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**Inherited vs Self-Made Wealth:
Theory and Evidence from a Rentier Society
(Paris 1872-1937)**

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Gilles Postel-Vinay
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Inherited vs Self-Made Wealth: Theory & Evidence from a Rentier Society (Paris 1872-1937)

Thomas Piketty, Gilles Postel-Vinay & Jean-Laurent Rosenthal*

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Abstract: This paper divides the population into two groups: the “inheritors” or “rentiers” (whose wealth is smaller than the capitalized value of their inherited wealth, i.e. who consumed more than their labor income during their lifetime); and the “savers” or “self-made men” (whose wealth is larger than the capitalized value of their inherited wealth, i.e. who consumed less than their labor income). Applying this simple theoretical model to a unique micro data set on inheritance and matrimonial property regimes, we find that Paris in 1872-1937 looks like a prototype “rentier society”. Rentiers made about 10% of the population of Parisians but owned 70% of aggregate wealth. Rentier societies thrive when the rate of return on private wealth r is permanently and substantially larger than the growth rate g (say, $r=4\%-5\%$ vs $g=1\%-2\%$). This was the case in the 19th century and early 20th century and is likely to happen again in the 21st century. In such cases top successors, by consuming part of the return to their inherited wealth, can sustain living standards far beyond what labor income alone would permit.

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1. Introduction

The relative importance of inherited and self-made wealth is arguably one of the most controversial issues in political debates and in the social sciences. Of course, most countries like to view themselves as fundamentally meritocratic. That is, as societies where the path to material well being and wealth involves hard work and wise savings decisions – rather than inheritance or luck. France is no exception. Ever since the Revolution of 1789, the French see themselves as citizens of a country where the principles of individual merit, personal accountability, and freedom have triumphed over the principle of lineage. Equally strong beliefs exist in many parts of the world, most notably in the United States. Truthfully, however, these are mostly self-serving political statements rather than facts – in France, in the United States, and elsewhere. In terms of scientific research, we actually know very little about the relative importance of inherited wealth and self-made wealth, and their variation across time and space.

This paper makes two contributions to this debate. First, we propose a new theoretical definition of the share of inherited wealth in aggregate wealth. We take a population at a given point in time and split it into two groups: first, “inheritors” (or “rentiers”). Their assets are worth less than the capitalized value of the wealth they inherited (over time they consume more than their labor income). The second group is composed of “savers” (or “self-made individuals”). Their assets are worth more than the capitalized value of the wealth they inherited (they consume less than their labor income). We define inherited wealth as the sum of inheritors’ wealth plus the inherited fraction of savers’ wealth, and self-made wealth as the non-inherited fraction of savers’ wealth. By construction, inherited and self-made wealth sum to aggregate wealth. Although the definition is fairly straightforward, it differs considerably from the standard ones based upon representative agent models. We argue that our definition is conceptually more consistent, and provides a more meaningful way to look at the data and to analyze the structure of wealth accumulation processes.

Next, in order to illustrate this point, we apply our theoretical definitions to an extraordinarily rich micro level data set, which we collected using individual estate tax records in Paris between 1872 and 1937. We find that inheritors made up about 10% of Parisians and owned about 70% of the wealth. The total fraction of inherited wealth was as large as 80%. Most importantly, rentiers’ share of population and

wealth rises dramatically with wealth levels. Inheritors made only 25% of the middle class (wealth fractile P50-90), but about 50% of the “middle rich” (P90-99), and over 70% of the “very rich” (P99-100). This does not mean that there were no savers. In the very top the wealth hierarchy, we always find about 25% of self-made individuals, i.e. persons who had started off in life with limited inherited wealth and made their way to the top. But they were a minority.

We argue that Paris between 1872 and 1937 was the quintessence of what one might indeed call a “rentier society”. That is, a society where top successors could sustain living standards far beyond what labor income and individual merit alone would have permitted. They did so by drawing heavily on the return to their inherited wealth. In sum, Paris at that time looked more like a “land of rentiers” than a “land of opportunities”. We document a gradual weakening of the rentier society during the interwar period, but this is due to a series of exogenous shocks incurred by wealth holders from World War 1 onwards – and certainly not to a natural, spontaneous economic process.

What do we learn from these findings? Do rentier societies belong to the past, or are today’s developed societies not that different, and why? Unfortunately, we do not know of any sufficiently rich data set for the contemporary period (neither for France nor for any country we know) that to undertake the same rigorous computations as we perform for Paris 1872-1937. To our knowledge, the simple decomposition between inheritors and savers has never been estimated for any population prior to the present paper. However, exploratory computations suggest that while today’s rentiers shares in population and wealth are probably lower than in Paris 1872-1937, they might not that much lower.

First, when studying wealth and inheritance, one must bear in mind that the historical decline of wealth concentration in developed societies has been quantitatively less important than some observers tend to imagine. Compare the wealth distributions prevailing in France around 1910 and in today’s France and United States (see Table 1).¹ France around 1910 was clearly a very unequal place. The top 10% of the

¹ The French 1910 data comes from published reports of estate tax filings. The U.S. 2010 data simply comes from the latest wealth survey (Survey of consumer finances), with no adjustment whatsoever (Kennickell 2009, 2011). In particular, the SCF probably understates top wealth shares, and we did not try to correct for this.. The top shares reported for France 2010 use estate and wealth tax data to upgrade INSEE wealth survey estimates, but might also be understated. The French 1910 data is probably the closest to the true distribution prevailing then. The data are derived from estate tax filings at a time when tax rates were extremely low and heirs had strong incentives to report the entirety of

population, which one might call the “upper class”, owned over 85% of aggregate wealth (with 50%-55% for the top 1%, and 30%-35% for the next 9%). In Paris, as we will see below, wealth concentration was even more extreme. In our data base, we find that the top 10% wealth share was over 95% in Paris in 1912, and the top 1% share around 60%-65%. The wealth shares of the bottom 50% (the “poor”) and the middle 40% (the “middle class”) were close to 0%. Basically there was no middle class.²

Now, if one compares with the level of wealth concentration observed in today’s France or United States, one can see that the main transformation of the past century is the development of a middle class. Yet one should not overstate the quantitative importance of these historical changes. Even today, the middle class wealth share in the United States is only 26%; the upper class wealth share is 72%. This is less than the 87% observed in France 1910. But this is not that much lower.

Another reason we feel that the study of rentier societies of the past is relevant the present and the future is the high quality of the data and the permanence of the processes that lead to wealth accumulation. While the economy of Paris between 1872 and 1937 is unique and radically different in several ways from contemporary economies, the key mechanisms are the same today. In particular, wealth accumulation is associated with significant inequality and it involves very different groups of agents and wealth trajectories. Such a process simply cannot be properly understood and analyzed within representative agent frameworks. Also, Paris around 1872-1937 was a place with highly developed capital markets and very diversified and international financial portfolios (as we shall see below), which in many important ways resembles today’s world.

Finally, the issue of inherited wealth should rank highly on the research agenda because the relative importance of inherited wealth is growing. In the coming decades, it is likely to become as large as it was in Paris between 1872 and 1937. In

decendent’s estate. In order to make the figures more concrete, we report on Table 1 both the wealth shares and the corresponding average wealth levels, assuming that per adult average wealth is equal to 200,000€ both in France 1910 and 2010 and U.S. 2010 (this is roughly the French 2010 average).

² It is worth noting that most French economists of the time described France as a place with a relatively egalitarian wealth distribution (thanks to the 1789 Revolution, and as opposed to aristocratic Britain), and concluded from this “fact” that the introduction of progressive estate taxation was unnecessary in France (but might well be justified in Britain). See e.g. Leroy-Beaulieu (1881). Modern evidence suggests that wealth concentration at that time was actually almost as large in republican France as in aristocratic Britain. This illustrates the importance of chauvinist bias in this area.(!

any case, it will be much bigger than the unusually low levels observed in the 1950s-1970s period (a period which has had a deep – and arguably excessive – impact on modern economic thinking on wealth accumulation, with a great deal of faith in the lifecycle story). As one of us has recently shown for the case of France, the aggregate inheritance flow has gone through a very marked U-shaped evolution over the past century (see Figure 1, which we extract from Piketty (2010)). This aggregate evolution can be partly accounted for by the aggregate evolution of the private wealth-income ratio (which fell to unusually low levels in the 1950s, due to war destructions and – most importantly – to the low real estate and stock prices prevailing in the post war period). But this U-shaped pattern is also the consequence of the long time it took to restore their pre WWI steep slopes to age-wealth profiles.

The key economic mechanism behind aggregate inheritance's eventual return to its former high levels follows directly from a simple " $r > g$ " logic. That is, when the rate of return on private wealth r is permanently and substantially larger than the growth rate g (say, $r=4\%-5\%$ vs. $g=1\%-2\%$), which was the case in the 19th century and early 20th century and is likely to happen again in the 21st century, then past wealth and inheritance are bound to play a key role for aggregate wealth accumulation. As we shall see in the present paper, this " $r > g$ " logic matters both at the aggregate level and for the micro structure of lifetime inequality and the emergence and sustainability of rentier societies.

This research is related to several literatures. First, it continues the line of work begun in Piketty, Postel-Vinay and Rosenthal (2006). In this paper, we concentrated upon the long run evolution of cross-sectional wealth concentration in France. The novelty of the present paper is that by making use of details of the matrimonial property regime we can relate decedents' wealth to the bequests and gifts they had received during their entire lifetime. On a second level it seeks to move the literature on long run trends in income and wealth inequality pioneered by Kuznets (1953), and recently revived by Atkinson and Piketty (2007, 2010) and Atkinson, Piketty and Saez (2011), away from its heavy reliance on published aggregate data towards more micro based research. While the published aggregate data have allowed scholars to describe the evolution of income or wealth inequality in more than two dozen countries, they have serious limits in terms of explaining the evolution of wealth and its distribution. As we shall see, France and Paris in particular are data rich environments which are quite conducive to making the transition to micro data.

More directly, our methodological innovation and our estimates relate to the literature on intergenerational transfers and wealth accumulation as well as to debates over the extent of life cycle versus dynastic savings in aggregate wealth. As we discuss more extensively in section 2, we were largely inspired by the debate between Kotlikoff and Summers (1981, 1988) on one side and Modigliani (1986, 1988) on the other over the share of inherited wealth in total wealth.

Finally, our work is also related to the recent literature attempting to introduce wealth heterogeneity into calibrated general equilibrium macro models (see Cagetti and De Nardi (2008) for a recent survey). One limitation of this literature is that inheritance parameters tend to be imprecisely calibrated (and are generally underestimated; see Piketty (2010)). Here we develop a particular way to introduce heterogeneity (inheritors vs savers), which we hope might be useful for macro modeling and the welfare analysis of various macro policies.

The rest of the paper is organized as follows. In section 2, we present our theoretical framework and introduce our novel, non-representative-agent definition of the share of inherited wealth in aggregate wealth accumulation. In section 3, we describe our micro data set, with particular emphasis on the matrimonial property dimension of the data, which will allow us to apply our new theoretical definitions. In section 4, we present our empirical results. In section 5, we offer brief concluding comments. A detailed data appendix is available on-line.

2. A simple model of “inheritors” vs “savers”

2.1. Basic notations and definitions

Consider a population of size N_t , with aggregate private wealth W_t and national income $Y_t = Y_{L,t} + r_t W_t$, where $Y_{L,t}$ is aggregate labor income, and r_t is the average rate of return on private wealth. We note $w_t = W_t/N_t$ per capita wealth, $y_{L,t} = Y_{L,t}/N_t$ per capita labor income, $y_t = Y_t/N_t = y_{L,t} + r_t w_t$ per capita national income.

Consider a given individual i with wealth w_{ti} at time t . Assume he or she received bequest b_{ti}^0 at time $t_i < t$. Note $b_{ti}^* = b_{ti}^0 e^{r(t_i,t)}$ the capitalized value of b_{ti}^0 at time t (where $r(t_i,t)$ is the cumulated rate of return between time t_i and time t).

Definitions.

	Inheritors (rentiers)	Savers (self-made men)
Number	$N_t^r = \{i \text{ s.t. } w_{ti} < b_{ti}^*\}$	$N_t^s = \{i \text{ s.t. } w_{ti} \geq b_{ti}^*\}$.
Share in population	$\rho_t = N_t^r / N_t$	$1 - \rho_t = N_t^s / N_t$
Average wealth	$w_{tr} = E(w_{ti} \mid w_{ti} < b_{ti}^*)$	$w_{ts} = E(w_{ti} \mid w_{ti} \geq b_{ti}^*)$
Average capitalized bequest	$b_{tr}^* = E(b_{ti}^* \mid w_{ti} < b_{ti}^*)$	$b_{ts}^* = E(b_{ti}^* \mid w_{ti} \geq b_{ti}^*)$
Share in aggregate wealth	$\pi_t = \rho_t w_{tr} / w_t$	$1 - \pi_t = (1 - \rho_t) w_{ts} / w_t$

φ_t and $1 - \varphi_t$ the shares of inherited wealth and self-made wealth in aggregate wealth:

$$\varphi_t = [\rho_t w_{tr} + (1 - \rho_t) b_{ts}^*] / w_t = \pi_t + (1 - \rho_t) b_{ts}^* / w_t \quad (2.1)$$

$$1 - \varphi_t = (1 - \rho_t)(w_{ts} - b_{ts}^*) / w_t = 1 - \pi_t - (1 - \rho_t) b_{ts}^* / w_t \quad (2.2)$$

It is worth stressing that the joint distribution $G_t(w_{ti}, b_{ti}^*)$ of current wealth w_{ti} and capitalized bequest b_{ti}^* is all we need in order to compute ρ_t , π_t and φ_t . This does require high-quality, individual-level data on wealth and inheritance. But the important point is that we do not need to know anything about individual labor income and/or consumption paths (y_{Lti} , c_{ti} , $t' < t$) followed by individual i up to the time of observation. Of course more data are better. If we also have (or estimate) labor income and/or consumption paths, then one can compute lifetime individual savings rate s_{Bti} , i.e. the share of lifetime resources that was not consumed up to time t :

$$s_{Bti} = w_{ti} / (b_{ti}^* + y_{Lti}^*) = 1 - c_{ti}^* / (b_{ti}^* + y_{Lti}^*) \quad (2.3)$$

With: $y_{Lti}^* = \int_{t' < t} y_{Lti} e^{r(t', t)} dt'$ = capitalized value at time t of past labor income flows
 $c_{ti}^* = \int_{t' < t} c_{ti} e^{r(t', t)} dt'$ = capitalized value at time t of past consumption flows

By definition, inheritors are individuals who consumed more than their labor income (i.e. $w_{ti} < b_{ti}^* \leftrightarrow c_{ti}^* > y_{Lti}^*$), while savers are individuals who consumed less than their labor income (i.e. $w_{ti} \geq b_{ti}^* \leftrightarrow c_{ti}^* \leq y_{Lti}^*$). But the point is that we only need to observe an individual's wealth (w_{ti}) and capitalized inheritance (b_{ti}^*) in order to determine whether he or she i is an inheritor or a saver.

In this paper, we want to estimate ρ_t , π_t and φ_t at the aggregate level. We also want to track how $\rho_t(w)$, $\pi_t(w)$ and $\varphi_t(w)$ vary with the wealth level w . In other words we would like to know what is the fraction of inheritors $\rho_t(w)$ within the top 10% or top 1%

of the wealth distribution, and what wealth share $\pi_t(w)$ do they own within top wealth fractiles?

Note also one can define ρ_t , π_t and φ_t either for the entire living population or for the subpopulation of decedents (i.e. for the subset of individuals i who die at time t). We provide both computations (as well as the full age profiles $\rho_t(a)$, $\pi_t(a)$ and $\varphi_t(a)$), but because our data come from estates, we tend to be more interested in the values taken by ρ_t , π_t and φ_t among decedents. The idea of lifetime balance sheets (how much one received in lifetime resources, vs how much one consumed) makes most sense at the time of death.

2.2. A simple numerical illustration

Example 1. At age $a=60$, Mr Martin owns a Paris apartment worth 500,000€ (net of outstanding mortgage liabilities), 100,000€ in equities, another 300,000€ in mutual funds. At age $l=30$, he inherited 400,000€ in life insurance assets from his parents, which he does not own any more. So $w_{ti}=900,000€$ and $b_{ti}^0=400,000€$. With a constant rate of return $r_t=r$, capitalized bequest b_{ti}^* is given by:

$$b_{ti}^* = e^{r(a-l)} b_i \quad (2.4)$$

With $l=30$, $a=60$ and $r=4\%$, then $e^{r(a-l)}=332\%$ and $b_{ti}^*=1,328,000€ = 400,000€$ (capital value) + 928,000€ (cumulated return). That is, $b_{ti}^* > w_{ti}$, i.e. according to our definitions Mr Martin is an “inheritor” (or a “rentier”). We do not really care about how exactly Mr Martin organized his life and his finances, or how he used his 400,000€ inheritance. Maybe he invested this sum in mutual funds, from which he received a cumulated income equal to 928,000€. He then used part of this to purchase his Paris apartment, and consumed the 428,000€ more (928,000€ - 500,000€) that remained. He could have used the 400,000€ capital to purchase his Paris apartment with a small mortgage of 100,000€, and saved on rents. The details of his decisions are wholly irrelevant from a welfare perspective. Whatever his consumption and investment choices were, he acquired assets while at the same time consuming more than his labor income. Of course, the rate of return on assets plays a key role in these computations. With $r=3\%$, $e^{r(a-l)}=246\%$ and $b_{ti}^*=984,000€$. With $r=5\%$, then $e^{r(a-l)}=448\%$ and $b_{ti}^*=1,792,000€$. We return to this in the empirical section.

Example 2. At age $a=60$, Mr Smith owns a small house worth 60,000€ (net of outstanding mortgage liabilities), and 20,000€ in various savings accounts. He inherited 10,000€ from his parents at age $l=30$, which he spent when he contracted a loan to purchase his house. So $w_{ti}=80,000€$ and $b_i=10,000€$. With $r=4\%$, $e^{r(a-l)}=332\%$ and $b_{ti}^*=33,000€$. So we have $b_{ti}^* < w_{ti}$. Mr Smith is a “saver”; over his lifetime he consumed less than his labor income.³

Now consider a hypothetical economy where one fifth (ρ_t) of the population are inheritors like Mr Martin ($w_{tr}=900,000€$, $b_{tr}^*=1,328,000€$) and four fifths ($1-\rho_t$) are savers like Mr Smith ($w_{ts}=80,000€$, $b_{ts}^*=33,000€$). Average wealth $w_t=\rho_t w_{tr}+(1-\rho_t)w_{ts}=244,000€$, while average capitalized bequest $b_t^*=\rho_t b_{tr}^*+(1-\rho_t)b_{ts}^*=292,000€$. The inheritors' share of aggregate wealth π_t is $\rho_t w_{tr}/w_t = 74\%$, and the total share of inherited wealth in aggregate wealth is $\varphi_t=\pi_t+(1-\rho_t)b_{ts}^*/w_t = 85\%$.

These numbers were chosen for illustration, but they are not too different from the actual numbers currently prevailing for the top 20% and the bottom 80% of the wealth distribution (each taken as a homogenous group) in countries like France or the United States.⁴

2.3. Differences with the Kotlikoff-Summers-Modigliani definitions

The key difference between our definition of the inheritance share in aggregate wealth accumulation and the Kotlikoff-Summers or Modigliani standard definitions is that we explicitly distinguish between two subgroups in the population, while the KSM definitions are based upon a representative agent model. Modigliani (1986, 1988) defined the inheritance share as the share of aggregate non-capitalized bequests in aggregate wealth:

$$\varphi_t^M = B_t^0/W_t = b_t^0/w_t \quad (2.5)$$

³ Here we implicitly assume that the rate of return r_t is the same for all assets and all individuals (and is the same as the borrowing rate). In practice rates of return r_{it} vary enormously across assets and individuals. To the extent that on average $r_t(w)$ tends to rise with wealth w (e.g. because of fixed costs in financial advice, or because large portfolios are more often invested in high risk assets, which is typically what we find in our data), and that the borrowing rate is higher than the lending rate, this would most certainly tend to amplify the inequality in lifetime resources between inheritors and savers. When we apply our definitions to our micro data set, we use individualized rates of returns varying with observed micro level portfolio composition (see section 5 below).

⁴ In the U.S., wealth concentration is actually somewhat larger: the top 10% share alone is equal to 72% (see Table 1 above). On the other hand some top decile individuals are savers, not inheritors.

With: B_t^0 = non-capitalized value of past bequests (i.e. all bequests received at any time $t' < t$ by individuals still alive at time t)

$b_t^0 = B_t^0/N_t$ = per capita non-capitalized value at time t of past bequests

Kotlikoff and Summers (1981, 1988) defined the inheritance share as the share of aggregate capitalized bequests in aggregate wealth:

$$\varphi_t^{KS} = B_t^*/W_t = b_t^*/w_t \quad (2.6)$$

With: B_t^* = capitalized value at time t of past bequests (i.e. all bequests received at any time $t' < t$ by individuals still alive at time t)

$b_t^* = B_t^*/N_t$ = per capita capitalized value at time t of past bequests

By construction, as long as assets generate positive returns ($r > 0$): $\varphi_t^M < \varphi_t^{KS}$.

Take for instance the illustrative economy described above. Applying Modigliani's definition, we find $\varphi_t^M = b_t^0/w_t = 36\%$.⁵ Applying Kotlikoff-Summers' definition, we find $\varphi_t^{KS} = b_t^*/w_t = 120\%$.⁶ With our own definition we found $\varphi_t = 85\%$ (see above).

For plausible joint distributions $G_t(w_{ti}, b_{ti}^*)$, our inheritance share φ_t will typically fall somewhere in the interval $[\varphi_t^M, \varphi_t^{KS}]$. Note, however, that there is no theoretical reason why it should be so in general. Imagine for instance an economy where inheritors consume their bequests the very day they receive it, and never save afterwards, so that wealth accumulation entirely comes from the savers, who never received any bequest (or negligible amounts), and who patiently accumulate savings from their labor income. Then with our definition $\varphi_t = 0\%$: in this economy, 100% of wealth accumulation comes from savings, and nothing at all comes from inheritance. However with the Modigliani and Kotlikoff-Summers definitions, the inheritance shares φ_t^M and φ_t^{KS} could be arbitrarily large.

More generally, the problem with the KSM representative-agent approach is that it fails to recognize that the wealth accumulation process always involves very different kind of people and wealth trajectories. In every economy, there are inheritors (people who typically consume part the return to their inherited wealth), and there are savers (people who do not inherit much but do accumulate wealth through labor income

⁵ $b_t^0 = \rho_t b_{tr}^0 + (1 - \rho_t) b_{ts}^0 = 88,000\text{€}$, and $88,000/244,000 = 36\%$.

⁶ $b_t^* = \rho_t b_{tr}^* + (1 - \rho_t) b_{ts}^* = 292,000\text{€}$, and $292,000/244,000 = 120\%$.

savings). This is an important feature of the real world that must be taken into account for a proper understanding of the aggregate wealth accumulation process.

The Modigliani definition is particularly problematic, since it simply fails to recognize that inherited wealth produces flow returns. This mechanically leads to artificially low numbers for the inheritance share φ_t^M (as low as 20%-40%), and to artificially high numbers for the life-cycle share in wealth accumulation, which Modigliani simply defined as $1-\varphi_t^M$ (up to 60%-80%).⁷ As Blinder (1988) argued: “a Rockefeller with zero lifetime labor income and consuming only part of his inherited wealth income would appear to be a life-cycle saver in Modigliani’s definition, which seems weird to me.” In the illustrative example described above, even if everybody in the economy was like Mr Martin (i.e. if all wealth comes from inheritance, so that $\varphi_t=100\%$ with our definition), then Modigliani would still find an inheritance share φ_t^M of only 44%, and would attribute 56% of aggregate wealth accumulation to life-cycle motives.⁸ This really makes little sense.

The Kotlikoff-Summers definition is conceptually more satisfactory than Modigliani’s. But it suffers from the opposite drawback, in the sense that it mechanically leads to artificially high numbers for the inheritance share φ_t^{KS} . As the above example illustrates, φ_t^{KS} can easily be larger than 100%, even though there are savers in the economy, and a significant fraction of aggregate wealth accumulation comes from them. This will arise whenever the cumulated return to inherited wealth consumed by inheritors exceeds the savers’ wealth accumulation from their labor savings. In the real world, this condition seems to hold not only in prototype rentier societies such as Paris 1872-1937, but also in countries and time periods when aggregate inheritance flow are relatively low. For instance, aggregate French series show that the capitalized bequest share φ_t^{KS} has been larger than 100% throughout the 20th century, including in the 1950s-1970s.⁹ We return to this issue when we present our micro based estimates for Paris 1872-1937.

⁷ In effect, Modigliani defined savings as labor income plus capital income minus consumption (and then defines life cycle wealth as the cumulated value of past savings), while Kotlikoff-Summers defined savings as labor income minus consumption. Given that the capital share is typically larger than the savings rate, this of course makes a big difference. See Piketty (2010).

⁸ $400,000\text{€}/900,000\text{€} = 44\%$.

⁹ See Piketty (2010). In their original paper, Kotlikoff and Summers found an inheritance share of “only” 80% for the U.S. (i.e. somewhat less than 100%), which was already quite large, given that Modigliani was claiming that the right number was 20%, in spite of the fact that both were using the same data. Both sides relied on US data of the 1960s-1970s, when aggregate inheritance flows were unusually low. Neither took proper account of inter vivos gifts, which are hard to measure in the U.S. given the imperfections of U.S. estate tax data while both deducted the share going to surviving

Of course, the downside with our definition is that it is more demanding in terms of data availability. While Modigliani and Kotlikoff-Summers could compute inheritance shares in aggregate wealth by using solely aggregate data, we definitely need micro data. Namely, we need data on the joint distribution distributions $G_t(w_{ti}, b_{ti}^*)$ of current wealth and capitalized inherited wealth.

2.4. Husbands and wives

Strictly speaking, our individual-based definitions of inheritors and savers only apply to a world of single individuals, or to a world where all married couples adopt a matrimonial regime with complete separation of property and income. However, in France, and in many countries, people most often marry under a “community of acquisitions” regime, whereby each spouse remains the sole owner of his or her inherited assets (so-called “separate assets”), but the returns to these assets automatically accrue to the community, and can be used to accumulate “community assets”, along with other income flows. That is, the total wealth w_{tij} of a married couple ij can generally be broken down into three parts:¹⁰

$$w_{tij} = w_{tij}^c + b_{ti}^0 + b_{tj}^0 \quad (2.7)$$

Where:

w_{tij}^c = community wealth of married couple ij

b_{ti}^0 = non-capitalized value of past bequests received by husband i

b_{tj}^0 = non-capitalized value of past bequests received by wife j

One possibility would be to define inheritors and savers at the household level rather than at the individual level. According to the household-level definition, both spouses i and j in a married couple are said to be “inheritor” if the following holds:

$$w_{tij} < b_{ti}^* + b_{tj}^* \quad (2.8)$$

With: b_{ti}^* = capitalized value of past bequests received by the husband i

spouses (typically 10%-15%) from the aggregate inheritance flow which we do not feel is justified, especially in a world with frequent divorce and remarriage.

¹⁰ Here we ignore a number of legal and empirical complications, in particular due to asset portfolio reallocations during marriage and reimbursements between spouses, and due to inter vivos gifts and dowries. In section 3 we provide more details on the French matrimonial property regime and the way we use the data that goes with it in order to compute w_{ti} and b_{ti}^* .

b_{tj}^* = capitalized value of past bequests received by the wife j

One can then define household-level inheritor shares ρ_t^H , π_t^H and φ_t^H . Unfortunately, because we generally do not observe b_{ti}^* and b_{tj}^* for both spouses i and j at the same time, we cannot rely on these household-level definitions. So we will focus upon individual-level definitions of inheritor shares ρ_t , π_t and φ_t . That is, if a given individual i belongs to a married couple ij, then we say that individual i is an inheritor when the following condition holds:

$$w_{ti} = w_{tij}^C/2 + b_{ti}^0 < b_{ti}^* \quad (2.9)$$

In case of perfect positive assortative mating ($b_{ti}^* = b_{tj}^*$), then the household and individual definitions coincide: $\rho_t = \rho_t^H$, $\pi_t = \pi_t^H$ and $\varphi_t = \varphi_t^H$. In this case a married couple ij qualifies as “inheritor” according to the household definition if and only if each spouse i and j individually qualifies as an “inheritor.” With less than perfect positive assortative mating, one can easily construct cases where $\rho_t < \rho_t^H$, and cases where $\rho_t > \rho_t^H$. E.g. a penniless man i ($b_{ti}^* = 0$) married to a wealthy woman j ($b_{tj}^* > 0$) might appear as a self-made man according to the individual definition (equation (3.8)), although the married couple as a whole qualifies as rentier according to the household definition (equation (3.9)). Such cases tend to push ρ_t below ρ_t^H . I.e. the individual level definition tends to underestimate the fraction of rentiers in the population. But there can also be cases where the married couple as a whole does not qualify as rentier, but where one member does, thereby pushing ρ_t above ρ_t^H . We return to this issue when we present our results.

3. Inheritance data and matrimonial property regimes in France

To estimate the joint distribution $G_t(w_{ti}, b_{ti}^*)$ of wealth and capitalized bequest, we take advantage of the exceptional quality of French estate tax data. We use a new micro level inheritance data base which we collected from individual estate tax records in Paris between 1872 and 1937.

3.1. Estate tax data in France

French estate tax data are both abundant and detailed, for one simple reason. As early as 1791, shortly after the abolition of the tax privileges of the aristocracy, the French National Assembly introduced a universal estate tax, which has remained in

force since then.¹¹ The estate tax was universal: it applied both to bequests and to inter-vivos gifts, at any level of wealth, and for nearly all types of property (both real estate and financial assets). The key characteristic of the tax is that the beneficiaries of bequests and inter vivos gifts were required to file a return, no matter the size of the estate or gift. For most of the 19th century and early 20th century, the tax brought an important benefit that offset its minimal cost: filling a return was an easy way to register changes in title to property. There is ample evidence that beneficiaries followed the law. Indeed, the tax rates were relatively small until the interwar period, so there was really very little incentive to cheat.

The other good news for scholars is that the tax authorities transcribed (or bound) individual returns in registers that have been preserved since the early 19th century. In particular, the archives of Paris have all the returns for individuals who died there from 1800 to the 1950s. In our previous work, we collected returns for the whole population of decedents in Paris for a large number of years between 1807 and 1902, which we linked to national samples and to tabulations by estate and age brackets compiled by the tax administration after 1902. Our primary objective was to construct cross-sectional estimates of wealth concentration in Paris and France from 1807 until the present day. So we mostly collected data on the cross-sectional distribution of wealth w_{ti} among year t decedents (which we then converted into cross-sectional distribution of wealth among year t living individuals, using standard differential mortality techniques and assumptions).¹²

We later realized that the estate tax returns contain a great deal of information on the wealth trajectory of decedents, and not only on wealth at death. In particular, they allow us to estimate the full joint distribution $G_t(w_{ti}, b_{ti}^*)$ among married decedents, rather than just the cross section distribution $G_t(w_{ti})$. That is, for the subset of married decedents, one can observe in individual tax returns not only the current wealth w_{ti} left by all individuals i who died in year t , but also the value of past bequests b_{ti}^0 which these individuals received over their lifetime (from which one can compute capitalized bequest b_{ti}^*). In effect, it is as if we were observing wealth across two

¹¹ The French Revolution may not have created a perfect meritocracy; but at least it created a data source to study wealth and inheritance. The United Kingdom did not see a universal estate tax before 1894, and the United States waited until 1916. Even after these dates, only a small minority of the population was required to fill estate tax returns in these two countries, so the data is much less rich. On U.K. and U.S. estate tax data, see the classic historical studies of Atkinson and Harrison (1978) and Lampman (1962). For early comparisons between French and U.K. data, see Seailles (1910) and Strutt (1910). For more references, see Piketty, Postel-Vinay and Rosenthal (2006) and Piketty (2010).

¹² See Piketty, Postel-Vinay and Rosenthal (2006).

generations, except that we do not need to match estate tax returns across two generations (which is very costly to do with large populations, and generally results often suffer from severe sample attrition problems). This retrospective wealth data is available in the estate tax returns of married decedents is simply because the tax administration needed this information in order to make sure the Civil Code rules we followed when the estate was divided among the surviving spouse, children and other heirs. We therefore returned to the archives and collected new data in the Paris tax registers for years 1872, 1882, 1912, 1922, 1927, 1932, 1937. As before, we collected aggregate information for every decedent in Paris who left an estate in each of the sample years. Thus, we do not need to estimate the distribution of wealth; we measure it directly. For a stratified subsample (approximately 100% of the wealthiest 2%, 50% of the next 4%, 25% of the next 10%, and 25% for the rest of the population), we collected detailed data on the decedent assets, and his or her marital status. The existence of both community and personal property led us to pay close attention to the matrimonial structure of property among married decedents. In order to better explain the richness (and limitations) of the data source, it is useful to give more information about matrimonial property regimes and estate division rules in France.

3.2. Community assets vs separate assets

Since the promulgation of the Civil Code in 1804, the default matrimonial property regime in France has been “community of acquisitions.” That is, when the first spouse dies, the net wealth (assets minus liabilities) w_{tij} owned by a married couple ij is broken down into three parts:

$$w_{tij} = a_{tij}^c + a_{ti}^s + a_{tj}^s \quad (3.1)$$

With:

a_{tij}^c = community assets (“biens de communauté”)

a_{ti}^s = husband’s separate assets (“biens propres du mari”)

a_{tj}^s = wife’s separate assets (“biens propres de la femme”)

By law, community property a_{tij}^c includes all assets acquired after marriage (minus all outstanding liabilities contracted during its span), while separate property a_{ti}^s and a_{tj}^s includes all assets (net of asset-specific liabilities such as business debts) which the husband i or the wife j received as bequests or inter vivos gifts (both before and while

married),¹³ and which they still own in year t . The general rule is that community assets a_{tij}^c belong equally to the husband and the wife (on a 50%-50% basis, irrespective of whose income was used to acquire the assets), while the husband has sole ownership of his separate assets a_{ti}^s and similarly for the wife (a_{tj}^s)

The tax returns provide us with both total values (a_{tij}^c , a_{ti}^s and a_{tj}^s) for these three groups of assets, but also the detailed asset portfolio composition behind each total: real estate, equity, bonds, cash, movables, etc.¹⁴ Note that the asset values reported in tax registers are estimated at the asset market prices prevailing on the day of death (irrespective of when the asset was acquired or transmitted).

In the life of a married couple, it often happens that some assets which the husband and/or the wife received via bequests and inter vivos gifts are sold during the marriage (e.g. in order to acquire community assets, or to raise community consumption). The parents of bride and groom also often give sums of money at the time of marriage (dowry), which the married couple then uses to purchase real estate or financial assets.

The Civil Code requires that asset portfolio reallocations be tracked carefully. Indeed, under the “community of acquisitions” regime whatever is contributed by parents (or any other donor) to a given spouse belongs solely to him or her, irrespective of how the money was used by the married couple. In order to make the necessary adjustments to estate division, the Civil Code specifies that: “Shall be established in the name of each spouse an account of the reimbursement which the community owes to him or her and of the reimbursement which he or she owes to the community” (Article 1468). These accounts also include any cash that one of the spouses brought to the community at marriage or inherited.

The returns thus report both the lists of community and separate assets a_{tij}^c , a_{ti}^s and a_{tj}^s which are currently owned by the married couple and by each spouse separately,

¹³ Strictly speaking, separate property assets also include assets that were acquired (rather than inherited) by the husband or the wife prior to the marriage. Within the set of assets owned before marriage, we can't distinguish between acquired and inherited assets. However because most people married at a relatively early age and rarely divorced at that time, the non-inherited fraction of separate property assets is bound to be very small. In order to test for this assumption, we re-did the computations with the sub-samples of decedents who married early and late (we observe the date of marriage in the tax registers), and found no significant difference in the results.

¹⁴ In the registers, we actually observe the address for each piece of real estate property, the company name and corresponding stake for each equity or bond asset, etc. We reclassified these assets into broad categories. See section 5 below, and Appendix B for detailed results

and the lists of inherited assets a_{ti}^R and a_{tj}^R which were sold and contributed to the community during the marriage, and that must now be reimbursed to each spouse. The reported reimbursement values a_{ti}^R and a_{tj}^R are valued at nominal prices when these assets were sold, with no inflation adjustment.¹⁵ In effect, what moneys go into the community (either from the sale of separate property or from cash that belongs to one of the spouse) are treated as interest free loans. They are deducted from community assets and added to separate assets in order to compute the estate values e_{ti} and e_{tj} belonging to each spouse.¹⁶

$$e_{ti} = [a_{tij}^c - a_{ti}^R - a_{tj}^R]/2 + a_{ti}^S + a_{ti}^R \quad (3.2)$$

$$e_{tj} = [a_{tij}^c - a_{ti}^R - a_{tj}^R]/2 + a_{tj}^S + a_{tj}^R \quad (3.3)$$

By construction these corrections cancel each other and are irrelevant to total household wealth. I.e. $e_{ti} + e_{tj} = w_{tij} = a_{tij}^c + a_{ti}^S + a_{tj}^S$. But they can have a major impact on the shares of total wealth obtained by the surviving spouse, children and possibly other heirs. There is extensive evidence suggesting that reimbursement accounts have long been established very carefully by the agents of the heirs and closely monitored by the tax administration.

Take for instance the case where the husband dies first. The estate e_{ti} is then divided between the surviving spouse, the children (if any), and possibly other heirs, in case the husband made specific bequests in his will. The important practical point in most situations is that the surviving spouse usually gets a relatively small fraction of e_{ti} , while the children get the largest part, with equal division among them. However the surviving spouse (here the wife) remains the sole owner of $e_{tj}=w_{tij}-e_{ti}$, irrespective of the share she gets in e_{tj} . Should the wife die first, the same process applies in the

¹⁵ Prior to World War 1 this was almost irrelevant, since there was virtually no inflation. During and after WW1 this becomes a significant issue, and we will make the necessary adjustments (see below).

¹⁶ So as to simplify exposition, we actually note a_{ti}^R and a_{tj}^R the net reimbursement values owed by the community to each spouse, i.e. the net difference between reimbursement owed by the community and reimbursements owed to community. The latter are usually much smaller than the former, so net reimbursement values are generally positive. Reimbursements owed to the community correspond to situations when some community income or asset was used during the marriage in order to raise the value of a separate asset (say, to repair the roof of a countryside house, or to repay a business debt or invest in a business, in case these are separate assets). See Appendix B (Table B16) for full details. Note that reimbursements owed by the community used to be called "contributions" ("reprises en deniers", as opposed to the separate assets a_{ti} and a_{tj} used which were never sold, and which are sometime referred to as "reprises en nature"). Both types of reimbursements now tend to be called "reimbursements" ("recompenses"). The exact wording used by the Civil Code has changed slightly over time, but the concepts and rules have remained the same since 1804.

reverse order (these property sharing rules have always been gender-neutral, ever since the 1804 Civil Code).¹⁷

3.3. An illustrative example

Example. Mr and Mrs Martin are both aged 60-year-old, and married at age 20. At that time they owned nothing at all. Now they own a Paris apartment worth 500,000€ (net of outstanding mortgage liabilities), 100,000€ of equities, and 300,000€ in mutual funds. These assets were all purchased during their marriage. At age $I=30$, Mrs Martin inherited 400,000€ in life insurance assets from her parents, which she sold immediately. Mr Martin did not receive any inheritance from his parents. So we have $a_{tj}^c=900,000\text{€}$, $a_{ti}^S = a_{tj}^S = a_{ti}^R = 0\text{€}$, and $a_{tj}^R = 400,000\text{€}$.

In case Mr Martin dies first, then $e_{ti}=250,000\text{€}$ is divided between Mrs Martin, children and other heirs, and Mrs Martin remains the single owner of $e_{tj}=650,000\text{€}$. When she dies, her wealth (e_{tj} plus the fraction of e_{ti} she received at her husband's death plus any other asset she acquired or received in the meantime) will be divided between children and other heirs.

In case Mrs Martin dies first, then $e_{tj}=650,000\text{€}$ is divided between Mr Martin, children and other heirs, and Mr Martin remains the single owner of $e_{ti}=250,000\text{€}$. When he dies, his wealth (e_{ti} plus the fraction of e_{tj} he received at his wife's death plus any other wealth he acquired or received in the meantime) will be divided between children and other heirs.

As we can see, it is irrelevant from the Civil Code viewpoint whether the Martins purchased their Paris apartment by using the capital income derived from their assets (coming predominantly from Mrs Martin's inherited assets), or by using their labor income (maybe coming predominantly from Mr Martin). The only important point is that it was purchased during the marriage, i.e. using the income flows accruing to the Martin family, and as such the apartment falls automatically into

¹⁷ This is not saying that the Civil Code at large has always been gender neutral. For instance, during most of the 19th century, married wives had limited legal rights to sell and purchase community assets (or contract community debts) on their own, i.e. without the husband's signature. Under some marriage contracts, these limited control rights also applied to their separate property assets. Some asymmetries persisted well into the 20th century (e.g. married wives could not open bank accounts without the husband's signature until the 1970s). However the important point here is that in France these legal asymmetries between husbands and wives in control rights over assets during marriage did not entail asymmetries in formal property rights and sharing rules at the time of death or divorce.

community property and belongs equally to both spouses.¹⁸ As far as we understand, these basic rules apply not just in France, but also in many countries around the world where the “community of acquisitions” regime is the default matrimonial regime.¹⁹ In France, and in other countries as well, these default rules of property sharing apply not only to wealth sharing at death, but also to wealth sharing after a (no-fault, mutual-consent) divorce.

Whether this is a “good” or “fair” or “efficient” regime or not is an interesting issue, but it is not our concern in the present research. This regime is important for our purposes because it allows us to observe separately acquired assets and inherited assets. Note however that “community of acquisitions” is simply the default matrimonial property regime in France, i.e. what applies in the absence of a marriage contract. Married couples can also choose to write a marriage contract and organize their property relationship differently. Possible regimes range from complete “separation of property” (then there is no community property: all inherited and acquired assets are separate property assets and belong either entirely to the husband or entirely to the wife) to “universal community of property” (then there is no separate property, all assets fall automatically into community property, whether they were acquired during marriage or received through bequests or gifts). In both cases, we are unable to distinguish between inherited and acquired assets. Fortunately, these alternative arrangements are relatively rare in our data set. Most married couples did not sign marriage contracts, and when they do they usually adopt the “community of acquisitions” regime, with minor changes for specific assets. We find that in Paris from 1872 to 1937 period, the fraction of married decedents who were

¹⁸ The general principle behind this matrimonial regime is that the assets received by bequests or gifts always remain the separate property of the spouse who received them, but that the flow income of these assets, (e.g. rent, interest, dividends...) automatically becomes the property of the community. This rule actually applies to all income flows, either derived from assets or from labor or from any other source (lottery gains, social transfers, etc.). The only exception is capital gains (in effect, the French Civil Code does not treat capital gains as ordinary capital income and makes a sharp distinction between the first sale of inherited assets - in which case capital gains fall into separate property - and further portfolio reallocations - in which case capital gains fall into community property). This general rule logically implies that any asset acquired during the marriage automatically falls into community account, whether or not it was explicitly acquired by both spouses acting together or by one of them acting alone (this also applies to liabilities). By construction, the “community of acquisitions” is built upon the presumption that any new acquisition of assets must have been financed by the income flows accruing to the community, and therefore falls into community property.

¹⁹ See « World Map of Matrimonial Property Regimes », *Notarius International* 1-2 (2005). “Community of acquisitions” appears to be the most widespread regime (the main alternatives being “separation of property with distribution by the courts” – applied in most Anglo-Saxon countries – and “full separation of property” – applied in most Arabic countries).

married under the default regime was at least 85% and that this fraction was approximately the same over all wealth fractiles.²⁰

3.4. Using estate tax data in order to estimate $G_t(w_{ti}, b_{ti}^*)$

Although the data reported on tax registers are very rich, they are not sufficient for us to estimate the joint distribution $G_t(w_{ti}, b_{ti}^*)$ of current wealth and capitalized bequest among married decedents without further assumptions. First, we only observe the data relevant to establishing the estate of the deceased. So for instance in case the husband i dies first, then we observe all variables necessary to compute his estate $e_{ti} = [a_{tij}^c - a_{ti}^R - a_{tj}^R]/2 + a_{ti}^S + a_{ti}^R$. We observe the full list of community assets a_{tij}^c , husband's separate assets a_{ti}^S and community reimbursements owed to the husband and wife a_{ti}^R and a_{tj}^R . But we do not observe the wife's separate assets a_{tj}^S , since they play no role in her husband's estate. Of course these assets will be reported to the administration when the wife dies. While death is certain, hers will happen sometime later, perhaps not in Paris. Thus, collecting this additional information would be prohibitively expensive. Moreover, when the widow dies, she is no longer member of a partnership, and her share of the community has been merged with her separate assets. Legally her estate has the same structure as that of single and divorced decedents. All assets tend to be mixed up in estate tax returns, and the information becomes unusable.²¹ In short we can't observe the separate assets a_{ti}^S and a_{tj}^S of both spouses at the same time. So we define inheritors and savers at the individual rather than at the household level (see section 2 above).²²

²⁰ See Appendix B, Table B15. We do not observe full marriage contract details for all married decedents. However the marriage contract information that we collected in the tax registers for a subsample of decedents shows that "universal community" is almost never used, and that "separation of property" is the only significant alternative arrangement. Therefore we identify all married decedents with positive community assets as being married under the "community of acquisitions" regime, and we find that this fraction is approximately stable around 85%-90% for all years and all wealth fractiles, except at the level of the top 0,1%, where it goes down to about 50%-60%. In effect we are excluding married decedents who were married under the default regime but who did not accumulate any community asset. Also it is likely that married couples opting for the "separation of property" regime tend to have above average inherited assets (for given total assets). Therefore by focusing upon married decedents with positive community assets we are probably under-estimating somewhat the true inheritors shares in population and wealth (especially at the very top).

²¹ About 15% of widowed decedents have assets reported as community assets in their estate tax return (as compared to 85%-90% of married decedents). A small number of single and divorced decedents (less than 5%) also have assets reported as community assets. See Appendix B, Table B15. We did not attempt to use the community vs separate asset information available for non-married decedents.

²² The fact that we observe the wife's reimbursements a_{tj}^R at the husband's death does however give us some (imperfect but interesting) information about assortative mating. See section 5 below.

Next, we do not have systematic information about the dates at which inherited assets were received and sold. Consider a married individual i who died in year t . We know the value of community assets $a_{t_{ij}}^C$ and separate assets $a_{t_i}^S$ (both are measured by their market value in year t), and the value of inherited assets $a_{t_i}^R$ and $a_{t_j}^R$ that t were sold during the marriage (both are measured by their sales value at the time they were sold). But generally we do not know the exact date t_i at which inherited assets $a_{t_i}^S$ were received by individual i , and we do not know the exact date t_i^* at which inherited assets $a_{t_i}^R$ and $a_{t_j}^R$ were sold. We do observe for (almost) all married decedents their age at death D_{t_i} and their age at marriage M_{t_i} (e.g. in year $t=1912$ the average age at death is 57.2 and the average age at marriage is 29.1), but we have direct information on t_i and t_i^* only for a limited sub-sample.

We rely on external information and proceed as follows. For t_i^* , our data show that asset sales tended to take place at the beginning of marriage, with an approximately uniform distribution during the first 10 years of marriage; so we simply draw such a uniform distribution for t_i^* over the interval $[t_{M_i}; t_{M_i}+10]$ (where t_{M_i} is year of marriage). For t_i , since most inherited assets come from parents, we simply need to estimate the distribution of year-of-death gaps between decedents and their parents; we do have very reliable demographic data showing the average age at parenthood (which we note H) was extremely stable around 30 year-old (with a stable standard deviation around 5.5-6.5 years) during the 19th and 20th centuries,²³ so we simply draw a distribution for t_i centered around $t-30$.²⁴

In effect, we are assuming that the idiosyncratic variations in t_i^* and t_i are uncorrelated with individual wealth; given that these variations mostly come from demographic shocks, this is quite plausible. We tried several alternative assumptions about the distributions of t_i^* and t_i , and found that this had relatively little impact on our final results.²⁵

²³ See Piketty (2010, Appendix C, Table C15).

²⁴ If year- t decedents and their parents died at exactly the same age, then $t-t_i$ would be exactly equal to H_i (where H_i is the age of the decedent's parents when the decedent was born), i.e. it would be equal to a distribution centred around $H=30$ with standard deviation of about 5.5-6.5. However in general children and their parents do not die at the same age, which creates extra variations. In order to take this into account we assume that $t-t_i$ is uniformly distributed over $[H-10; H+10]$. For a more complete attempt to estimate the age distribution of inheritance receipts (taking explicitly into account the fact that about 70% of inheritance flows go to children, 10% go to surviving spouses, and 20% go to other heirs – mostly nieces/nephews and brothers/sisters), see Piketty (2010, Appendix C).

²⁵ See Appendix B, Tables B17-B18 for the detailed results obtained under our benchmark assumptions and under the assumption of fixed gaps $t_i^*-t_{M_i}=5$ and $t-t_i=30$ (i.e. no idiosyncratic shock). As one can see, the results for the shares of inherited wealth in total wealth are extremely close under

Once we have estimated t_i^* and t_i , it is relatively straightforward to compute capitalized bequest b_{ti}^* from available data. First, we convert reimbursement values into year t asset prices, which then allows us to compute the non-capitalized value b_{ti}^0 of total bequests received by individual i during his lifetime (evaluated at asset prices prevailing in year t):

$$a_{ti}^{R*} = a_{ti}^R \times Q_t / Q_{t_i^*} \quad (3.4)$$

$$a_{tj}^{R*} = a_{tj}^R \times Q_t / Q_{t_i^*} \quad (3.5)$$

$$b_{ti}^0 = a_{ti}^S + a_{ti}^{R*} \quad (3.6)$$

With: Q_t = asset price index

Because inflation was very low prior to World War 1, adjusting for price changes makes little difference between 1872 and 1912. But for years 1922-1937 it makes a big difference. In effect, many of the inherited assets a_{ti}^R reported in interwar tax registers were sold prior to World War 1, at much lower prices than those prevailing in the interwar period, so without the adjustment factor we would significantly underestimate the importance of these assets relative to assets a_{ti}^C and a_{ti}^S (which in tax registers are always valued at current prices).²⁶ With this adjustment we now have the value of bequests received by an individual valued on the same day as his or her own estate—we can thus perform the proper calculation of Modigliani's uncanceled inheritance to wealth ratio.

Next, we must capitalize b_{ti}^0 to get b_{ti}^* . We must make some assumptions about the rate of return r_i prevailing between t_i and t in the different sub-periods:

$$b_{ti}^* = b_{ti}^0 e^{r_i(t-t_i)} \quad (3.7)$$

The choice of individual rates of return r_i and capitalization factors $e^{r_i(t-t_i)}$ plays an important role, and we pay special attention to the robustness of our findings with respect to the rate of return. We explore a wide range of assumptions and variants. In our benchmark estimates and as detailed in section 4, we compute r_i at the individual level on the basis of the individual portfolio structure observed in our micro

both sets of assumptions (inherited shares are somewhat larger under our benchmark case, because of the convexity of the capitalization effect).

²⁶ Full details on the asset price indexes and returns that we use are given in Appendix A. We return to this issue when we present the results in section 4 below.

data set. For each year going back to the 1850s we develop rates of return for real estate, safe assets (e.g. bonds and savings accounts) and risk assets (e.g. equities whether private or public). Each individual's return is the average of these three returns weighted by the share of each asset class in his or her portfolio.

Finally, we can apply our definition of inheritors and savers by comparing capitalized bequests b_{it}^* to current individual wealth w_{it} , which is given by:

$$w_{it} = [a_{itj}^C - a_{it}^{R*} - a_{it}^{R*}]/2 + a_{it}^S + a_{it}^{R*} \quad (3.8)$$

Note that this economic definition of individual wealth w_{it} differs from the tax definition of the estate e_{it} , because the price adjustment factor applied to reimbursement value may not be symmetric between spouses.

3.5. Inter vivos gifts and dowries

Beyond the adjustments above, we must also take into account inter vivos gifts when we define inheritors and savers. That is, when we apply the equation $w_{it} < b_{it}^*$ defining inheritors, it is critical to include inter vivos gifts received by individual i into the computation of capitalized bequests b_{it}^* (which we do, since separate assets include assets received both through bequests and through gifts). For consistency purposes, it is also critical to add to w_{it} the capitalized value v_{it}^* of inter vivos gifts v_{it}^0 made by individual i prior to time t .

Fortunately for us, the value of inter vivos gifts made by married decedents is reported in tax registers, again for estate division purposes. More precisely, at the time of death of the first deceasing spouse (say, the husband i), we observe in tax registers both the value of gifts v_{ijt}^C which were paid out of community assets and the value of gifts v_{it}^S which were paid out of the decedent's separate assets. We do not observe the value of gifts v_{jt}^S which were paid out of the surviving spouse's separate assets, because as before this is not relevant for tax purposes.

Several points are worth emphasizing here. First, in the French legal and social context of the time, a very large fraction of inter vivos gifts took the form of dowries

“dots”).²⁷ Dowries correspond to the inter vivos gifts made to the children (boys and girls) at the time of marriage, generally through a marriage contract. Of course parents also make gifts to their children at other times than marriage.

Next, dowries and other gifts had to be reported at the time of death of the first deceasing parent to ensure that the Civil Code’s principle of equal division between children had been properly applied. It was also important to establish whether the gifts were paid out of the separate assets of a parent or out of community assets, because this affects the shares of the remaining assets going to the surviving spouse and to the children. Available evidence suggests that this legal obligation was enforced relatively strictly.

For the purpose of estate division, the tax administration was using the following formula in order to compute the gift-corrected value of the decedent’s estate e_{ti} :

$$e_{ti} = [a_{tij}^C + v_{ijt}^C - a_{ti}^R - a_{tj}^R]/2 + a_{ti}^S + v_{it}^S + a_{ti}^R \quad (3.9)$$

However, in the same way as reimbursement values a_{ti}^R and a_{tj}^R , the value of dowries v_{ijt}^C and v_{it}^S reported in tax registers is expressed in prices prevailing at the time the dowry was made. So we need to correct for this as well. We note t_i^{**} the time at which dowries were given to children. We draw a distribution for t_i^{**} on the basis of the decedent’s age at death D_{it} (see above), and we convert dowries values into year t asset prices:

$$v_{tij}^{C*} = v_{tij}^C \times Q_t/Q_{t_i^{**}} \quad (3.10)$$

$$v_{ti}^{S*} = v_{ti}^S \times Q_t/Q_{t_i^{**}} \quad (3.11)$$

We then compute the non-capitalized value b_{ti}^0 of total bequests received by individual i during his lifetime (evaluated at asset prices prevailing in year t), and the capitalized value of those bequests:

$$b_{ti}^0 = a_{ti}^S + a_{ti}^{R*} + v_{ti}^{S*} \quad (3.12)$$

$$b_{ti}^* = b_{ti}^0 e^{r_i(t-t_i)} \quad (3.13)$$

²⁷ In the late 19th century and early 20th century, dowries made over 50% of the total value of inter vivos gifts in France, and over 75% in Paris. For a more detailed discussion of issues related to gifts and dowries, see Appendix B (and particularly the discussion about Table B14).

Finally, when computing gift-corrected individual wealth w_{ti} , it is conceptually important to use the capitalized value of dowries v_{tij}^{C**} and v_{ti}^{S**} (including the cumulated return between year t_i^{**} and year t), rather than simply their current price value v_{tij}^{C*} and v_{ti}^{S*} :

$$v_{tij}^{C**} = v_{tij}^{C*} e^{r_i(t-t_i^{**})} \quad (3.14)$$

$$v_{ti}^{S**} = v_{ti}^{S*} e^{r_i(t-t_i^{**})} \quad (3.15)$$

$$w_{ti} = [a_{tij}^C + v_{tij}^{C**} - a_{ti}^{R*} - a_{tj}^{R*}]/2 + a_{ti}^S + a_{ti}^{R*} + v_{ti}^{S**} \quad (3.16)$$

In effect, gift-corrected individual wealth w_{ti} is equal to the wealth that decedent i would have had at death had he not made any gift to his children, and had he chosen not to consume any of the return to the corresponding assets (which indeed he did not consume, since the gift was made).²⁸ So w_{ti} , as defined by equation (3.16), is the relevant wealth concept that ought to be compared to b_{ti}^* , as defined by equation (3.13), in order to determine whether individual i is an inheritor or a saver (i.e. whether he consumed more or less than his labor income during his lifetime), and in order to apply our definitions of inheritors and inherited wealth shares ρ_t , π_t and φ_t (see section 2 above). All results presented below were obtained by applying these equations to the raw data coming from tax registers.²⁹

4. Paris 1872-1937: a rentier society

4.1. Basic descriptive statistics

The basic characteristics of our data set appear in Table 2. The population of Paris rose sharply between 1872 and 1912 (and then stabilized), and so did the annual number of decedents: about 25,000 decedents in 1872, over 35,000 decedents in 1882-1912, and around 30,000-35,000 decedents per year in 1922-1937. The first fact to know about Paris 1872-1937 is that most people died with no wealth at all.

²⁸ Note that in a small number of cases there are dowries which were promised but not given to the children (either because the marriage contract planned family affairs in this way, or whatever other reason). However this appears to be a very small fraction of cases, so we do not make any special correction for this. In any case, note that since most dowries were made relatively shortly before death (see above), this dowry capitalisation effect is bound to be relatively small.

²⁹ Note that our individual wealth concept w_{ti} (as defined by equation (4.16)) differs from the legal concept of individual estate e_{ti} (as defined by equation (4.9)) for two different reasons: first because we upgrade reimbursements and dowries in order to take into account asset price inflation (this plays essentially no prior before World War 1); next because of the dowries capitalisation effect (this effect is quantitatively limited but is conceptually present throughout the 1872-1937 period).

The fraction of decedents with positive wealth was less than 30% in 1872-1912 (at a time when it was about 50% for the all of France). It then rose during the interwar period and reached 40% in 1932-1937.

Second, although there were more poor people in Paris than in the rest of France, there were also a lot more rich people. Average wealth at death in Paris (including decedents with zero wealth) was actually much larger than in the rest of France in 1872-1937 – about 4-5 times larger. As a consequence, with a population share a little above 5%, the Parisians owned as much as 25% of aggregate wealth in France at that time (see Figure 2).

In 1912, the average estate left by Parisians decedents with wealth was over 130,000 francs. The average estate left by the top 10% decedents was about 370,000 francs; for the top 1%, it was 2.4 million francs. To put these numbers in perspective, average national income per adult y_t was about 1,500 francs in 1912, and that average labor income per adult y_{Lt} was about 1,000 francs (with a labor share $1-\alpha_t$ around 65%).³⁰ With a rate of return $r=4\%$, an estate of 2.4 million francs generates an annual income of about 100,000 francs in rent, interest or dividend, i.e. the equivalent of 100 times the average labor income of the time. As a matter of comparison, top 1% labor income earners received less than 10 times average labor income. I.e. top 1% successors, by consuming part of the return to their inherited wealth, could sustain living standards far beyond what labor alone would permit.

The level of wealth concentration in Paris at that time was truly astonishing. At first sight, one might feel that it was relatively stable during the 1872-1937 period—at least as a first approximation. The top 1% share in aggregate wealth rose from 52% in 1872 to 63% in 1912, started declining in the aftermath of World War 1, and returned to 52% in 1937 (see Figure 3). One needs to wait until World War 2 and the 1950s to observe more significant declines in wealth concentration (with top 1% shares falling below 40%).³¹

Note however that we do observe a gradual but significant “rise of the middle class” in the interwar period. The wealth share of the middle class (the middle 40%) was as little as 3%-4% in 1872-1912, and rose to as much as 9% in 1937. This is certainly a

³⁰ For background data on the national income and wealth accounts of France and Paris at that time, see Appendix A. For detailed results and tables from our micro data collected in Paris estate tax archives, see Appendix B.

³¹ See Piketty, Postel-Vinay and Rosenthal (2006).

modest change (in 1937 the upper class – the top 10% - still controls over 90% of aggregate wealth). But if one considers that the middle class currently owns about 30% of total wealth (26% in the U.S., 34% in France.; see Table 1 above), one can see that this is not so negligible (this is about a quarter of the way). We return to this issue below when we discuss the rise of life-cycle wealth accumulation.

In the same way, one should not underestimate the decline in top 1% shares that occurred between 1912 and 1937. This is between one quarter and one third of the total long run decline. This is particularly striking if one compares the 1912-1937 decline with the gradual and sustained rise in top wealth shares which took place between 1807 and 1912 (see Piketty, Postel-Vinay and Rosenthal (2006)).

Why did wealth concentration start to decline around World War 1? This is a complex and fascinating issue. Although this is not our central concern in the present paper (we plan to address it again when we have finished collecting post-World War 2 estate tax micro data), the data we have collected so far already allows us shed some light on this interesting question. We return to this issue below when we discuss the shocks incurred by rentiers during the interwar period.

For the time being, it is important to have in mind that World War 1 induced very large movements in asset prices relatively to consumer prices. From 1872 to 1912, there was virtually no asset or consumer price inflation, and wealth accumulation was proceeding steadily, approximately at the same pace as national income (with growth rates around 1% per year). But then consumer prices were multiplied by almost 6 between 1912 and 1927, and asset prices (both real estate and stock market prices) were multiplied by less than 3 (see Table 3). Expressed in constant consumer prices, the estates of the interwar period are about half those of 1912. But expressed in constant asset prices, they look just 20%-30% smaller (or comparable).³² In effect, the large fall in asset prices largely destroyed the value of estates relatively to labor income flows, which roughly followed consumer prices. In 1872-1912, the average estate left by Parisians decedents with wealth was equal to the equivalent of about

³² This 20%-30% figure roughly corresponds to the share of aggregate assets that suffered from physical destruction and expropriation (e.g. Russian bonds) during World War 1 in France. According to the best available national accounts estimates, destruction and expropriation accounts for the about one third of the aggregate fall of the French private wealth-national income ratio between 1913 and the 1920s, while the other two thirds come from the fall in the relative price of assets (itself being due to a number of factors including nominal rigidities in the price of certain assets, rent control policies, higher taxes on profits and top incomes, political instability and other factors generating a loss of confidence in the profitability and value of privately held assets). See Piketty (2010).

120 years of average labor income. In 1922-1937, it was equal to only 30-40 years of average labor income (see Table 2).

4.2. Asset composition and portfolios

One of the most striking characteristic of Parisian wealth in 1872-1937 is the very high degree of asset portfolio diversification and sophistication. The share of real estate assets in total gross assets was about one third (including about 20% in Parisian real estate and 10% in out-of-Paris real estate), while the share of financial assets was about two thirds. Most importantly, one can see in Table 4 that in the aggregate Parisians' financial portfolios were very diversified. In 1912, out of the 62% of total gross assets held in financial assets, they had 20% in equity, 18% in private bonds, 14% in government bonds, and 9% in other financial assets.³³

In each of these categories, the share of foreign financial assets is large and rises very fast between 1872 and 1912: foreign financial assets made 20% of the total assets of the Parisians in 1912 (as much as Paris real estate assets), and only 7% in 1872. Foreign assets fall during World War 1 (default on Russian bonds, etc.), but less than we expected, which might reflect the fact that these were more diversified than one usually believes. One can also see a shift towards equity and a relative decline of bonds during the interwar period, which probably reflects the fact that bond values and the bond market at large were severely damaged by over ten years of high inflation.

Given that the upper class (top 10%) owned over 90% of total assets throughout the 1872-1937 period, the aggregate asset composition reported on Table 4 mostly reflect the portfolios of the upper class. The top 1% and the next 9% appear to have very similar asset composition (except that the former hold more foreign assets: 24% vs 14% in 1912). There are more marked differences if one looks at the portfolio held by the middle class (middle 40%). E.g. while the upper class (and the aggregate) holds two thirds of its real estate in Paris, most of middle class real estate assets is outside Paris. Also, while the upper class holds less than 5% of its wealth in movables, the middle class it is a little bit above 10%. But by and large the aggregate middle class portfolio also display a very high degree of asset diversification, with a real estate/ financial assets break down around 1/3-2/3, and very balanced financial

³³ Checking accounts, cash, current income including pensions, etc. For detailed results with more asset categories, see Appendix B.

portfolios across equity, private bonds, public bonds and other assets.³⁴ As compared to the enormous differences in total wealth levels across groups, the differences in portfolio composition look relatively small. The same conclusion applies when we compare portfolios across age group.³⁵

4.3. Inherited assets and portfolio reallocations during marriage

If we now turn to married decedents and compare community assets with inherited assets, we find again very diversified portfolios. It is not too surprising that inherited assets contain the same diversified mix of real estate, equity, private and public bonds as total assets, since inherited assets are by definition the same as total assets left by the previous generation. Note however that there is one significant difference between both portfolio structures: inherited assets contain more real estate (both from Paris and out of the city) than community assets (see Tables 5 and 6). This could be partly explained the fact that the overall share of real estate has declined over time, since inherited assets were received a long time before death (about 30 years on average), so they should be representative of total assets 30 years before.

Also, note that the inherited asset composition depicted on Table 6 is by definition restricted to the assets inherited by married decedents and which were not sold or given during the marriage. I.e. these are the assets a_{ti}^S (using the notations introduced in section 3 above). Regarding the inherited assets which were sold or given during marriage, we only know the corresponding reimbursement and dowry values, and not what kind of assets they had been. It could well be that the higher real estate share found on Table 6 simply reflects the fact that real estate inherited assets were less often sold or given during marriage than financial assets.

More generally, one interesting finding for our purposes is that married couples sell or give away a very substantial fraction of their inherited assets during their marriage – between one third and one half according to our computations on the tax registers. On Figure 4 we report both the share of currently owned inherited assets in total assets (i.e. the fraction $a_{ti}^S / (a_{tij}^C / 2 + a_{ti}^S)$), and the share of total inherited assets (including those sold or given, as measured by corrected reimbursement and dowry

³⁴ See Appendix B, Table B11.

³⁵ See Appendix B, Table B10. Older individuals have slightly more real estate and low-risk financial assets, middle age individuals have slightly more high risk financial assets and liabilities, etc.; but by and large the differences and portfolios again look relatively small (as a first approximation).

values) in total assets (i.e. the fraction b_{ti}^0/w_{ti} , as defined by equations (4.12) and (4.16) above).

As one can see, currently owned inherited assets typically make about 25%-40% of total assets, with a peak at 42% in 1912. That is, the vast majority of assets owned by married couples when the first spouse dies are community assets, i.e. assets that were acquired during marriage. But the point is that many of these assets were acquired either by using cash gifts or by selling some inherited assets. Once this is taken into account, we find that inherited assets make as much as 50%-60% of total assets (see Figure 6). In other words, it is critical to take into account the portfolio reallocations going on during marriage when estimating the role of inheritance in aggregate wealth accumulation.³⁶

Note that at this stage we do not take into account the return to inherited assets, i.e. both inherited assets shares reported on Figure 4 measure the share of uncanceled inheritance. The fraction b_{ti}^0/w_{ti} simply corresponds to the Modigliani definition ϕ_t^M of the inheritance share in aggregate wealth accumulation (see section 2 above). Now, it is clear that with an uncanceled inheritance share as large as 50%-60%, then the capitalized inheritance share $\phi_t^{KS} = b_{ti}^*/w_{ti}$ defined by Kotlikoff-Summers is bound to be larger than 100%. With a modest, exogenous rate of return $r=3\%$, the capitalized inheritance share ϕ_t^{KS} appears to be about 120%-150% throughout the 1872-1937 period. With a more realistic, exogenous rate of return $r=5\%$, it is around 200-250% (see Figure 5). These estimates are consistent with the uncanceled and capitalized bequest shares series recently computed for the all of France on the basis of aggregate data.³⁷ Note that the exact number for ϕ_t^{KS} appears to depend a lot on the rate of return. As we argued in section 2 above, the Kotlikoff-Summers definition is

³⁶ Note that the fraction of inherited assets sold or given during marriage is about 45%-50% in 1872-1882 and 1922-1937, but appears to be significantly lower in 1912 (about 25%). This could reflect the fact that wealth holders are particularly prosperous in 1912 and faced less of need to sell some of their spouse's assets. Conversely the very high fraction observed in the interwar (and particularly in the 1920s) could reflect the impact of shocks. We return to this issue below.

³⁷ For the all of France, aggregate inheritance flow series and observed average rates of return imply aggregate capitalized bequest shares ϕ_t^{KS} around 250%-300% during the 1870s-1930s period (down to 100%-150% in the 1950s-1970s); aggregate uncanceled bequest shares ϕ_t^M are around 70%-80% prior to World War 1, down to about 50%-60% in the 1920s-1930s, and to less than 40% in the 1950s-1960s. See Piketty (2010). For Paris, our data shows that uncanceled bequest shares ϕ_t^M have been relatively stable around 50%-60% during the 1870s-1930s. It could be however our methodology in the present paper leads us to under-estimate somewhat the share of inherited assets (both because we neglect married decedents under the "separation of property" regime and married decedents with zero community assets; and possibly because of under reporting of sales and gifts of assets).

conceptually more consistent than the Modigliani definition, but neither of them is really satisfactory.

Another interesting finding regarding portfolio reallocations during marriage is that they appear to be relatively symmetric between husbands and wives. That is, if we consider all married decedents, and also if we break down married decedents by wealth fractiles, we find that reimbursement and dowry values are approximately the same on the husband side and on the wife side.³⁸ Moreover, the overall share of inherited assets in total assets is also gender neutral (i.e. it is almost identical when husbands die first and when wives die first), both at the aggregate level and in all wealth fractiles. These findings imply that on average husbands and wives bring about as much inherited assets to the marriage. This is not surprising, given that French estate sharing laws since the Revolution have been gender neutral. They also suggest that the ability and willingness of each spouse to convince the other spouse to sell off (or give to children) his or her inherited assets have also been relatively symmetric over this time period. This was less obvious, given the legal asymmetries in control rights over assets, and in particular the limited rights of married wives to sell and purchase assets on their own.³⁹ Unfortunately, as was already stressed in section 2, we cannot go much further with our data set. In particular we cannot precisely estimate the degree of assortative mating (which seems to be very high), because we do not observe the unsold inherited assets of the surviving spouse.⁴⁰

4.4. Inheritors vs savers: aggregate results

We now come to our main results on inherited vs self-made wealth. We first compute the fraction of rentiers (inheritors) in total population ρ_t , the rentiers share in aggregate wealth π_t and, and the total share of inherited wealth φ_t (including the inherited fraction of non-rentiers' wealth). Our benchmark estimates are plotted on

³⁸ With the possible exception of the 1920s, where wife's inherited assets appear to be sold and given more often than husband's inherited assets. However this is marginally significant, and holds only in married couples where the husband dies first (when the wife dies first, symmetry prevails again). For detailed results, see Appendix B, Table B16.

³⁹ See section 3 above.

⁴⁰ The fact that the symmetry in asset sales holds in all wealth fractiles, and that we also observe very high individual-level correlation between husbands' and wives' asset sales, certainly suggests a very high degree of assortative mating. But the individual-level correlation between sales is bound to be a lower bound estimate of assortative mating, since there are all sorts of idiosyncratic shocks explaining individual level propensity to sell or give inherited assets. We plan to further explore these interesting issues in the future.

Figure 6. These were computed by estimating individual rates of return and capitalization factors on the basis of observed individual portfolios, and by using observed average rates of return over three broad categories of assets: real estate assets, high-risk financial assets (equity and bonds issued by private sector), and low-risk financial assets (government bonds, bank accounts and other financial assets). We discuss alternative assumptions below.

We first find that the fraction of rentiers in total population ρ_t was relatively stable. Throughout the period, about 10% of the Parisian population had wealth w_{ti} below the capitalized value of their inherited assets b_{ti}^* . These individuals had consumed more than their labor income during their lifetime. Although this was obviously a minority of the population, this was an important minority. Also note that this is the fraction of rentiers in total population, including the approximately two thirds of the population who had zero (or near zero) wealth when they died. The fraction of rentiers within the approximately one third of the population holding wealth was actually as large as 30% throughout the 1872-1937 period.⁴¹ In other words, rentiers were a real social group, not just a few dozen people.

Next, and most importantly, we find that rentiers alone owned about 60%-70% of aggregate wealth π_t in Paris throughout the 1872-1937 period. There is evidence that the rentiers wealth share was declining in the interwar period. No clear rise seems to occur between 1872 and 1912, due to the fact that the increase in uncanceled inherited assets share seems to be approximately compensated by the decline in rates or returns and capitalization factors. But the main fact if we look at the 1872-1937 period as a whole is that the rentiers share was very high, and relatively stable.

Finally, when we add non-rentiers inherited wealth, we find that the total share of inherited wealth in aggregate wealth φ_t was about at least 70% in Paris over the 1872-1937 period (again with a statistically significant but quantitatively modest decline during the interwar period).

The fact that φ_t was not that much larger than π_t is interesting per se and is highly informative about the dualistic nature of the wealth accumulation process. For instance, if $\pi_t=60\%$ and $\varphi_t=70\%$, then by definition this means that non-rentiers own

⁴¹ It was actually as large as 30%-35% in 1872-1922, and then declined to about 25%-30% in 1927-1937. But because the fraction of wealth holders in the population increased in the interwar, the fraction of rentiers in total population was pretty stable around 10% throughout the 1872-1937 period, with no trend. See Appendix B, Table B18.

40% of aggregate wealth, but out of these 40% only 10% correspond to the capitalized inherited wealth of non-rentiers. In other words, the (capitalized bequest)/wealth ratio b_{ti}^*/w_{ti} for non-rentiers is only 25%: non-rentiers got only a quarter of their wealth through inheritance, while three quarters come from their own accumulation. What this means is that non-rentiers are very different from rentiers: they really are savers (or “self-made men”), i.e. individuals who accumulated most of their wealth through their labor income. Even in 1912, i.e. at the peak of the rentier society, when $\pi_t=70\%$ and $\varphi_t=80\%$, non-rentiers got only about a third of their wealth through inheritance. Over the entire 1872-1937 period, we find that the average ratio b_{ti}^*/w_{ti} was relatively stable around 25%-30% for non-rentiers, and around 300%-400% for rentiers.⁴² That is, while savers were accumulating three or four times more wealth than what they were receiving from their parents, rentiers on the contrary ended with wealth three or four times smaller than the capitalized bequest they received from the previous generation (i.e. they were consuming two thirds or three quarters of the capitalized value of their inherited wealth).

It is now clear that there were really two very different kinds of wealth accumulation processes going on simultaneously in Paris (and presumably in every society, of course with varying proportions), and that it is important to distinguish between these two patterns and groups of people. If we mix up everybody into a representative agent model and ignore this heterogeneity, it is unlikely that we will properly understand the overall process of wealth accumulation.

4.5. Inheritors vs savers: results by wealth fractile

In order to further explore this issue, we then computed the population shares of rentiers $\rho_t(w)$, the wealth shares of rentiers $\pi_t(w)$, and the total shares of inherited wealth $\varphi_t(w)$, for all wealth fractiles w . In principle, for given aggregate shares ρ_t , π_t and φ_t , one could expect any wealth pattern. E.g. to the extent that entrepreneurship plays an important role for building large fortunes, one could expect rentiers and inheritance shares to decline at the top of the wealth hierarchy. However this is not what we find. Throughout the 1872-1937 period, we find that the wealth profiles of rentier shares and inheritance shares $\rho_t(w)$, $\pi_t(w)$ and $\varphi_t(w)$ grew with wealth fractile and were highest at the top of the distribution. We report the results obtain for 1912 on Figure 7.⁴³

⁴² See Appendix B, Table B18.

⁴³ The profiles obtained for other years have a similar shape. See Appendix B, Table B18.

The connection between rentiers and wealth fractiles is spectacular. In 1912, the rentiers made only 25% of the middle class (wealth fractile P50-90), but about 50% of the “middle rich” (P90-99), and over 70% of the “very rich” (P99-100). Since rentiers tend to have somewhat larger average wealth than non-rentiers in each wealth fractile, the wealth shares $\pi_t(w)$ are somewhat larger than $\rho_t(w)$. They range from almost 40% for the middle class, 60% for the middle rich, and over 75% for the very rich. If we now add the inherited wealth of non-rentiers, we find that total inheritance shares $\phi_t(w)$ are again a bit higher, and range from over 40% for the middle class to 70% for the middle rich and over 80% for the very rich.

It is worth noting that within each wealth fractile, including at very top, there exists a sizeable fraction of savers, and a large heterogeneity between two groups of people, the savers and the rentiers. This is demonstrated by the fact that the $\phi_t(w)$ shares are only a bit higher than the $\pi_t(w)$ shares (see Figure 7). For instance, even within the top 1%, at least a quarter of the very rich had started off in life with very little wealth, and despite this they managed to make their way to the top. We might call these people “entrepreneurs”. They started off with relatively little in life, in the sense that the average (capitalized bequest)/ wealth ratio b_{ti}^*/w_{ti} for the savers within the top 1% was about 30% in 1912 (and in other years). This is higher than what we find for middle class savers (for whom the corresponding ratios are generally less than 10%), but this still means that 70% of their wealth was self-made.⁴⁴ If we compute the b_{ti}^*/w_{ti} ratios for the rentiers of the top 1%, then we again find ratios of about 300%-400%.

4.6. Looking for life-cycle wealth: results by age group

The fact that wealth at death is less than capitalized inherited wealth does not necessarily imply that there is no life-cycle wealth. It could be that people actually transferred a lot of wealth through over their life time and that we do not see it at death (because they have already ‘consumed’ it). The simplest way to address this issue is to look at the rentiers vs savers breakdown by age group. In principle, if life-cycle wealth accumulation plays an important role, one should see more self-made wealth in middle age groups. In practice, one indeed observes that the share of

⁴⁴ See Appendix B, Table B18. Note however that our individual level definitions rely on the assumption of perfect assortative mating (see section 3 above). It could well be a substantial fraction of this group started off with very little wealth, but married with someone with large inherited wealth. We plan to further investigate this in future research.

rentiers in population with wealth is somewhat lower in middle age groups. However the effect is rather small and on the whole the relative importance inherited and self-made wealth is stable across age groups (see Figure 8).⁴⁵

Insert Figure 8: Rentiers by age groups in Paris 1912

We do observe this same flat pattern for all years, including during the interwar period. In particular, the (moderate) rise of middle class wealth during the interwar does not seem driven by the rise of life-cycle saving. At first sight, the main reason why the middle class starts accumulating more wealth over time seems to be the rise of their income and their desire to own or transmit assets, rather than the rise of their life expectancy. Note that this conclusion partly stems from the fact that we only look at transmissible (non-annuitized) wealth. During the 1872-1912 period, and even more so during the interwar period, we do observe a gradual rise of pension (annuitized) wealth within the middle class. To some extent, we can see this through the lenses of estate tax returns, because the outstanding balance for occupational, state or private pensions was usually paid at the end of each term and added to the pensioner's estate. For the middle class, the corresponding, equivalent pension wealth appears to be at least as large as transmissible wealth during the interwar. For Paris as a whole, however, this does not significantly alter the conclusion about the predominance of rentiers and inherited wealth in aggregate wealth accumulation.⁴⁶

4.7. Robustness of the findings with respect to the rate of return

In the data appendix, we present two broad classes of robustness checks with respect to the rate of return. First, we introduce idiosyncratic shocks around individual returns. Namely, we compute individual returns as in the benchmark estimates described above (on the basis of observed individual portfolios and observed average returns for real estate assets, high-risk financial assets and low-risk financial assets), and then we draw a normal distribution of realized returns around the average high-risk financial return. We vary the variance of the idiosyncratic shock, and look at the impact on ρ_t , π_t and φ_t . The general finding is that

⁴⁵ It is hard to imagine how differential mortality could undo this conclusion. If anything, mortality would tend to be lower for individuals with higher inherited wealth (for given total wealth level), which would lead us to underestimate the share of inherited wealth among middle age groups. For a discussion of various alternative modelings of differential mortality, see Appendix C.

⁴⁶ See Appendix B, Table B14 for a detailed discussion of the data on pensions.

idiosyncratic shocks have very little impact. In particular, they have virtually no impact on the rentiers share in population ρ_t : idiosyncratic noise induces reallocation between rentiers and savers (some individuals previously defined as rentiers now become savers, and vice versa), but has no systematic impact on the aggregate fraction of rentiers. Noisy returns do tend to reduce rentiers shares in wealth and total shares of inherited wealth (the asymmetry comes from the fact that with high-shock returns capitalized inheritance is already well above current wealth; while low-shock returns reduce capitalized inheritance further below current wealth). But the point is that shocks need to be very large to have a significant impact. E.g. in 1912 the share of inherited wealth φ_t is equal to 74% according to our benchmark estimates (no shock), and falls to 73% with a shock variance equal to 50% of the high-risk average rate, and to 68% with a variance of 100%.⁴⁷

Next, we also introduce aggregate shocks to average rates of returns. In our benchmark computations, which we view as our most reliable estimates, we of course tried to use the best available series on average rates of return to various kinds of assets. However even the best available series in this area are highly imperfect and potentially subject to mismeasurement. For instance, available series suggest that the average rate of return was substantially larger in the 1850s-1870s than in the 1880s-1900s (say, 6% vs 4%-5%). But maybe we exaggerate somewhat the time series variations in aggregate rates of return. E.g. we might slightly overestimate the capital share during the earlier subperiod, say because we overestimate profits and underestimate entrepreneurial labor income. Given the limited quality of the raw statistical material on labor income and capital income, there is no way we can exclude such a possibility. So in order to address this problem, we re-estimated entirely the shares ρ_t , π_t and φ_t under the assumption of a fixed, exogenous return throughout the 1872-1937 period (e.g. $r=3\%$, $r=4\%$, $r=5\%$ etc.). In this way, we completely shut down the variations in ρ_t , π_t and φ_t that are due to time variations in rates of return and capitalization factors.

The central conclusion of these robustness checks is that our main results do not rely too much on the exact rate of return. For instance, whether we take a fixed $r=3\%$ or a fixed $r=5\%$ (which corresponds to an enormous variation in the aggregate rate of return), we find fairly similar results (see Figure 9).⁴⁸ The population shares of

⁴⁷ See Appendix B, Table B18, and Figure B1 for detailed results.

⁴⁸ We provide other robustness checks corresponding to alternative assumptions on rates of return in Appendix B, Table B21 (in particular, we combine idiosyncratic and aggregate shocks).

rentiers p_t always appears to be stable around 10% of total population throughout the 1872-1937 period, and the rentiers shares in wealth π_t and total inheritance shares in aggregate wealth ϕ_t are reduced by only 5 to 10 percentage points when we go from $r=5\%$ to $r=3\%$. This contrasts sharply with the enormous impact of the rate of return on the representative-agent definitions. Using the very same data, we found that moving from $r=3\%$ to $r=5\%$ drives the capitalized bequest share in aggregate wealth accumulation ϕ_t^{KS} (Kotlikoff-Summers definition) up from 120%-150% to over 200%-250% (see Figure 5 above).

Why is it that the rate of return has such a limited impact on our individual-level definitions? As we argued before, it is simply that the two groups that we have identified – the rentiers and the savers – are very different from one another: at all wealth levels, the rentiers are real rentiers, and the savers are real savers. Because the rentiers as a group have capitalized bequests that far exceed the value of their wealth (with b_{ti}^*/w_{ti} as large as 300%-400%), most of them will remain rentiers when we reducing the rate of return from $r=5\%$ to $r=3\%$. Of course this is going to have a strong impact on their living standards. But it does not matter to our definitions of rentiers shares in population and wealth (since they were already consuming most of their capitalized bequest anyway). In the same way, because the savers as a group have relatively small capitalized bequests as compared to their wealth (with b_{ti}^*/w_{ti} as small as 20%-30%), even doubling the rate of return from 3% would not lead us to reclassify many of them from savers to rentiers.

One way to illustrate this is to draw the histogram for the distribution of the b_{ti}^*/w_{ti} ratio. We find a clear twin-peaked pattern. If we look at the total population with wealth, we find that about 60% of the population had little inheritance (with a ratio below 50%) and that about 30% had benefited from major bequests (with a ratio above 200%), with only 10% of the population in between (see Figure 10). If we look at the subpopulation with top 1% wealth, the pattern is basically reversed – with 20% with little inheritance, 60% received big bequests, and again a tiny population in between (see Figure 11). This is why the two groups do not change too much when we change the rates of return.⁴⁹ We view this result as strong evidence in favor of our non-representative-agent approach to the study of wealth accumulation.

⁴⁹ Here we drew the histograms using our benchmark estimates (individual rates of return based upon observed individual portfolios and observed rates of return by class of assets). But the histograms would be almost identical with fixed rates of return $r=3\%$ or $r=5\%$. See Appendix B.

4.8. Rentiers in the chaotic interwar: the beginning of the end

As was already stressed above, it would be erroneous to view the years between 1872 and -1937 as having a constant dynamic of wealth. True, wealth concentration was very high throughout the period (see Figure 3), and so were the shares of rentiers and inherited wealth in aggregate wealth (see Figure 6). But behind this apparent stability, there were quite dramatic changes. Starting with World War 1, wealth holders were hit by a series of catastrophes and the value of estates relatively to consumer prices and labor income flows plummeted. These shocks set the seeds for the end of the rentier society that was realized in the 1940s and 1950s.

In order to see this, we computed the living standards enjoyed by top Paris rentiers dying in 1872-1937 and compared these to the equivalent living standards which they leave to their successors. The results are quite spectacular (see Figure 12). In 1872-1912, the rentier society was self-sustaining, in the sense that top rentiers left to the next generation sufficient wealth to enjoy the same living standards as those they themselves enjoyed (approximately 100 times the average labor income of the time). But in 1922-1937, top rentiers were unable to leave anywhere what they received: they consumed the equivalent of around 80 times average labor income (almost as much as pre-World War 1 rentiers), but left to their successors barely enough to consume the equivalent of 20-30 times average labor income.

More precisely, we did the following computations.⁵⁰ We looked at Paris rentiers dying in 1872-1937 and belonging to the top 1% of the estate distribution. We know their capitalized inherited wealth b_{it}^* , their wealth at death w_t , and the time of which they inherited $t_i < t$. By definition, $b_{it}^* > w_t$. So that we can compute how many multiples of average labor income y_{Ls} (for all years s in $[t_i; t]$) he or she was able to consume since the time on inheritance. We find that on average top rentiers dying in 1872-1912 could consume around 100 times average labor income every year since inheritance (typically about 30 years). In order to estimate the equivalent living standards which they leave to the next generation, we apply a fixed rate of return $r=4\%$ to their estate w_t . In 1872-1912, top 1% estates were approximately equal to 2,500 times average labor income, so they were sufficiently large to sustain living standards of approximately 100 times average labor income.

⁵⁰ See Appendix B, Table B18, and corresponding computer codes, for full details. We also did the same computations with fixed rates of returns and found similar results (see Table B21).

These massively high levels of consumption are perhaps overstated because some of the income to separate assets may have been reinvested directly into those assets without transiting through the community account. Nevertheless aggregate data on the growth of the French wealth stock (or on the value of Parisian real estate) suggest this kind of measurement error has a limited effect. It would reduce rentier consumption in all periods. The massive decline in the consumption value of bequests would diminish somewhat. Conversely we also omit any labor income. This is because we do not know whether our individual rentiers worked or not, how much they earned, and how much they really consumed. Probably some of our pre-World War 1 did work, and earned the equivalent of (say) 10 times average labor income, in which case they could consume 110 times average labor income instead of 100. But the point is that even without working, they could enjoy very high living

Because of the sudden fall in the real value of assets, this self-sustaining equilibrium broke down after World War 1. In order to restore a new equilibrium, rentiers should have consumed much less, or worked much more, or both. For those who died in 1922, very soon after the war, no wealth reconstitution was possible, they spend most of their lives consuming *before* the war started. For those who dies in 1927, some adjustment was possible but they had spent half their adult lives in the pre war shock and less than a third in the post shock economy. With returns at 4% they could have compensated half their losses if they had consumed no capital income leaving their children still much poorer than themselves. For those who died in the 1930s, adjustment would have been difficult since they again had little time to adjust to the financial shock of 1929.

By and large, despite its limitations, our data suggests that they did not enough in that direction. Interwar rentiers apparently consumed almost as much as their prewar counterparts (without working more, and/or while consuming their extra labor income), and therefore left much less than what they received. This mechanical, reduced saving effect (due to insufficient consumption adjustment following wealth shocks) can also explain the gradual decline in wealth concentration during the interwar period.

Of course the other important mechanism pushing towards lower wealth inequality is the rise of tax progressivity. Note that all computations presented in this paper (in particular those presented on Figure 12) are pre-tax estimates. When we compare

capitalized inherited wealth and current wealth, we ignore all forms of wealth taxes, either inheritance taxes or taxes on the capital income flow. For most the period under study, this is an acceptable approximation. Top estate rates were less than 5% until World War 1, and before 1914 there was no income tax at all. However top estate and income tax rates were abruptly raised in the early 1920s and were as large as 30%-40% (and sometime even larger) during most of the interwar period. Most rentiers dying in 1922-1937 inherited before the war and therefore did not have to pay much inheritance taxes on the bequests they received. However they did pay substantial income taxes on their capital income flow during the 1920s and 1930s, and their successors had to pay significant estate taxes. In other words, in after-tax terms, the successors of top rentiers dying in 1922-1937 actually received much less than the pre-tax estimates reported on Figure 12 (maybe less than twice as less).

To properly study such processes, we need longer time spans, so as to include World War 2 and the post World War 2 period into the analysis. We are currently collecting new micro data in Paris estate archives for the 1940s-1950s, and we plan to re-address these issues and to analyze the relative importance of these various dynamic mechanisms in our future research.

5. Concluding comments

The key findings of this paper are twofold. The first set is methodological. It is clear that the methodology and data one uses to evaluate the relative importance of life-long accumulation of wealth versus inheritance are critical. Modigliani's approach is generally understates the role of inheritance because it fails to recognize that inherited assets deliver positive flow returns – thereby denying altogether the existence of rentiers living off the return to their inherited wealth. Although the Kotlikoff-Summers' method goes a long way in the right direction by properly capitalizing observed bequests, it will tend to overstate the role of inherited wealth because it cannot subtract from the stock of capitalized bequest the fraction of the cumulated return that was actually consumed by rentiers. Using a representative agent model one cannot properly account for the fact that the real world is made of a mixture of rentiers and savers. Our departure from the representative agent framework is both minimal and tractable (in effect we move from one homogenous group to two groups: inheritors and savers), and it allows for a better understanding of the aggregate process of wealth accumulation.

The second set of findings is substantive and concerns the share of inherited assets in total wealth. Of course we do not claim that the specific results we obtain for Paris 1872-1937 hold universally for all countries and time periods. We picked this time and place not only for data availability reasons, but also because it allows us to illustrate in a fairly extreme form what a rentier society can look like. However there are good reasons to believe that the results would not be radically different in today's France or U.S., i.e. one would still find substantial rentiers shares in population and wealth. We hope our findings will contribute to stimulate more research on these issues.

In particular, it is worth noting that Paris 1872-1937 was a place with highly developed financial markets. While a hundred years ago Paris was clearly a city of rentiers, one should not think that this was due to poorly functioning capital markets. The kind of estates Parisian had at the time are more modern than one might think: they were highly diversified, and mostly composed of financial assets, with a relatively sophisticated mix of domestic and foreign equity, private and public bonds. In fact, on a purely theoretical basis, one could even argue that financial development facilitates the emergence of rentier societies, by raising the return to incumbent wealth holders (i.e. even low skill inheritors can have high returns to their inherited wealth). Of course, financial development also has positive effects on savers, since it also allows middle class agents starting off with limited wealth to borrow and acquire assets.⁵¹ In any case, what our findings suggest is that the issues of rentiers societies and efficiency are largely disconnected.

Finally, in this paper we have treated the issue of the share of wealth that is inherited as nearly orthogonal to that of the evolution of estate tax rates. This is because in our period of study estate tax rates were relatively small. However if one wants to look at the entire 20th century then the interaction between rentiers shares and estate tax progressivity must surely be important. This is an issue we plan to address in future research.

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⁵¹ See Hoffman, Postel-Vinay, and Rosenthal (2007).

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Table 1: Wealth inequality 1910-2010: the (limited) rise of the middle class

	France 1910	France 2010	U.S. 2010
Top 10% "Upper Class"	87% 1 740 000 €	62% 1 240 000 €	72% 1 440 000 €
<i>incl. Top 1%</i> <i>"Very Rich"</i>	<i>53%</i> <i>10 600 000 €</i>	<i>24%</i> <i>4 800 000 €</i>	<i>33%</i> <i>6 600 000 €</i>
<i>incl. Other 9%</i> <i>"Middle Rich"</i>	<i>34%</i> <i>755 556 €</i>	<i>38%</i> <i>844 444 €</i>	<i>39%</i> <i>866 667 €</i>
Middle 40% "Middle Class"	12% 60 000 €	34% 170 000 €	26% 130 000 €
Bottom 50% "Poor"	1% 4 000 €	4% 16 000 €	2% 8 000 €
Share in total wealth <i>Average per adult wealth</i>	100% 200 000 €	100% 200 000 €	100% 200 000 €

Table 2: Inheritance in Paris, 1872-1937 - Summary Statistics

	N. decedents (20-yr +)	N. decedents with estate>0	% decedents with estate>0	Average estate (estate>0)	Average estate (all decedents)	Average labor income	Average estate (estate>0)	Average estate (all decedents)
				(current francs)			(years of labor income)	
1872	24 348	6 936	28%	88 070	25 088	725	121	35
1882	34 932	8 942	26%	98 564	25 231	812	121	31
1912	36 681	10 262	28%	133 547	37 362	1 073	124	35
1922	33 300	10 791	32%	166 270	53 883	4 259	39	13
1927	31 780	9 935	31%	257 835	80 600	7 069	36	11
1932	31 725	12 100	38%	273 139	104 174	7 287	37	14
1937	30 274	12 790	42%	220 017	92 951	8 560	26	11

Table 3: Average estate and average labor income vs price indexes in Paris 1872-1937

	Average estate (estate>0) (nominal index)	Average labor income	Asset price index	Consumer price index	Average estate (estate>0) (relative to asset price index)	Average labor income	Average estate (estate>0) (relative to consumer price index)	Average labor income
1872	66	68	97	97	68	70	68	69
1882	74	76	97	98	76	78	76	78
1912	100	100	100	100	100	100	100	100
1922	125	397	203	312	61	195	40	127
1927	193	659	273	574	71	241	34	115
1932	205	679	229	537	89	296	38	126
1937	165	797	242	616	68	329	27	129

Table 4: Asset composition in Paris 1872-1937

(% gross assets)	Real estate assets	Financial assets	inc. Equity	inc. Private bonds	inc. Govt bonds	inc. Other, cash,..	<i>Total foreign financial assets</i>	Furnitures
1872	34%	63%	17%	21%	15%	10%	7%	3%
1882	35%	63%	18%	21%	16%	8%	8%	2%
1912	36%	62%	20%	19%	14%	9%	20%	3%
1922	27%	69%	25%	13%	19%	11%	15%	4%
1927	24%	70%	37%	10%	13%	11%	20%	6%
1932	27%	66%	30%	11%	14%	11%	11%	7%
1937	25%	68%	36%	10%	12%	11%	22%	7%

Note: Out-of-Paris real estate assets are missing in 1872-1882; in 1912-1937, they make about 1/3 of real estate assets

Table 5: Community asset composition in Paris 1872-1937

(% gross assets)	Real estate assets	Financial assets	inc. Equity	inc. Private bonds	inc. Govt bonds	inc. Other, cash,..	<i>Total foreign financial assets</i>	Furnitures
1872	34%	62%	20%	19%	11%	12%	5%	3%
1882	31%	66%	24%	19%	12%	11%	6%	3%
1912	30%	67%	27%	17%	13%	11%	20%	3%
1922	18%	77%	30%	14%	22%	12%	12%	5%
1927	15%	78%	44%	10%	12%	12%	23%	7%
1932	20%	71%	32%	12%	14%	14%	10%	9%
1937	18%	73%	38%	10%	10%	15%	18%	9%

Note: Out-of-Paris real estate assets are missing in 1872-1882; in 1912-1937, they make about 1/3 of real estate assets

Table 6: Inherited asset composition in Paris 1872-1937

(% gross assets)	Real estate assets	Financial assets	inc. Equity	inc. Private bonds	inc. Govt bonds	inc. Other, cash,..	<i>Total foreign financial assets</i>	Furnitures
1872	43%	55%	14%	18%	15%	8%	9%	1%
1882	43%	55%	18%	15%	15%	7%	6%	2%
1912	45%	54%	17%	16%	10%	9%	11%	1%
1922	33%	63%	24%	11%	11%	17%	11%	4%
1927	33%	62%	34%	8%	9%	12%	15%	4%
1932	39%	57%	29%	8%	11%	8%	12%	4%
1937	43%	53%	28%	8%	8%	8%	14%	4%

Note: Out-of-Paris real estate assets are missing in 1872-1882; in 1912-1937, they make about 1/3 of real estate assets

Figure 1: Annual inheritance flow as a fraction of national income, France 1820-2100

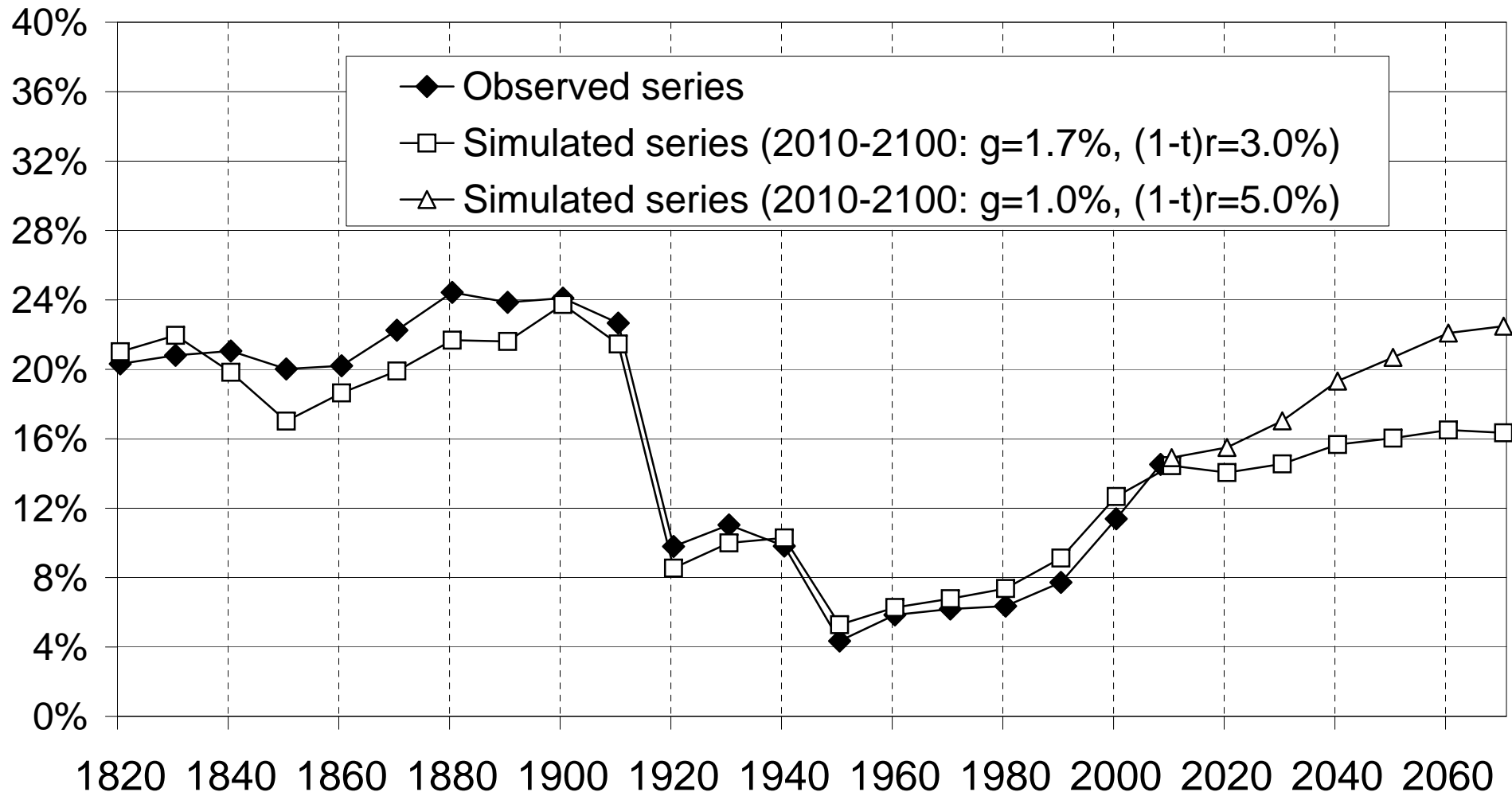


Figure 2: Paris share in France, 1872-1937

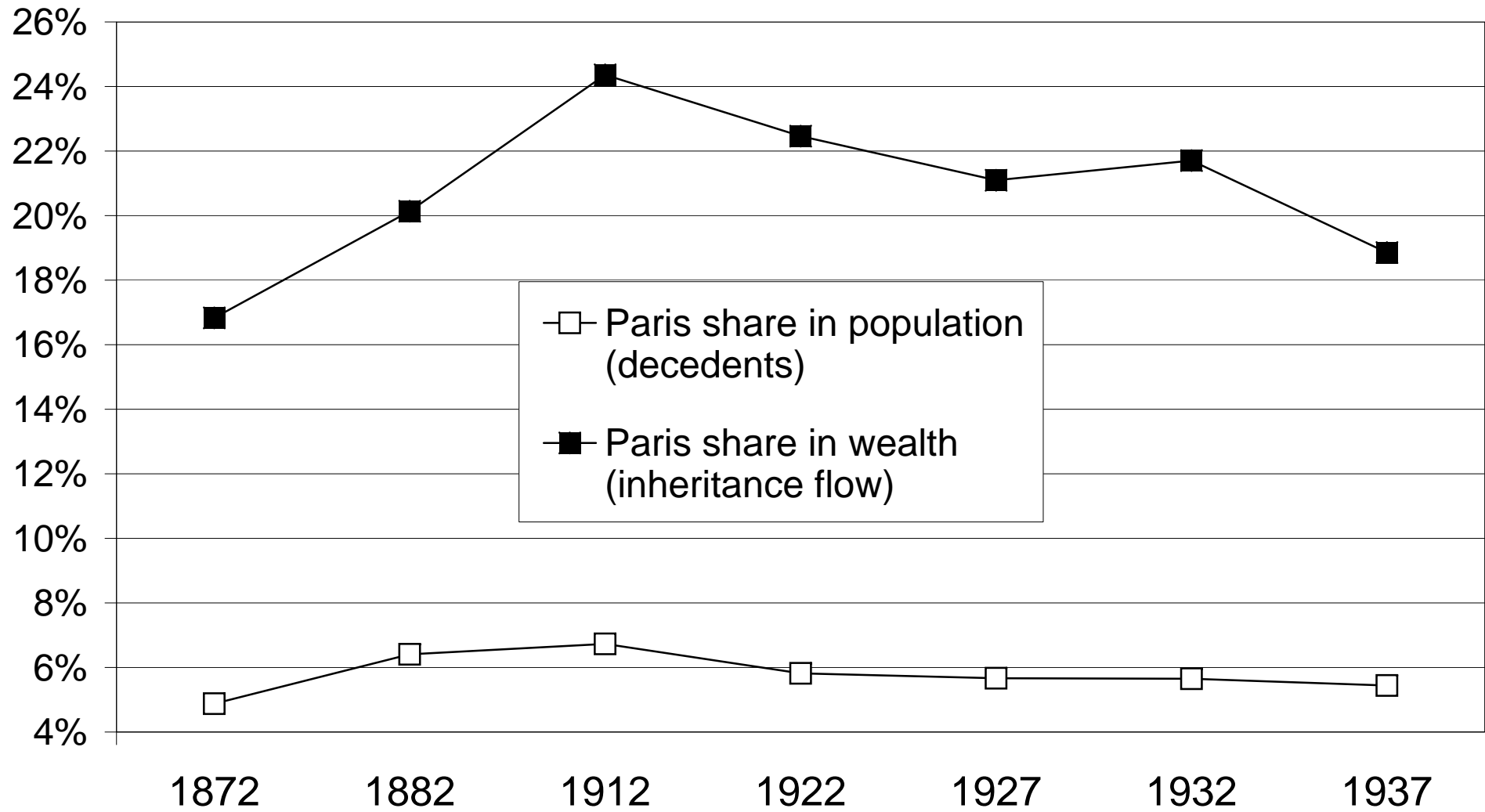


Figure 3: Wealth concentration in Paris, 1872-1937

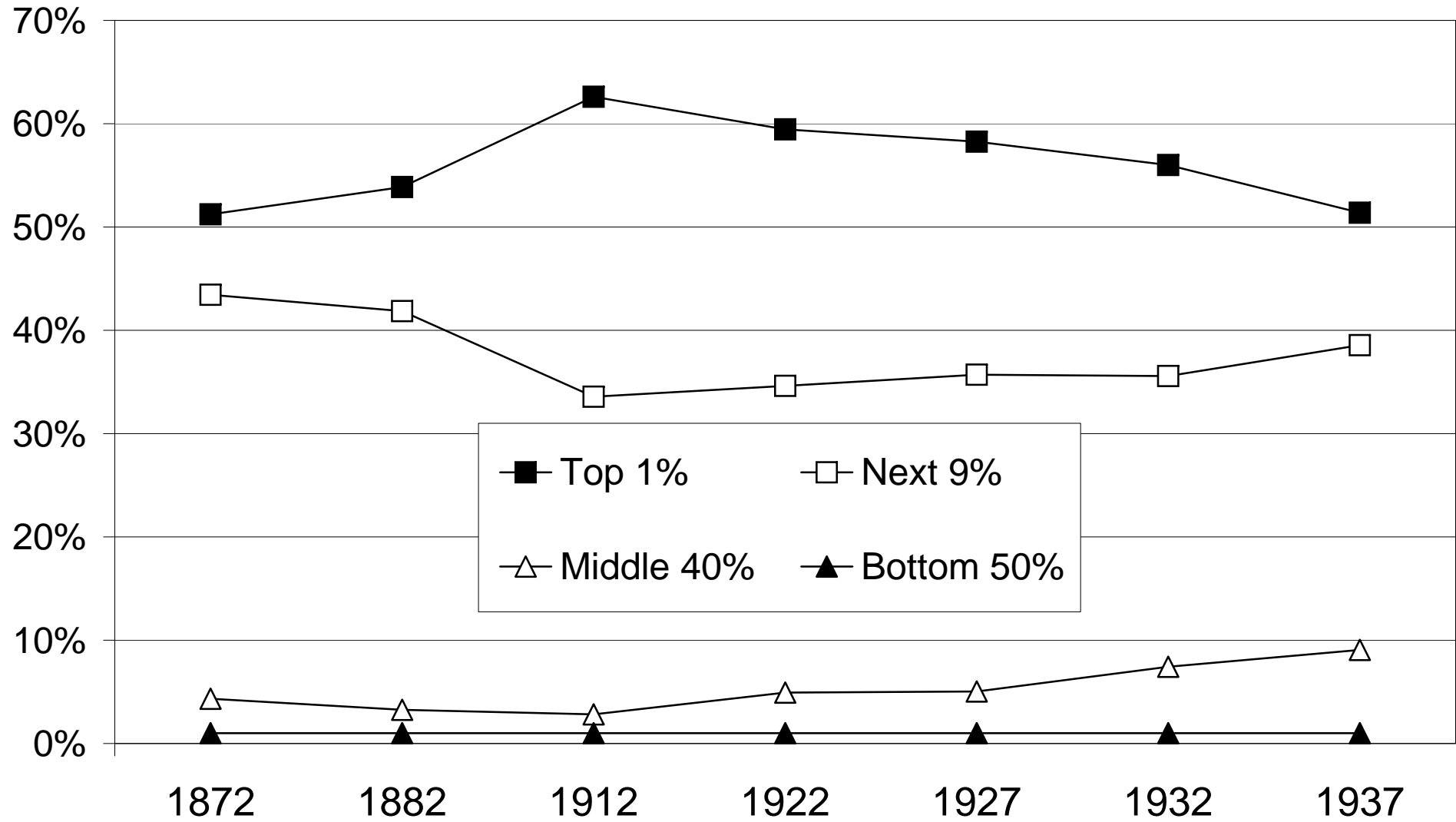


Figure 4: Porfolio reallocations during marriage

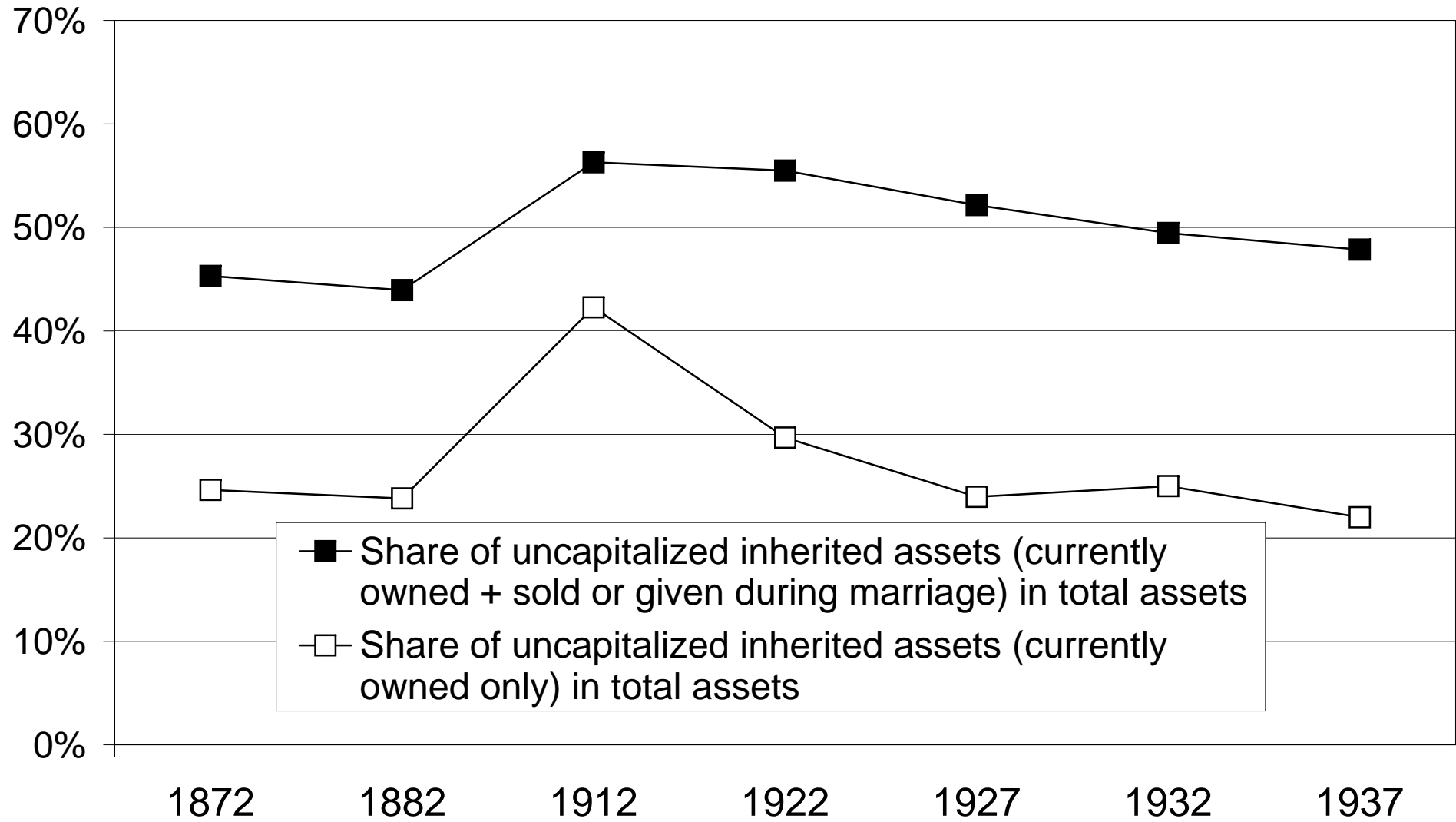


Figure 5: Uncapitalized vs capitalized inheritance share in aggregate wealth accumulation (standard definitions)

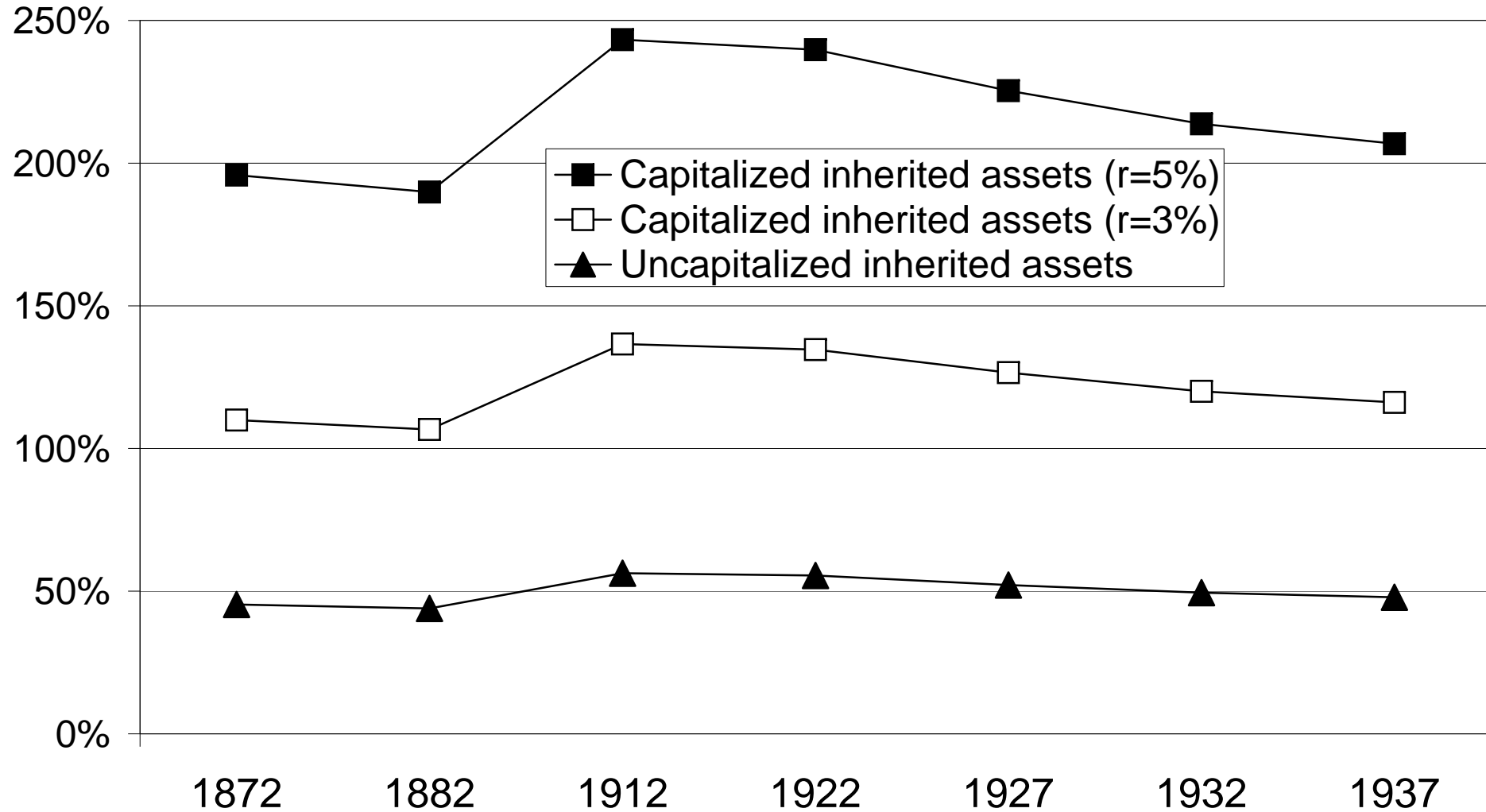


Figure 6: Rentiers in Paris, 1872-1937

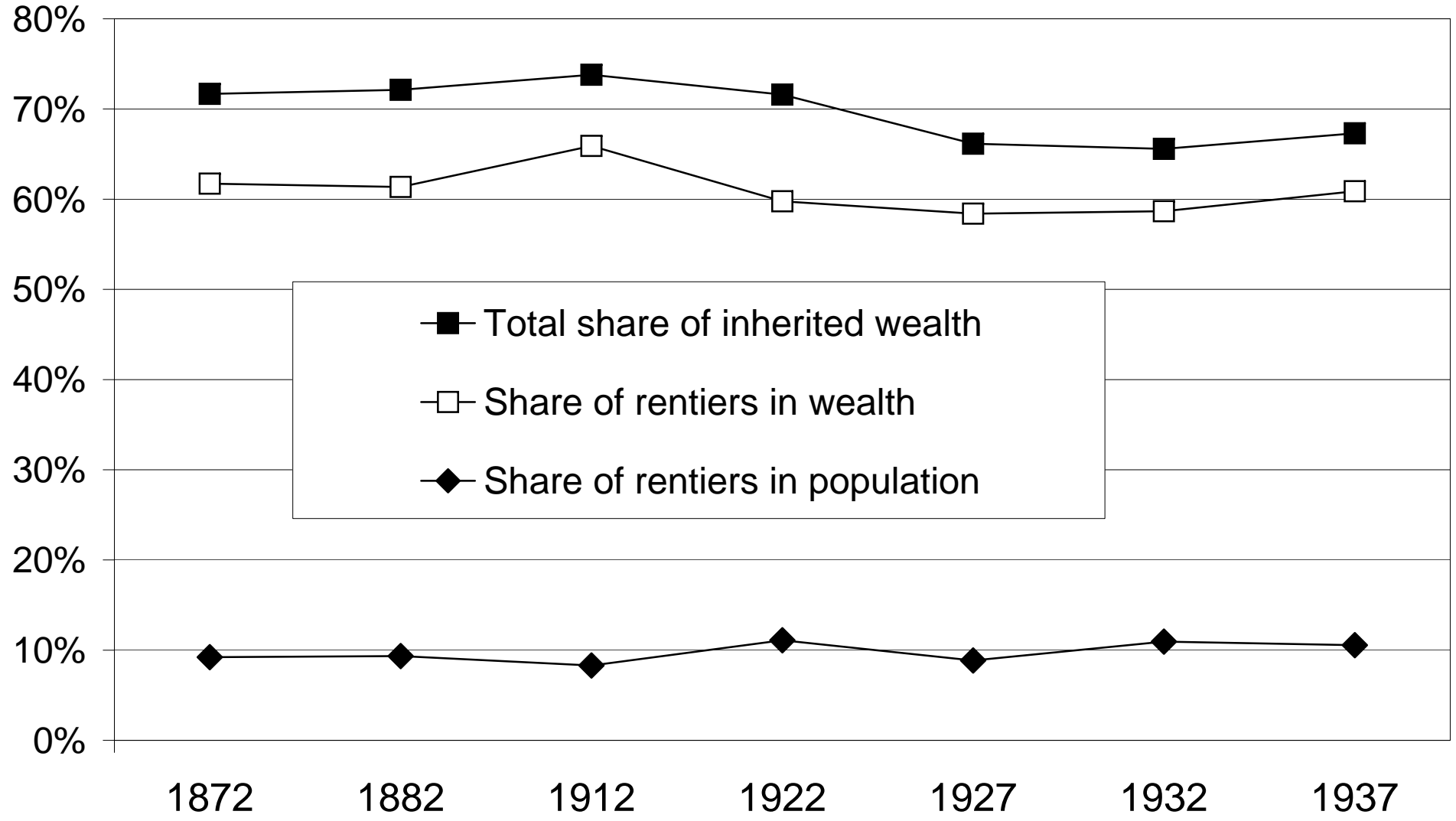


Figure 7: Paris 1912: a Rentier Society

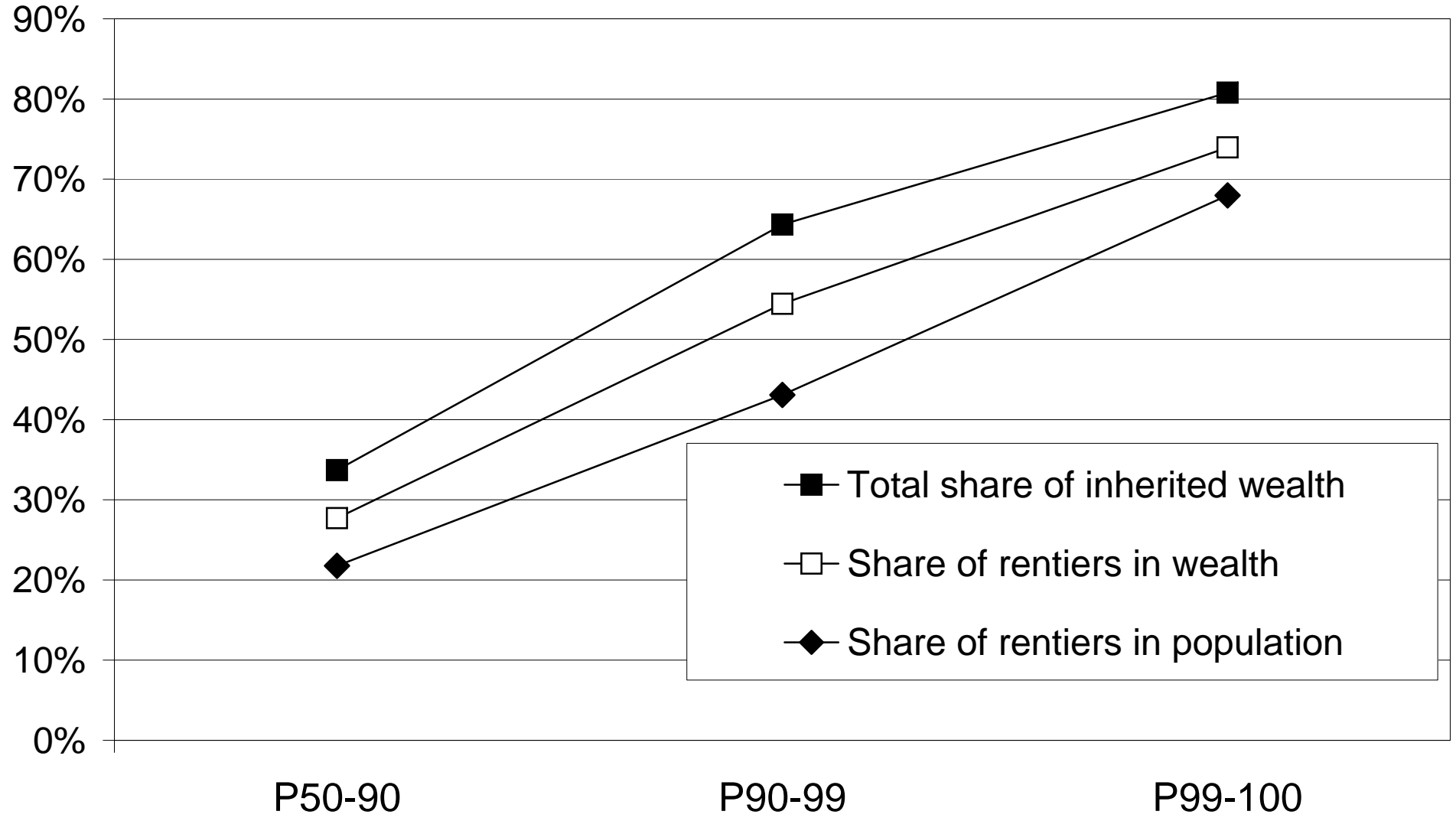


Figure 8: Rentiers by age group in Paris 1912

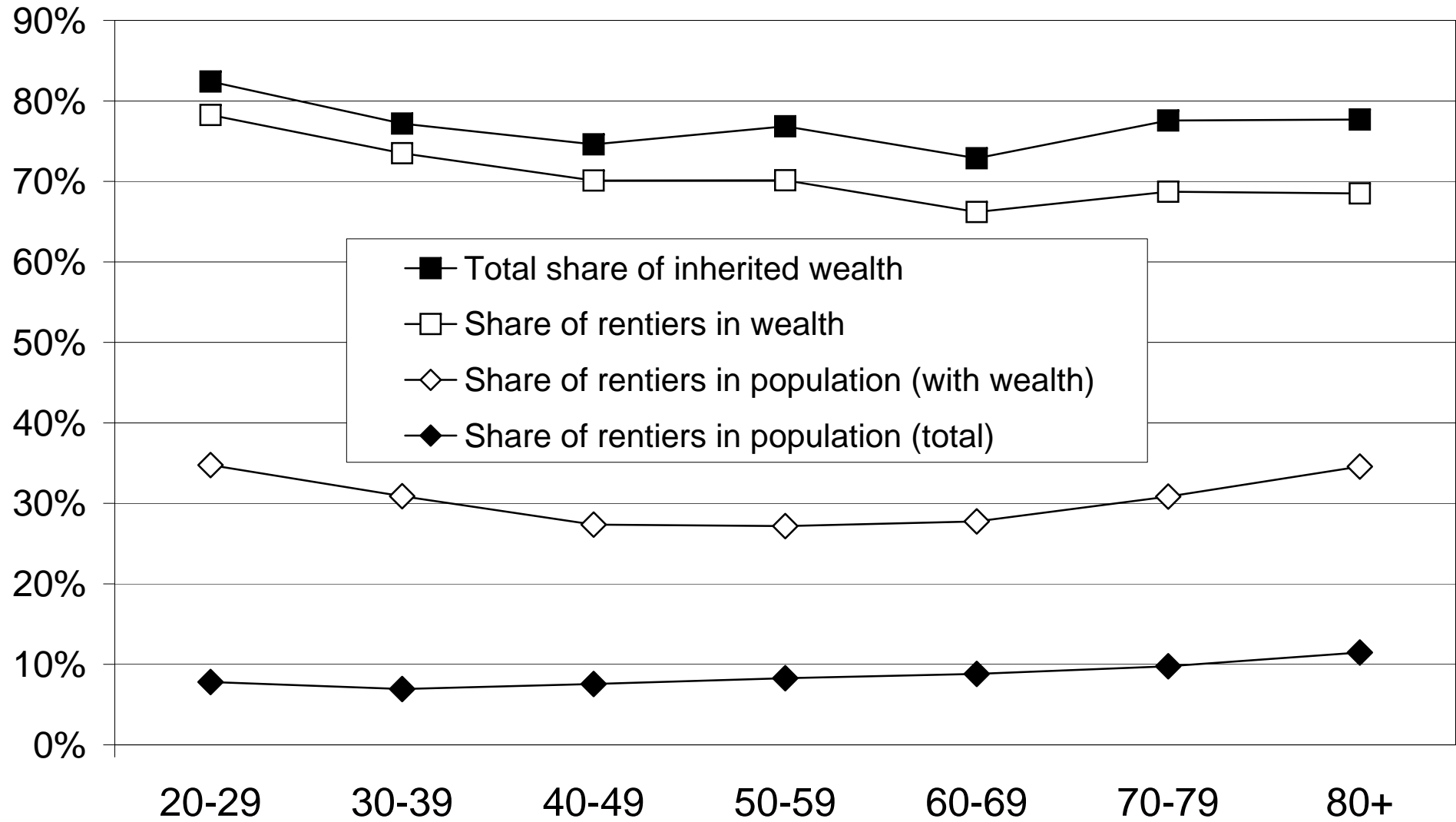


Figure 9: Robustness with respect to the rate of return

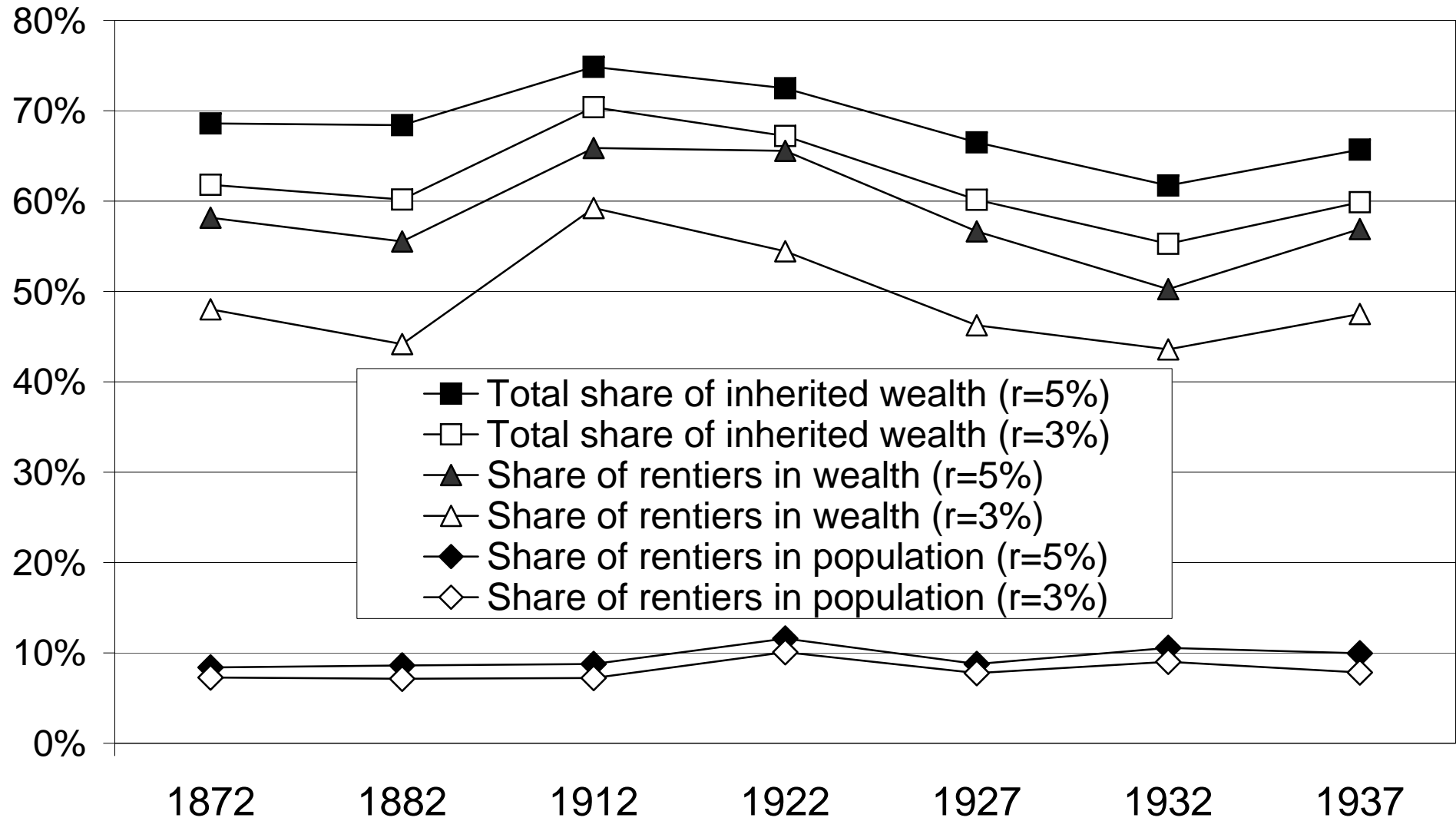


Figure 10: The Twin-Peak Distribution of Inheritance

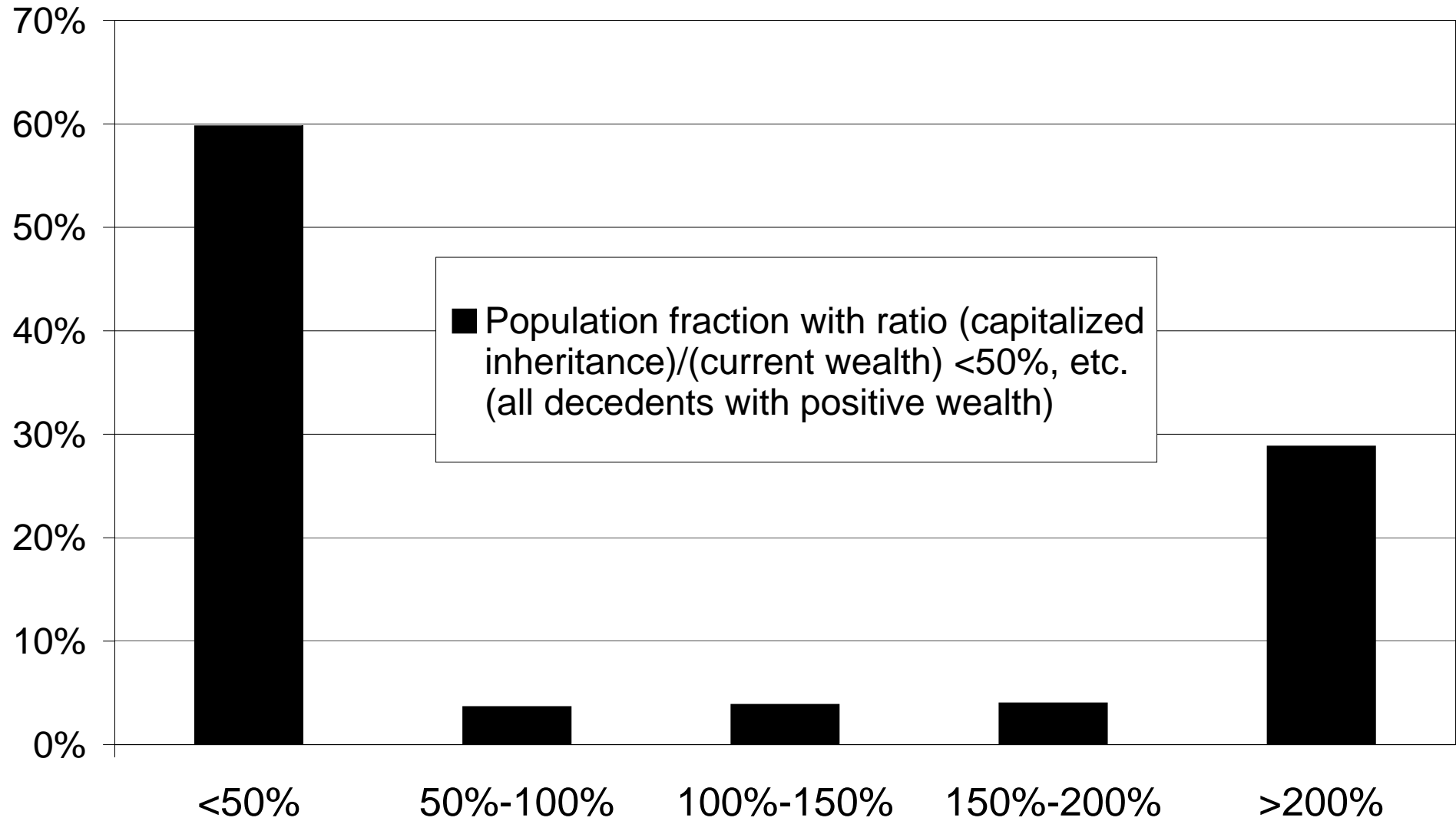


Figure 11: The Twin-Peak Distribution of Inheritance

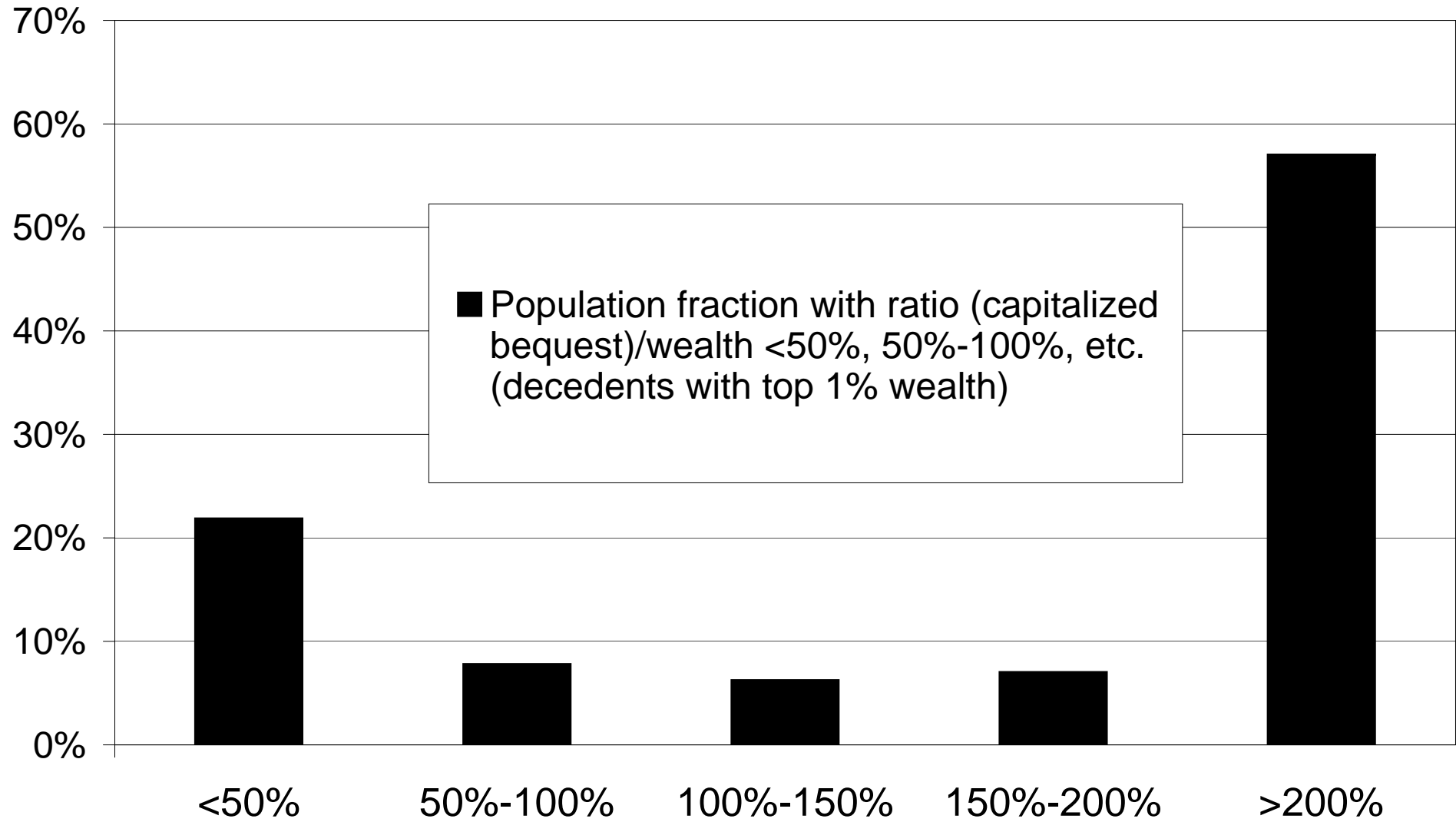


Figure 12: The living standards of top 1% Paris rentiers

(multiples of average labor income)

