodology. We then present our main results, starting in section 4 with the long-run picture (1800-2014), and then moving on in section 5 to the more detailed series available over the 1970-2014 period. In section 6 we discuss the possible interpretation behind our findings and present our simulation results. In section 7 we compare our findings with recent series constructed for other countries, and particularly with the U.S. series constructed by Saez and Zucman (2016). Finally, section 8 offers concluding comments. This paper is supplemented by an on-line data appendix including complete series and additional information about data sources and methodology.
Section 2. Relation to existing literature

Our work builds upon a long tradition of research on wealth inequality measurement dating back to the 19th century. It is also part of a recent project attempting to develop consistent estimates of the distribution of income and wealth at the global level: the “World Wealth and Income Database” (www.wid.world).

Economists and statisticians started using inheritance data in order to study the wealth of the living in a systematic manner in the late 19th and early 20th centuries. A large number of authors, often from the United Kingdom and France, independently developed the “estate multiplier” method, first to estimate aggregate wealth of the living from the aggregate inheritance flow, and subsequently in order to study wealth distribution among the living by reweighting individual inheritance data (using the inverse mortality rate of their age and gender group).²

It is only in recent decades, however, that these methods were used to construct homogenous historical series on top wealth shares. Even today, such series are available only for a handful of countries (in particular the U.S., the U.K., France and Sweden). The first attempt to construct long-run top wealth shares series using the estate multiplier approach was due to Lampman (1962), who exploited U.S. estate tabulations over the 1922-1956 period. Atkinson and Harrison (1978) then applied the estate multiplier method to British inheritance data over the 1923-1972 period. In addition, Atkinson and Harrison compared their estate-multiplier top wealth shares series with alternative series based upon the income-capitalization method (using income tax data) and showed that they are consistent.

In the case of France, top wealth shares covering the 1807-1994 period were first constructed by Piketty, Postel-Vinay and Rosenthal (2006, 2014), using national inheritance tabulations together with large micro-samples of inheritance declarations collected in the Paris archives and other local archives.³ As compared to the U.S.

² Some of the main references in this literature include Giffen (1878, 1889), Foville (1893), Colson (1903), Levasseur (1907), Mallet (1908), Séaillès (1910), Strutt (1910), Mallet and Strutt (1915) and Stramp (1919). See Piketty (2011, p.1081-1083).
³ See also Bourdieu, Postel-Vinay and Suwa-Eisenmann (2003) and Bourdieu, Kesztenbaum and Postel-Vinay (2013).
and the U.K, where homogenous estate data is not available until the early 20th century, one key advantage of the French data is that it is available since 1800 (the modern inheritance tax system was put in place in 1791 during the French Revolution and hardly changed since then).

Long-run top wealth shares have also been constructed for Sweden by Roine and Waldenström (2009) using both inheritance registers since the early 19th century and annual wealth tax data since the early 20th century (when Sweden introduced an annual wealth tax).

The U.S. series first constructed by Lampman (1962) were subsequently extended until 2000 by Kopczuk and Saez (2004). More recently, Saez and Zucman (2016) have argued that estate-multiplier series underestimate rising wealth concentration for the latest decades, and that the rising inequality trend is better estimated by income-capitalization series.

Our paper directly follows this literature. That is, we refine and update in various ways the wealth inequality series constructed by Piketty, Postel-Vinay and Rosenthal (2006, 2014). First, by using generalized, non-parametric Pareto interpolation techniques recently developed by Fournier and Piketty (2016), we are able to use historical data from inheritance registers and inheritance tabulations in order to estimate wealth series for all percentiles of the distribution, from the bottom to the top, and not only for top groups. Next, and most importantly, we link up our historical inheritance-based wealth inequality series (covering the 1800-1970 period) with new series that we construct for the 1970-2014 by using a mixture of income capitalization and survey-based method. We also follow Saez and Zucman (2016) in computing synthetic saving rate series by wealth groups, which as we will show offers a very powerful way to analyze the structural determinants of wealth inequality. Unlike Saez and Zucman (2016), we are able to reconcile estate-multiplier and income-capitalization method for the recent decades.

The reasons why we choose to favor the income-capitalization approach for our 1970-2014 series are twofold. First, this method offers joint annual information on both wealth and income, which inheritance-based approaches cannot offer. Next, we
agree with Saez and Zucman (2016) that inheritance data and estate-multiplier methods raise more and more problems in recent decades, especially because of rising life expectancy (so that it is increasingly rare and abnormal to observe decedent wealth at earlier ages) and intensive terminal tax planning (with extensive private information about terminal illness). In addition, access to inheritance data has deteriorated in a country like France (annual data is not available any longer, and available data comes from samples with limited size). In case inheritance data was annual and exhaustive, and income tax data was not, the situation would be different. But given present data availability in France (and also in the U.S.), the most sensible choice in our view is to use the income capitalization method. Of course the conclusion could be different in other countries (such as the U.K.; see the recent work by Alvaredo, Atkinson and Morelli, 2016).

This paper is also closely related to recent research on wealth distribution using household wealth surveys and Pareto adjustment for top wealth groups based upon billionaire rankings. Generally speaking, household wealth surveys have become very widespread in recent decades. One of the oldest and best established wealth surveys in the world is the SCF (Survey of Consumer Finances) run by the U.S. Federal Reserve. The SCF has been conducted every three years since 1983 (the last survey was conducted in 2013; see SCF, 2015). A number of European countries also started to conduct household wealth surveys during the 1980s-1990s. It is only in recent years, however, that there has been some serious attempt to homogenize European wealth surveys. The first wave of the HFCS (Household Finance and Consumption Survey) was conducted in 2010-11 in 15 Eurozone countries (see HFCS, 2014).

The development of wealth surveys has led to a new wave of comparative wealth studies, with particular attention to the statistical modeling of the distribution, from the very bottom - including segments with negative net wealth - to the very top (see e.g. Cowell and Van Kerm (2015) for a survey article using HFCS data for 15 Eurozone countries; see also Cowell (2013) for a comparison of wealth distributions in the UK, Canada, Sweden and the U.S.).

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4 A preliminary SCF survey was conducted in 1962, but there was no other survey until 1983.
There has also been growing recognition in recent years that despite the best efforts of the organizing institutions these wealth surveys suffer from major biases, particularly regarding top wealth groups, and that new methods need to be developed in order to correct for these biases in a systematic manner. Although the SCF is usually regarded as the best existing wealth survey, recent research by Saez and Zucman (2016) using fiscal data and the income capitalization method has shown that the SCF significantly underestimates rising wealth concentration in recent decades. The European HFCS is likely to suffer from even bigger biases, with potentially large variations between countries (since the methodologies used in each country are still far from being fully homogenous). The fact that both the Federal Reserve and the ECB have limited ability to measure and monitor the evolution of the distribution of wealth is increasingly regarded as highly problematic, especially in light of the fact that quantitative-easing policies conducted in recent years are likely to have major distributional consequences.

In light of this, several recent studies have attempted to use billionaire rankings and Pareto interpolation techniques in order to correct upwards the top wealth levels reported in household wealth surveys (see in particular Vermeulen (2016) and other references provided in Blanchet (2016)).

Our contribution to this literature is twofold. First, we argue that wealth surveys and Pareto adjustments using billionaire rankings can be useful, but that whenever possible these sources and methods need to be used together with fiscal data (via income capitalization, estate multiplier, and/or annual wealth tax methods). The central advantages of fiscal sources are that - in addition to being available over much longer time periods than wealth surveys and billionaire rankings – they are annual (as opposed to wealth surveys, which are typically conducted every 3 to 5 years), they are exhaustive (i.e. they do not suffer from sampling problems: the entire population is covered, rather than a small subsample), and they rely extensively on third-party reporting and auditing (rather than self-reporting). These are key strengths that cannot be neglected, especially given the many uncertainties surrounding self-reporting biases in surveys, and the methodology used in billionaire rankings.
Next, in countries where fiscal sources do not exist and/or are not accessible, it is critical to develop flexible, non-parametric generalized Pareto interpolation methods (such as those developed by Fournier and Piketty, 2016; Blanchet, 2016) and to systematically compare the patterns of Pareto coefficients with those obtained in countries where fiscal data are available. There is still a long way to go before we can use these methods in a reliable way.
Section 3. Concepts, data sources and methodology

In this section we describe the concepts, data sources and main steps of the methodology that we use in order to construct our wealth distribution series. Broadly speaking, we combine three main types of data: national income and wealth accounts; fiscal data (income tax returns and inheritance tax returns); and wealth surveys. A longer and more complete discussion of the general methodological issues involved in creating DINA estimates (not specific to France) in presented in Alvaredo et al. (2016). Complete methodological details of our French specific data sources and computations are presented in the online data appendix along with a wide set of tabulated series, data files and computer codes.

Section 3.1. Wealth and income concepts

Our wealth distribution series are constructed using a concept of "net personal wealth" based upon national accounts categories.\(^5\) That is, net personal wealth is defined as the sum of non-financial assets and financial assets, net of financial liabilities (debt), held by the household sector. All these concepts are defined using the latest international guidelines for national accounts (namely SNA 2008; for additional details, see Alvaredo et al, 2016, and the appendix). We break down non-financial assets into housing assets and business assets. We include in housing assets the value of the building and the value of the land underlying the building. We include in business assets all non-financial assets held by households other than housing assets. In practice, these are mostly the business assets held by self-employed individuals (but this also includes other small residual assets). We break down financial assets into four categories: deposits (including currency and saving accounts); bonds (including loans); equities (including investment funds shares); life insurance (including pension funds). We therefore have seven asset categories (housing assets, business assets, four financial asset categories, and debt), or actually eight categories when we break down housing into owner-occupied and tenant-occupied housing.

\(^5\) The reason for using national accounts concepts is not that we believe they are perfectly satisfactory. Our rationale is simply that national accounts are the only existing attempt to define income and wealth in a consistent manner on an international basis.
Also, our wealth distribution series always refer to the distribution of personal wealth among individual adults (i.e. the net wealth of married couples is divided by two, unless available information suggests to do differently).\(^6\)

We use official national accounts established by INSEE for the recent decades (post-1969 for national wealth accounts, and post-1949 for national income accounts). For the earlier periods, we use the historical series provided by Piketty and Zucman (2014). National income series for housing rental income (owner-occupied and tenant-occupied), self-employment income, and interest and dividend income (which are available separately for the four financial asset categories described above, at least for the recent decades), allow us to compute average rates of return for housing, business and financial assets, which we then use when we apply the income capitalization method (see below).


We now describe the data sources and methodology used to estimate the distribution of wealth for the 1970-2014 period. This is a mixed method, in the sense that it is based both on the income capitalization method (W1) and on the wealth survey method (W3).

In order to apply the income capitalization method, we use the micro-files of income tax returns that have been produced by the French Finance Ministry since 1970. We have access to large annual micro-files since 1988. These files include about 400,000 tax units per year, with large oversampling at the top (they are exhaustive at the very top; since 2010 we also have access to exhaustive micro-files, including about the universe of all tax units, i.e. about 37 million tax units in 2010-2012).\(^7\)

\(^6\) With most methods, we do not observe adequate information that would allow us to split the wealth of married couples on the basis of unequal individual property rights, so we revert to the equal-split method. With the estate multiplier method, however, we are sometime able to directly observe own assets and community assets, so that we can compare equal-split wealth inequality estimates with unequal-split estimates.

Before 1988, micro-files are available for a limited number of years (1970, 1975, 1979 and 1984) and are of smaller size (about 40,000 tax units per year).

We also have access to income tax tabulations, which have been produced by the French Finance Ministry since the creation of income tax in France in 1914 (first applied in 1915). These tabulations are available on an annual basis throughout the 1915-2014 period (with no exception) and are based upon the universe of all tax units. They report the number of taxpayers and total income for a large number of income brackets. By applying the generalized, non-parametric Pareto interpolation techniques developed by Fournier and Piketty (2016), they can be used to estimate annual series on income percentiles (for all percentiles, from the bottom to the top of the distribution of total income; see Garbinti, Goupille-Lebret and Piketty (2016)). These tabulations also include detailed breakdowns by income categories (wages, self-employment income, dividend, interest, etc.), which we use to estimate separately the distribution of labor income and capital income (see Garbinti, Goupille-Lebret and Piketty (2016, Appendix D)). In principle, one could also use these historical tabulations and the income capitalization method in order to estimate the distribution of wealth prior to 1970. However these tabulations by income categories suffer from a number of limitations, so that we prefer to use the income capitalization method as our benchmark method solely for the 1970-2014 period (when we have access to micro-files of income tax returns), and to adopt the estate multiplier method (based upon inheritance tax returns) as our benchmark method prior to 1970.

Thanks to the 1970-2014 income tax micro-files, we have access to detailed, individual-level information on taxable asset income flows, including tenant-occupied rental income, self-employment income, interest income, and dividend income. We divide these flows by the relevant asset-specific average rates of return (as described

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8 As of July 2016, the last tabulation available is the 2014 tabulation.
9 Generally speaking, the main limitation of income tax tabulations is that prior to 1985 they only cover tax units that are subject to positive income tax. Another specific limitation of tabulations by income categories is that prior to 1945 they only cover a limited number of years (namely, 1917, 1920, 1932, 1934, 1936 and 1937; they then become annual in 1945). In contrast, inheritance tax tabulations cover the entire distribution of wealth (whether the resulting asset income is subject to income tax), and they cover many more years prior to 1945. Full details on income tax tabulations and the way we exploit them are given in Garbinti, Goupille-Lebret and Piketty (2016, Appendix D).
above) in order to compute the stock of tenant-occupied housing assets, business assets, bonds, and equities.\(^\text{10}\)

The next step is to deal with assets that do not generate taxable income flows, namely owner-occupied housing, life insurance, and deposits (including currency and saving accounts).\(^\text{11}\) We use available wealth surveys in order to impute these assets on the basis of income, age and gender. Housing surveys (including information on housing assets and debt) were conducted by INSEE in 1970, 1973, 1978, 1984, 1988, 1992, 1996, 2001, 2006 and 2013. Household wealth surveys (including housing, business and financial assets and debt) were conducted by INSEE in 1986, 1992, 1998, 2004, 2010 and 2014.\(^\text{12}\) The 2010 and 2014 wealth surveys are the French component of the Eurosystem HFCS survey and are more sophisticated than previous surveys.\(^\text{13}\) We conducted sensitivity tests and applied several alternative imputation methods for tax-exempt assets using housing and wealth surveys over the 1970-2014 period, and the general conclusion is that the overall impact on wealth distribution series is extremely small.\(^\text{14}\) In addition, we observe the fiscal capital income flows in the 2010 and 2014 wealth surveys (together with self-reported information on asset stocks), and so we can successfully test the key assumption behind the income capitalization method, namely the fact that rates of return are approximately constant within a given asset class.\(^\text{15}\)

\(^\text{10}\) We interpolate the missing years 1971-1974, 1976-1978, 1980-1983 and 1985-1987 by using annual aggregate series by asset categories and by assuming linear trends in within-asset-class distribution. As an alternative strategy, we also used annual income tax tabulations (broken down by income categories) and found that this makes very little difference.

\(^\text{11}\) Note that owner-occupied rental income (i.e. imputed rent) was included in taxable income in France from the creation of the income tax until 1963.

\(^\text{12}\) These wealth surveys were called « enquête actifs financiers » in 1986 and 1992, and « enquête patrimoine » since 1998. Housing surveys were always called « enquête logement ».

\(^\text{13}\) The 2010 and 2014 surveys include answers with exact amounts (rather than answers by wealth brackets, which were used in previous surveys) and large oversampling at the top (although the sample size of the survey is still insufficient to go beyond the 99th percentile).

\(^\text{14}\) Given the limited long-run information at our disposal regarding negative net wealth holders, and the relatively small fraction of negative net wealth holders (less than 5% of households, with an aggregate negative net wealth of about 2% of aggregate net wealth), we choose to ignore them and to set minimum net wealth at zero. Using the Eurosystem 2010-11 HFCS survey, Cowell and Van Kerm (2015) find about 5-10% of households with negative net wealth in all 15 Eurozone countries (see their table 1). An exception seems to be Sweden, with more than 20% of households with negative net wealth (see their figure 1); however this estimate comes from wealth registers rather than from a wealth surveys, so it may not be entirely comparable.

\(^\text{15}\) As of July 2016, the final files of the 2014 wealth survey were not available yet, so we did the test solely with the 2010 wealth survey. This will be extended to the 2014 wealth survey as soon as the files are available.
By construction, our methodology delivers individual-level information on both wealth and income over the 1970-2014 period (which we will later use to compute synthetic saving rates and to perform simulations), together with detailed breakdowns by age, gender, and asset categories.

All data files, computer codes and robustness checks regarding our mixed income capitalization-wealth survey method are given in the data appendix (see appendix B).

Section 3.3. Estate multiplier method (W2) (1800-1970)

We now describe the data sources and the estate multiplier methodology that we use in order to estimate the distribution of wealth over the 1800-1970 period.

The main reason for using the estate multiplier technique over the 1800-1970 period is simply that this is the only data source and method available over such a long time period. The income tax was created in France in 1914, so there is no data on capital income flows prior to this date. In contrast, the modern inheritance tax was set up in 1791, and individual-level inheritance registers have been well preserved and are accessible to researchers since 1800. These registers include detailed information about assets, age, and gender, in principle for all decedents (irrespective of the level of their wealth), so they constitute the ideal source to apply estate multiplier techniques. That is, we reweight the distribution of wealth at death by using the mortality rate of the relevant age-gender cell (with standard corrections for differential mortality), so as to recover the distribution of wealth among the living. Regarding the 1800-1902 period, we refine the estate-multiplier estimates already computed by Piketty, Postel-Vinay and Rosenthal (2006, 2014) on the basis of the large individual-level micro-samples of estates which they collected in Paris inheritance registers and of the provincial samples collected by Bourdieu et al (2003, 2013) in the context of the TRA survey.

In 1902 the French inheritance tax was made progressive, and the tax administration started to compile detailed tabulations reporting the number of decedents and amount of their wealth for a large number of inheritance brackets. These tabulations are consistent with the data collected in inheritance registers, and they are available
on a quasi-annual, exhaustive national basis between 1902 and 1964 (except for the 1914-1924 sub-period). They occasionally include supplementary breakdowns by age brackets and asset categories. We use these national tabulations (together with the estate multiplier method and the Pareto interpolation techniques developed by Fournier and Piketty (2016)) in order to compute our wealth distribution series for the 1902-1970 period.\textsuperscript{16}

Unfortunately, annual inheritance tabulations were interrupted by the French Finance Ministry in 1964. Instead, for the recent decades, the tax administration compiled national micro-samples of inheritance tax returns in 1977, 1984, 1987, 1994, 2000, 2006 and 2010 (with limited sample size). We applied the estate multiplier method to the 1984-2010 samples (the 1977 file is not usable), together with correction for tax-exempt assets (particularly life insurance), and we found that the resulting W2 estimates for the wealth distribution are extremely close to the estimates coming from our mixed W1-W3 income capitalization-survey method. This is reinsuring and gives us confidence that we can link up our 1800-1970 estate-multiplier series with our 1970-2014 income-capitalization-survey series.\textsuperscript{17}

All data files, computer codes and robustness checks regarding the estate multiplier method are given in the data appendix (see appendix C for estate-multiplier estimates over the 1800-1970 period, and appendix D for reconciliation between estate-multiplier and income-capitalization estimates for the 1984-2010 period).

Section 3.4. Reconciliation with other methods

We also provide in the appendix detailed computations in order to reconcile our benchmark series with other available method for the recent period (see appendix F for reconciliation with wealth surveys, appendix G for reconciliation with wealth tax data, and appendix H for reconciliation with billionaire lists).

\textsuperscript{16} We complete the missing years 1914-1924 and 1965-1969 by using data on top capital incomes from income tax tabulations.
\textsuperscript{17} In principle, one could return to individual-level inheritance registers to collect annual samples for the recent decades; unfortunately it is very difficult to access these registers for the recent period.
As we mentioned above, the latest wealth surveys (2010 and 2014) are of relatively high quality and are matched with income tax declarations. The main limitation is their sample size, which is too small to go beyond the 99th percentile. In effect, very top capital income and wealth levels are under-estimated in wealth surveys.

We also compare the top wealth levels estimated in our benchmark series with the top wealth levels that can be estimated using wealth tax tabulations that are available over the 1982-2013 period (with a number of missing years). A progressive annual tax on top wealth holders (approximately the top 1%) was instituted in France in 1982 (IGF), abolished in 1986, re-instituted in 1989 (ISF), and still in place in 2016. There has been very limited access to micro-files so far, but tabulations by wealth brackets have been published on an irregular basis since 1982. The main difficulty with this data is that there are many tax-exempt assets, in particular regarding equity participations in family firms and in companies where asset holders play an active management role (the exemption for so-called “professional assets”). By making plausible assumptions on the fraction of tax-exempt wealth by asset categories and levels, we are able to reconcile this data with our benchmark estimates. But there is significant uncertainty about the exact level and evolution of tax exemptions, so it is difficult to use this source on its own.

Finally, we also compare our benchmark estimates with the top wealth levels that can be estimated using the billionaire list published by magazines (Forbes at the global level, and Challenges at the French level). The main difficulty here is that very little is known about how these lists are established, and also about the size of the family unit. By making plausible assumptions on the distribution of family unit size, we are able to reconcile this data with our benchmark estimates. However we conclude that there is so much uncertainty about billionaire lists that they should be used with a lot of caution (in addition to other sources rather than on their own).
Section 4. Long-run wealth inequality series (1800-2014)

We now present our benchmark unified series for wealth distribution in France over the 1800-2014 period. The two general facts that emerge from our series are, first, that wealth concentration is systematically much larger than income concentration, and next, that the exact level of wealth concentration displays strong variations over time. In particular, we confirm previous findings regarding a significant decline in the top 10% wealth share between 1914 and 1984 (from 80-90% of total wealth during the 19th century up until World War 1, down to 50-60% in the early 1980s), mostly to the benefit of the middle 40% of the distribution (the bottom 50% wealth share is always less than 5%). Since the mid-1980s, we observe a moderate rise of wealth concentration, with large fluctuations due to asset price movements.

The wealth levels, thresholds and shares for 2012 are reported on Table 1. In 2012, average net wealth per adult in France was about 200 000 €. Average wealth within the bottom 50% of the distribution was about 20 000 €, i.e. about 10% of the overall average, so that their wealth share was about 5%. Average wealth within the next 40% of the distribution was relatively close to 200 000 €, so that their wealth share was close to 40%. Finally, average wealth within the top 10% was about 1.1 million € (i.e. about 5.5 times average wealth), so that their wealth share was about 55%.

We report on Figure 1 the evolution of the wealth shares going to these three groups over the 1800-2014 period. The wealth share going to the bottom 50% (the “lower class”) has always been very small (less than 5%). The major long-run transformation is the rise of the share going to the middle 40% (the “middle class”) and the decline of the share going to the top 10% (the “upper class”). This major change entirely took place between 1914 and the early 1980s.

During the 19th and early 20th century, up until World War 1, the top 10% share is relatively stable at very high levels – between 80% and 90% of total wealth, with a slight upward trend over the period. The middle 40% share was relatively small throughout the period, e.g. slightly above 10% at the eve of World War 1, not very much above the bottom 50% share. In a sense there was no “middle class”: the middle 40% were almost as property-less as the bottom 50%.
The top 10% wealth share started to fall following the 1914-1945 capital shocks, and the fall continued until the early 1980s, with an absolute minimum in 1983-1984 (with slightly more than 50% of total wealth). Here it is interesting to recall that the aggregate wealth-national income ratio fell hugely over the 1914-1945 period - from about 700% to less than 200% - and gradually recovered in the decades following World War II (see Piketty and Zucman (2014) for a detailed analysis and decomposition between the various explanatory factors: destructions, inflation, lack of investment, and a general fall in asset price indexes as compared to consumer price indexes, partly due to rent control and other regulations). In other words, the rise of the middle 40% share during the 1914-1945 period is not due to the fact that the middle class accumulated a lot of wealth during this period: this simply corresponds to the fact they lost less wealth – in proportion to their initial wealth level – than the top 10%. In contrast, during the post-war decades, the rise of the middle class corresponds to a significant rise of their absolute wealth levels (see appendix A for detailed series in constant euros).

In the recent decades, we observe a moderate rise in the top 10% wealth share, and a corresponding erosion of the middle 40% wealth share. However we also notice strong short-run fluctuations, with a large rise in top 10% share up to 2000, followed by a sharp decline. As we will see below, this is entirely due to large movements in relative asset prices (stock prices are very high as compared to housing prices in 2000, which favors the upper class relative to the middle class).

Next, it is worth stressing that the historical decline in the top 10% wealth share is entirely due to the collapse in the top 1% wealth share, from 55%-60% of total wealth on the eve of World War 1 to 30% in 1945 and 15%-20% in the early 1980s, back up to about 25% in the early 2010s (see Figure 2).

Finally, we compare on Figures 3-4 our wealth inequality series with the income inequality series coming from our companion paper (Garbinti, Goupille-Lebret and Piketty, 2016). The central finding is that wealth concentration is always a lot larger than labor income concentration. For instance, the share of total labor income going to top 10% labor income earners always fluctuates around 25%-30% over the 1900-2014 period, while the share of total wealth going to top 10% wealth holders
fluctuates in the 50%-90% range (see Figure 3). The comparison is even more striking for the top 1% share: it fluctuates in the 5%-8% range for labor income, and in the 15%-60% range for wealth (see Figure 4). The concentration of total income (including labor and capital income) is intermediate between the two, and closer to the concentration of labor income (which is not too surprising, given that the labor share is typically around 65%-75% of total income). It is striking to see that the long-run decline in income inequality is entirely due to the decline in the concentration of wealth and capital income. This makes it even more important to understand the long-run determinants of wealth concentration. Note also that the concentration of capital income is even larger than the concentration of wealth, which corresponds to the fact that higher wealth individuals tend to own assets with higher rates of return - typically equity rather than housing or deposits (more on this below).
Section 5. Wealth inequality breakdowns by age and assets, 1970-2014

We now present our detailed wealth inequality breakdowns by age and asset categories for the 1970-2014 period. We begin with age decomposition and then proceed with asset decompositions.

If we first look at the age-wealth profile, we find that average wealth is always very small at age 20 (less than 10% of average adult wealth), then rises sharply with age until age 50-55, and finally stabilizes at very high levels (around 150%-160% of average adult wealth) at ages 60-85. This age-wealth profile appears to be relatively stable over the 1970-2014 period (see Figure 5). The key difference with the standard Modigliani triangle (implied by a pure life-cycle model with no bequest) is that average wealth does not seem to decline at high ages: it remains stable at very high levels, which means that old-age individuals die with substantial wealth and transmit it to their offspring. Note also that old-age individuals make very substantial inter vivos gifts in France, so that average wealth at high ages would be even higher without these gifts, particularly at the end of the period. Gifts are made on average about 10 years before death, and the aggregate gift flow has increased from about 20%-30% of the aggregate bequest flow in the 1970s to as much as 80% of the aggregate bequest flow in the 2000s-2010s (see Piketty, 2011).18

Next, it is interesting to see that wealth inequality is almost as large within each age group than for the population taken as a whole (see Figure 6). For instance, if we look at the distribution of wealth within the individuals aged 60-year-old and over, we find a top 10% wealth share equal to 56% in 1970 (vs 59% for the population taken as a whole) and to 52% in 2012 (vs 56% for the population taken as a while).

Before we move to inequality breakdowns by asset categories, it is important to recall that the composition and level of aggregate wealth have changed substantially in France over the 1970-2014 period (see Figures 7-8). Namely, the share of housing assets and financial assets have increased substantially, while the share of business

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18 In other words, when we observe on Figure 5 that the average wealth of 80-year-old individuals is about 140% of average adult wealth in 2010, it is important to keep in mind that this is the average wealth of individuals who have already given away almost half of their wealth (on average).
assets has declined markedly (due to the fall in self-employment). Financial assets (other than deposits) increase strongly after the privatization of the late 1980s and the 1990s and reach a high point in 2000 (stock market boom). In contrast, housing prices decline in the late 1990s, and rise strongly during the 2000s, at the same time as stock prices fall.

These contradictory movements in relative asset prices have an important impact on the evolution of wealth inequality, because the difference wealth groups own very different asset portfolios. As one can see on Figure 9, the bottom 30% of the distribution own mostly deposits in 2012. Then housing assets become the main form of wealth for the middle of the distribution. As we move toward the top 10% and the top 1% of the distribution, financial assets (other than deposits) gradually become the dominant form of wealth. This is particularly due to large equity portfolios. We find the same general pattern throughout the 1970-2012 period, except that business assets played a more important role at the beginning of the period, particularly among middle-high-wealth holders (see Figures 10-12). If we now decompose by asset categories the evolution of the wealth shares going to the bottom 50%, middle 40%, top 10%, and top 1%, then we see very clearly the impact of asset price movements on wealth shares, and particularly the impact of the 2000 stock market boom on the top 1% wealth share (see Figures 13-17). We return to this issue below.
Section 6. Accounting for wealth inequality: models and simulations

How can we account for our findings? Here it is important to distinguish short-run evolutions (which can typically be driven by sharp movements in relative asset prices) from long-run trends. From a long-run, structural perspective, how can we account for the very high levels of wealth concentration that we observe in the data, as well as the variations of these very high concentration levels across the 20th century? First of all, it is clear that a life-cycle model with no bequest is not going to generate sufficient inequality. Typically, in a standard life-cycle model, wealth inequality within age group should be comparable in magnitude to the inequality of labor income within age group, which is not at all what we observe. In addition, we have seen that decedents die with very substantial wealth. A model with precautionary saving is not going to work very well either, since this typically generates less wealth inequality than the cross-sectional inequality of labor income shocks. In order to generate substantial wealth concentration and fat Pareto upper tails for the wealth distribution, the most natural and flexible way to proceed is to use dynamic wealth accumulation models with long horizon and with multiplicative random shocks (see e.g. Nirei (2009), Benhabib, Bisin and Zhu (2011, 2016), Piketty and Saez (2013), and Piketty and Zucman (2015) for a survey). In this class of models, several structural forces tend to amplify wealth inequality toward high steady-state levels, particularly the inequality of saving rates and the inequality of rates of return, together with the inequality of labor incomes.\footnote{In the benchmark infinite-horizon, dynastic model with no random shock, any distribution of wealth (together with any exogenous distribution of labor income, and any exogenous correlation between the two) can be a steady-state. In effect, each dynasty saves a fraction g/r of its capital income so that all dynastic wealth levels grow at the same rate g (dynasties with no initial wealth save nothing, and dynasties with a lot of initial wealth save enough to maintain their position, hence the full persistence result). The only equilibrium condition is the well-known modified-Golden-rule steady-state condition for aggregate rate of return (and therefore aggregate capital): \( r = \theta + \gamma g \) (where \( \theta \) is the rate of time preference and \( \gamma \) the curvature of the utility function). The problem of this deterministic model is that it is too extreme (zero mobility, complete persistence of any initial wealth inequality). In effect the simple dynamic accounting model that we describe below is similar in spirit to the dynastic model, except that it allows for mobility and for any dispersion of saving rates (less extreme than in the dynastic model), as well as for any dispersion of rates of return.}

In order to illustrate this point and quantify these effects in a simple and transparent manner, we will decompose our series using the following transition equation:
\[ \text{W}_p^{t+1} = (1 + q_p^t)[\text{W}_p^t + s_p^t (\text{Y}_{pl}^t + r_p^t \text{W}_p^t)] \]

With: \( \text{W}_p^t, \text{W}_p^{t+1} = \text{average wealth of group } p \text{ at time } t \text{ and } t+1 \) (for instance, group \( p \) could be the top 10% wealth group)

\( \text{Y}_{pl}^t = \text{average labor income of group } p \text{ at time } t \)

\( r_p^t = \text{average rate of return of group } p \text{ at time } t \)

\( q_p^t = \text{average rate of real capital gains of group } p \text{ at time } t \) (real capital gains are defined as the excess of average asset price inflation, given average portfolio composition of group \( p \), over consumer price inflation)

\( s_p^t = \text{synthetic saving rate of group } p \text{ at time } t \)

We define synthetic saving rates in the same way as Saez and Zucman (2016). That is, we can observe variables \( \text{W}_p^t, \text{W}_p^{t+1}, \text{Y}_{pl}^t, r_p^t, q_p^t \) in our 1970-2014 series, and from this we compute \( s_p^t \) as the synthetic saving rate that can account for the evolution of average wealth of group \( p \). We call it “synthetic” saving rate because it should be thought as some form of average saving rate of the group (taking into account all the inter-group mobility effects). It clearly does not mean that all individuals in wealth group \( p \) save exactly that much. In practice, there is always a lot of mobility between wealth groups over time. In particular, individuals saving more than the synthetic saving rate of their group will tend to move up the wealth hierarchy, while individuals saving less than the average of their group will move down. In the same way, individuals earning more than the average rate of return of their group, and/or more than the average rate of real capital gain of their group, and/or more than the average labor income of their group, will tend to move up the wealth hierarchy. In this paper, we do not attempt to study this mobility process as such, and instead we focus upon this synthetic saving rate approach. This allows us to do simple simulations in order to illustrate some of the key forces at play.

The first simple simulation exercise consists of replacing the time-varying rates of real capital gains by constant capital gains. Over the 1970-2012 period, housing prices have increased faster than other asset prices (on average they have increased 2.1% faster per year than consumer price inflation, vs. 0.3% faster for the general asset price index). However this structural increase in housing prices has been far from steady: the housing boom was particularly strong in certain years and not in
others, thereby generating large short run fluctuations in wealth inequality. If we take as given the time varying synthetic saving rates for the top 1% wealth group, and if we replace the time varying rates of real capital gains by constant capital gains (namely by the average structural increase and decrease of the various asset prices over the 1970-2012 period), then we obtain the simulated series reported on Figure 18. We also indicate the simulated series obtained by replacing time varying synthetic saving rates by their averages over the period 1970-2012. By construction, all simulated series end up in 2012 at the same inequality level as the observed series. The difference is that we now see a gradual increase in inequality, rather than a sharp rise until 2000 followed by a decline. This confirms that the only reason for this inverted-U-shaped pattern is due to variations in relative asset prices, and more specifically to the stock market boom of 2000 (together with the low housing prices of 2000). Once this is corrected by our simulated series, this disappears: in other words the structural parameters at play push toward rising concentration of wealth.

We report on Figure 19 the simulated series that we obtain by replacing time varying rates of capital gains and synthetic saving rates by their averages over the 1970-2000 period, i.e. over the period ending before the housing boom of the 2000s. We find that the top 1% share would have increased a lot more by 2012. In other words, the housing boom of the 2000s has played an important role as a mitigating force to limit the rise of inequality. More generally, the structural increase in top 10% and top 1% wealth shares over the 1984-2012 period would have been substantially larger without the fact that housing prices increased structurally faster than other asset prices. It should be noted however that rising housing prices have an ambiguous and contradictory impact on inequality: on the one hand they raise the market value of the wealth of middle class members who were able to access real estate property, thereby raising the middle 40% wealth share relative to the top 10% wealth share; but on the other hand rising housing prices make it more difficult for lower class members (or of middle class members with no family wealth at all) to access real estate property.

We now turn to very long term forces and simulations. Assume the relative capital gain channel disappears, i.e. all asset prices rise at the same rate in the long run (which must happen at some point, otherwise there will be only one asset left), and
this rate is the same as consumer price inflation (otherwise wealth-income ratio would go to infinity). How is the long-run, steady-state level of wealth concentration determined? By manipulating the transition equation given above for wealth group p (for instance p = top 10% wealth group) and the corresponding equation for aggregate wealth, one can easily derive the following steady-state equation:

\[
sh^p_w = \left[\frac{(1 + s^p r^p - sr)}{(g - s^p r^p)}\right] \left(\frac{s^p}{s}\right) sh^{p_y}L
\]

With: \(sh^p_w\) (resp. \(sh^{p_y}L\)) is the share of wealth (resp. labor income) held by wealth group p (for instance p = top 10% wealth group)

g is the economy’s per capita growth rate

s the aggregate saving rate

r the aggregate after-tax rate of return

\(s^p\) the synthetic saving rate of wealth group

\(r^p\) the after-tax rate of return of wealth group p (given their portfolio composition)

This formula can be derived very simply (see appendix E) and is very intuitive.

For instance, if \(s^p = s\) and \(r^p = r\) (i.e. top wealth group has the same saving rate and rate of return as average), then \(sh^p_w = sh^{p_y}L\), i.e. wealth inequality is exactly the same as labor income inequality.

But if \(s^p > s\) and/or \(r^p > r\) (i.e. top wealth group saves more and/or has a higher rate of return than average), then this can generate large multiplicative effects, and lead to very high steady-state wealth concentration.20

The important point is the strength of these multiplicative effects. In order to illustrate this, we have done the following simulations. First, we have computed the evolution of synthetic saving rates for the different wealth groups over the 1970-2012 period. The results are represented on Figure 20. As one can see, the high levels of wealth concentration that we observe in France over this period can be accounted for by

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20 The difference with the steady-state formula presented by Saez and Zucman (2016) is that they relate wealth shares to total income shares (including both labor incomes and capital incomes, which themselves depend on wealth shares), so that they do not fully capture multiplicative effects between labor income inequality and steady-state wealth inequality.
highly stratified saving rates between wealth groups: while top 10% wealth holders save on average between 20% and 30% of their annual income, middle 40% and bottom 50% wealth groups save a much smaller fraction of their income. It is also striking to see that middle and bottom wealth groups use to save more in the 1970s (with a saving rate of about 15% for the middle 40% and 5% for the bottom 50%) than what we see since the 1980s-1990s (with a saving rate of less than 5% for the middle 40% and close to 0% for the bottom 50%). This is the key structural force which is accounting for rising wealth concentration in France over this period. This is similar to what was found by Saez and Zucman (2016) for the U.S. case.

Next, we computed the evolution of flow rates of return (excluding capital gains, which we assume to be zero in our simulations) for the different wealth groups over the 1970-2012 period. The results are represented on Figure 21. As one can see, higher wealth groups tend to have substantially higher rates of return. This large inequality of rates of return is due to the large portfolio differences that we documented earlier. In particular, top wealth groups own more financial assets like equity with higher rates of return than housing or deposits (see Table 2).

Finally, we use these estimates of sρ and rρ by wealth group in order to simulate steady-state trajectories for the top wealth shares in coming decades. The main results are reported on Figure 22 for the top 10% wealth share. Additional simulations covering the top 1% wealth and alternative variants for saving rates and after-tax rates of returns for the different wealth groups are reported in appendix B.

For simplicity, we report only two simulations on Figure 22. First, we assume that the same inequality of saving rates that we observe on average over the 1984-2012 period (namely 27.5% for the top 10% wealth group, and 2.5% for the bottom 90%) will persist in the following decades, together with the same inequality of rates of return and the same inequality of labor income. The conclusion is that the top 10% wealth share will gradually increase in the future and will finally converge toward a

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21 Note that the parameter shρYl reflects both the inequality of labor income and the correlation between the distributions of wealth and labor income. For simplicity we assume both to be constant in future decades in our basic simulations. See appendix B for more details and other simulations.
level of wealth inequality that is similar to that observed in the 19th and early 20th centuries (namely about 85% of total wealth).

The other simulation consists of assuming the same inequality of saving rates that we observe on average over the 1970-1984 period (namely 24.5% for the top 10% wealth group, and 8.5% for the bottom 90%) would have persisted between 1984 and 2012 and during the following decades, together with the same inequality of rates of return. The conclusion is that the top 10% wealth share would have continued the declining path observed before 1984 and would have gradually converged toward a substantially lower level of wealth concentration (with a top 10% wealth share of about 40%).

There are two main messages from these simple simulations. First, relatively small changes in the key parameters – inequality of saving rates and inequality of rates of return – can have enormous impact on steady-state wealth inequality. Next, these effects take a very long time – many decades and generations – before they fully materialize. This can explain why declining wealth concentration continued long after the capital shocks of the 1914-1945 period. Once some structural parameters have changed, it takes many decades to reach a new steady-state.

The main limitation of our approach is that we are not able to fully explain why saving rates and rates of return change the way they do. We can think of a number of plausible factors, but the data we use is insufficient to fully settle the issue. Regarding the evolution of saving rates, one can imagine that bottom and middle wealth groups were saving at higher rates during the high-growth postwar decades due to some form of “habit formation” effect (Carroll, Overland and Weil (2000). It is also possible that rising top income shares in recent decades, together with growth slowdown for bottom and middle groups, has contributed to rising inequality in saving rates, and this has been exacerbated by some form of relative consumption effect (on changing income shares, see our companion paper Garbinti, Goupille-Lebret and Piketty, 2016). Finally, it is clear that changes in the tax system, and in particular in tax progressivity, can have very large impact both on the inequality of saving rates between group and on the inequality of after-tax rates of return, and therefore on steady-state wealth inequality. The inequality of rates of return can also be influenced
by many other factors, including financial regulation and deregulation, rent control and the end of rent control, etc.

The other limitation is that our data series do not allow us to compute synthetic saving rates over the 1800-1970 period. However our simulations suggest that in order to maintain the very high level of wealth inequality that we observe over the 1800-1914 period, it was necessary to have very extreme stratification of saving rates, with a magnitude comparable to what we observe over the 1984-2012 period.

Regarding the 1914-1984 decline in wealth inequality, it must be the case that the inequality in saving rates declined during this period. One can imagine that the saving rates of top wealth groups were severely affected by the capital and fiscal shocks of the 1914-1945 period. In particular, there was no progressive taxation prior to 1914, and in the interwar period, effective tax rates for top income and wealth groups quickly reached very substantial levels, e.g. 20%, 30%, 40% or even more (see Piketty 2001, 2014). In case top wealth holders reacted by reducing their consumption levels and living standards less than the increase in tax (which came in addition to a negative shock to their pre-tax capital incomes), then in effect they had to reduce their saving rate. This is an issue that we further study using individual-level inheritance registers and wealth records in Paris over this period (Piketty, Postel-Vinay and Rosenthal, 2016). The other side of the coin is the rise in bottom and middle group saving rates, which according to our wealth series started mostly in post-war, high-growth decades. More research is needed to clarify these issues.
Section 7. International comparisons

We now compare our findings to available estimates for other countries. Existing wealth inequality series for the U.K. and Sweden suggest that our French findings (with extreme levels of wealth concentration in the 19\textsuperscript{th} and early 20\textsuperscript{th} centuries, a sharp decline between 1914 and the late 1970s-early 1980s, and a moderate rise since then) are representative of a more general form of European pattern (see Piketty 2014, chapter 11). On-going work on these two countries should allow us to clarify this in the near future and to provide more systematic comparisons.

We can also compare our French series to the U.S. series recently constructed by Saez and Zucman (2016). As one can see from Figure 23, wealth inequality used to be substantially larger in France than in the U.S. in the early 20\textsuperscript{th} century, while in recent decades it has become a lot higher in the U.S. Using our framework, one can interpret the lower U.S. wealth inequality level in the early 20\textsuperscript{th} century as the consequence of some kind of “New World” effect (population was still growing very fast in the U.S. so that wealth concentration was very far from its steady-state level). Regarding the recent decades, the fact that top labor income shares increased a lot more in the U.S. than in France can easily translate into much higher steady-state wealth inequality levels, and could also contribute to exacerbate the inequality in saving rates. In particular, the complete stagnation of bottom 50\% incomes in the U.S. in recent decades can contribute to explain the very low saving rates found by Saez and Zucman (2016). It is clear however that we would need more systematic comparison using data series for more countries in order to better understand these important issues.
Section 8. Concluding comments and research perspectives

In this paper, we have shown that it is possible to combine data sources and methods in order to improve our capacity to measure the long-run evolution of wealth distribution (using the case of France as an illustration), and in turn that the new resulting series can be used to better understand the long-run determinants of wealth concentration. We have found that small changes in the key structural parameters – in particular the inequality in saving rates and after-tax rates of return across wealth groups – can have very large long-run effects on steady-state wealth inequality.

We hope that this work can be extended to other countries. Note that the exact method will need to be adapted to each country, depending on the quality of the various data sources (income tax returns, inheritance registers, wealth survey, billionaire lists and other sources) in the different countries. We stress again that there is no perfect data source or method, and that they all need to be combined in a pragmatic and transparent way. Wealth measurement is still in its infancy, and in order to make progress we need to combine all the bits and pieces of knowledge that we have.
**References**

This list includes all references that are quoted either in the main paper or in the data appendix.


C. Colson, *Cours d’économie politique*, Gauthier-Villars, Paris, 1903, 1918, 1927 (several editions)


J. Fournier, T. Piketty


Table 1: Wealth thresholds and wealth shares in France, 2012

<table>
<thead>
<tr>
<th>Wealth group</th>
<th>Number of adults</th>
<th>Wealth threshold</th>
<th>Average wealth</th>
<th>Wealth share</th>
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<tr>
<td>Full Population</td>
<td>50 862 082</td>
<td>0 €</td>
<td>196 915 €</td>
<td>100.0%</td>
</tr>
<tr>
<td>Bottom 50%</td>
<td>25 431 041</td>
<td>0 €</td>
<td>20 643 €</td>
<td>5.2%</td>
</tr>
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<td>Middle 40%</td>
<td>20 344 833</td>
<td>89 404 €</td>
<td>187 653 €</td>
<td>38.1%</td>
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<td>392 200 €</td>
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<td>52 405 684 €</td>
<td>2.7%</td>
</tr>
<tr>
<td>incl. Top 0.001%</td>
<td>509</td>
<td>77 805 523 €</td>
<td>171 539 176 €</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Notes: This table reports statistics on the distribution of wealth in France in 2012 obtained by capitalizing income tax returns. The unit is the adult individual (20-year-old and over; net wealth of married couples is splitted into two). Fractiles are defined relative to the total number of adult individuals in the population. Source: Appendix Table B1-B2.

Sources: Wealth Appendix B
Table 2. Average annual rates of return by asset categories in France, 1970-2014

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Flow return (rent, interest, dividend, etc.)</th>
<th>Real capital gains (asset price inflation, in excess of consumer price inflation)</th>
<th>Total return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net personal wealth</td>
<td>5.5%</td>
<td>0.3%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Housing assets</td>
<td>3.4%</td>
<td>2.4%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Business assets</td>
<td>5.1%</td>
<td>0.1%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Financial assets (excl. Deposits)</td>
<td>11.3%</td>
<td>-3.4%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Deposits</td>
<td>3.8%</td>
<td>-4.1%</td>
<td>-0.5%</td>
</tr>
</tbody>
</table>

| Financial assets                      |                                             |                                                                                 |              |
|---------------------------------------|                                             |                                                                                 |              |
| incl. Equities/Shares/Bonds           | 11.5%                                       | -2.5%                                                                          | 8.7%         |
| incl. Life insurance/Pension funds    | 10.5%                                       | -6.7%                                                                          | 3.1%         |
| incl. Deposits/Saving accounts        | 3.8%                                        | -4.1%                                                                          | -0.5%        |
| Debt                                  | 5.6%                                        | -5.6%                                                                          | -0.3%        |
| Housing net of debt                   | 2.7%                                        | 4.7%                                                                           | 7.4%         |

Average real capital gains = 0.3% per year. To be compared to 3.5% saving induced wealth growth rate, 3.8% total wealth growth rate, and 2.2% national income growth rate. In other words, structural capital gains on personal wealth accumulation 1970-2014 are very small (like PZ; even a bit smaller); but with national wealth they would be larger (public debt/liquidity provision effect).

Sources: Table A24a and A25a from GGP2016DINAAppendixA
Figure 1. Wealth concentration in France, 1800-2012 (wealth shares, % total wealth)

1914-1984: the Fall of the Upper Class, the Rise of the Middle Class

Average net wealth per adult (2012): 197 000 €

1 115 000 €

188 000 €

21 000 €

Top 10% ("Upper Class")

Middle 40% ("Middle Class")

Bottom 50% ("Lower Class")

Average net wealth per adult (2012): 197 000 €
Figure 2. Top wealth shares in France, 1800-2012 (% total wealth)

Average net wealth per adult (2012): 197 000 €

740 000 €

4 528 000 €
Figure 3. Top 10% share: income vs wealth

Distribution of total income, labor income, capital income and net wealth among adults.

Equal-split-adults series (income and wealth of married couples divided by two).
Distribution of total income, labor income, capital income and net wealth among adults. Equal-split-adults series (income and wealth of married couples divided by two).
Figure 5. Age-wealth profiles in France, 1970-2012
Figure 6. Wealth concentration by age group, France 1970-2012

Top 10% (all ages)  
Middle 40% (all ages)  
Bottom 50% (all ages)

Top 10% (20-39-yr)  
Middle 40% (20-39-yr)  
Bottom 50% (20-39-yr)

Top 10% (40-59-yr)  
Middle 40% (40-59-yr)  
Bottom 50% (40-59-yr)

Top 10% (60-yr+)  
Middle 40% (60-yr+)  
Bottom 50% (60-yr+)
Figure 7. Composition of aggregate personal wealth, France 1970-2014

- **Deposits**
- **Financial assets (excl. deposits)**
- **Business assets**
- **Housing (net of debt)**
Figure 8. Level and composition of personal wealth, France 1970-2014 (% national income)

Ratio 2014 = 571%
Personal wealth per adult: 197 400 €
National income per adult: 34 600 €
Figure 9. Asset composition by wealth level, France 2012

- **Housing (net of debt)**
  - P0-10: 2,450 €
  - P10-20: 23,000 €
  - P20-30: 111,000 €
  - P30-40: 198,000 €
  - P40-50: 497,000 €
  - P50-60: 2,368,000 €
  - P60-70: 15,650,000 €

- **Deposits**

- **Financial assets (excl. deposits)**

- **Business assets**
Figure 10. Asset composition by wealth level, France 1970

- Housing (net of debt)
- Deposits
- Business assets
- Financial assets (excl. deposits)
Figure 11. Asset composition by wealth level, France 1984

- Housing (net of debt)
- Business assets
- Financial assets (excl. deposits)
- Deposits
Figure 12. Asset composition by wealth level, France 2000

- Housing (net of debt)
- Deposits
- Business assets
- Financial assets (excl. deposits)
Figure 13. Decomposition of bottom 50% wealth share (% aggregate wealth)

Bottom 50% personal wealth per adult: 21 000 € (2012)
Figure 14. Decomposition of middle 40% wealth share (% aggregate wealth)

Middle 40% personal wealth per adult: 188 000 € (2012)
Figure 15. Decomposition of top 10% wealth share (% aggregate wealth)

Top 10% personal wealth per adult: 1,115,000 € (2012)
Figure 16. Decomposition of top 10-1% wealth share (% aggregate wealth)

Top 10-1% personal wealth per adult: 736 000 € (2012)
Figure 17. Decomposition of top 1% wealth share (% aggregate wealth)

Top 1% personal wealth per adult: 4 529 000€ (2012)
Figure 18. Simulating the evolution of top 1% wealth share (1)

- Observed
- Fixed real rate of capital gains by asset class 1970-2012
- Fixed real capital gains by asset class + Fixed savings rate by fractile 1970-2012
Figure 19. Simulating the evolution of top 1% wealth share (2)

- Observed
- Fixed real rate of capital gains by asset class 1970-2000
- Fixed real capital gains by asset class + Fixed savings rate by fractile 1970-2000
Figure 20. Synthetic saving rates by wealth group, France 1970-2012

- Top 10%
- Middle 40%
- Bottom 50%
Figure 21. Flow returns by wealth group (before all taxes)
Figure 22. Steady-state top 10% wealth share, 1800-2150 (% total wealth)

Steady-state with 1984-2012 saving rates: 27.5% for top 10%, 2.0% for bottom 90%

Steady-state with 1970-1984 saving rates: 24.5% for top 10%, 8.5% for bottom 90%
Figure 23. Wealth concentration: France vs. US 1900-2012 (wealth shares, %)

- Top 10% (US)
- Top 10% (France)
- Top 1% (US)
- Top 1% (France)