Elite Demography and the Concentration of Wealth, Theory and Evidence

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Abstract

This paper is a contribution to the study of the effect of demography on wealth inequality. The paper focuses on demographic distinction i.e. a situation where the reproduction rate of an individual is increasing or decreasing with wealth. We present several measures of the reproduction gap between top wealth holders and the rest of the population in France during XIXth and XXth centuries. Cross-regional analysis shows a first evidence of an effect of demographic distinction on the level of wealth concentration in the long run. In particular we show that a smaller rate of heirlessness or a larger sibship size among the top in one generation is associated with lower wealth inequality at the next generation. We analyse then in a theoritical way the effects of demographic distinction with a two-classes model of wealth transmission over multiple generations. The model helps to compare the effects of demography to those of marriage technology, inheritance policies and class-specific wealth accumulation patterns. We simulate the model with the parameters observed in the French data and show that small differences of reproduction rate strongly affect the long run distribution of wealth.

Keywords: Inheritance, Inequality, Pareto Distributions, Reproduction Rates, Heirlessness.

JEL Codes: D31, J10.

1 Introduction

Economic theory has long recognized a role to demography in the dynamics of wealth inequality. Population growth is one of the equalizing forces identified in the seminal paper of Stiglitz (1969) based on the Solow growth model. In the long term (and if the legacies are egalitarian) Stiglitz shows that the speed of equalization of the distribution is an increasing function of the growth rate of the population n. Higher n redistributes indeed capital among a greater number of individuals in each generation. In the Solow growth model this phenomenon increases capital accumulation in the poorer classes more than in the richer ones, which equalizes wealth. Using the same class of models Piketty (2011) emphasizes the role of the *baby-boom* in the great compression of inequality observed in the 1960s and 1970s in France. In the r *versus* g framework a higher population growth means a higher g, hence a lower level of inequality.

The present paper emphasizes another channel through which demography can affect wealth inequality. We show that the concentration of wealth depends on the difference of reproduction rate between rich wealth holders and the rest of the population. Empirical evidences and theory suggest that a higher reproduction rate in the top wealth holders significantly decreases wealth inequality. As we will see wealth division of inheritance among a larger number of heirs at the top acts indeed as an equalizing force.

Class-specific demography or as we call it *demographic distinction* is discussed by Stiglitz in his article of 1969, but the constraints of his model does not allow to draw general conclusions on the distribution of wealth. To our knowledge no study has focused since then on this particular question. We try to show here that demographic distinction is as important for inequality as other well-studied forces such as inheritance policy or marriage technology.

Richer and poorer individuals are facing different economic incentives and have unequal access to food and health services. In low income economies this has led to major divergence of demographic structure between top and low income groups (see Deaton (2013) on the issue of life expectancy). Demographic distinction itself is also a by-product of wealth inequality, that has so far retained rather small attention among economists. It is however a well-known and studied phenomenon among historians, since the classical study of Hollingsworth (1964). This work focuses on the British peerage and hence gives access to the top 1% - a population particularly hard to sample in historical records. Its main conclusion is that the members of the high aristocracy born during XIXth century had lower reproduction rates than the average population of England and Wales. More recent work have completed our knowledge on demographic distinction in England. Clark and Hamilton (2006) have shown that during XVIIIth century wealthier individuals had more heirs than average and were also less likely to be heirless. It confirms that the end of XVIIIth century marks the beginning of demographic transition characterized by lower reproduction rates for richer individuals. The implications of demographic distinction for inequality have not yet been studied although Clark (2008) has studied the effect of the *survival of the richest* before the industrial revolution in England on social mobility and innovation in the long run.

In this paper we provide new evidence of demographic distinction of the elite in France during the first half of the XXth century. We estimate the proportion of heirless (or childless) successions (p_0) and the average sibship of children (h) in the top and and the rest of wealth holders at national and regional level. We present longer series for the city of Paris for which we have data of particularly good quality, from 1812 to 1977. By focusing on France we have the opportunity to observe the regional variations of demographic distinction in a relatively homogeneous legal context in space and time. The inheritance policy has been unified since the late eighteenth century after the French Revolution, which replaced the many local rules. Moreover French Tax data are particularly rich, and cover all estates until the mid-XXth century.

On top of these new measures we provide empirical analyses of a link between demographic distinction and long-run concentration of wealth, through cross-regional analysis. This paper is the first to our knowledge to show a correlation between the reproduction rate differences by level of wealth in one generation and the level of inequality in the next generation. To do so we use data at French départmental level on demographic distinction in 1929-1930 and on wealth concentration from 1929 to 1955. We find that a larger reproduction rate in the top means a lower concentration of wealth at death in the next generation.

This paper is also a contribution to the theoretical analysis of the effect of demographic distinction. We propose a model of inheritance inspired by Cowell (1998) to measure the long term impact of the level of demographic distinction observed in our data. In our model the population is divided between two groups of individuals (the top 5% and the bottom 95%) characterized by specific reproductive rates. As in Stiglitz (1969) we use our model in order to analyze the effect of several equalizing and unequalizing forces. We compare the effect of demography with other factors affecting the long-term inequality, such as marriage technology, inheritance policies and class-specific wealth accumulation.

The paper is organized as follows. Section two gathers the empirical results of our study. We present our estimates of reproductive rate differentials between the top 5 % and other holders of wealth in France, then we test a regression model of the level of inequality at the departmental level in the 1950s on the spreads of reproduction observed in the previous generation. Section three presents the effect of demographic distinction on wealth concentration in a multiple generation inheritance-model with heterogeneous sibship size, calibrated on French data. We then use the model to compare the effect of demographic distinction with other equalizing or unequalizing forces. Section four discusses the links between demographic growth and demographic distinction. Part five concludes.

2 New measures on demographic distinction

French inheritance archives are well known for their quality since the work of Piketty (2001). They are the main source of this study. Using micro data sets and published tabulations, we construct a measure of family structures in the top 5% and among the other wealth holders in France for various years in the XIXth and XXth century. We then provide a first evidence of the effect of demographic distinction on wealth inequality.

As in Clark (2008) we call the average number of heirs in a population the *rate of reproduction* (r). To measure this rate we observe two demographic variables. The first one is the proportion of successions with at least one child, or *direct successions*.

We note this proportion dir which is equal to one minus the proportion of childless successions ($p(0)$). The other variable is the average number of heirs in direct successions, which we note h. As Clark we note $r = dir \times h/2$ so the reproduction rate is the number of living descendants by individual. Hence a reproduction rate of 1 means population stability. All the measures provided for France are observed at the time of the death of individuals. In the paper I note $r_{top}, h_{top}, dir_{top} = 1 - p_{0,top}$ the demographic variables observed in the top 5% and $r_{rest}, h_{rest}, dir_{rest} = 1 - p_{0,rest}$ those observed among the other wealth holders.

Estate returns are the main source of information of the paper. This document gives precise information on the wealth of the deceased and the number of heirs he has. Because children cannot be deprived from their inheritance by law in France since the French Revolution, the information on the number of children is of particularly good quality. Moreover from 1791 to 1955 inheritance taxation was beginning at first franc transmitted, so all wealth holders were supposed to file a return. Individuals with no estate did not have to file any document, so we cannot observe their demography. The paper focuses on wealth holders exclusively, who made about 50% of the deceased at national level during the period we are studying.

Let us begin with the measures obtained on demographic distinction. I start by the presentation of the measure in Paris, a city for which have data of particularly good quality. Then I present the estimation of demographic distinction at départemental level at the beginning of XXth century, and at national level.

2.1 Reproduction by level of wealth in Paris, XIXth-XXth century

Let us start with the city of Paris. We dispose for this city of complete a micro data set of successions for various years between 1812 and 1977. We have universal data at individual level thanks to the work of Piketty, Postel-Vinay and Rosenthal (Piketty *et al.* (2006) and Piketty *et al.* (2014)). For every year available we distinguish individuals who are below and above P95 of wealth at death. Among top 5% we distinguish top 1% and next 4%. For the different groups we observe the proportion of childless successions ($p(0)$) and the average sibship of children in the successions with at least one child (h). These two variables enable us to compute the reproduction rate by individual ($r = dir * h/2$).

Figure 1 presents the evolution of the proportion of heirless successions from 1812 to 1977. We see that until the mid XXth century the probability to die heirless is clearly declining with the level of wealth of the individual. In the top about one quarter of individuals dies childless, a proportion which is very stable during XIXthe and XXth century. Below the top a very large proportion of individuals died childless in the city of Paris. This proportion is as high as 45% at the end of the XIXth century and declines progressively to 40% then 35% during XXth century.

"Figure 1 about here"

Figure 2 gives the average sibship of children in top and below top successions between 1872 and 1977. We see again a clear link between wealth and demography. In the long run average number of children is about 2.5 in the top 1%, 2.1 in next 4% and below 2 among the rest of the successions. Again the demographic structures seem to be very stable over a century. The only noticeable trend is the decline of h in the group below top 5% from 1.9 to 1.7 over the period.

"Figure 2 about here"

Combining the data on heirlessness and on sibships of inheritors we see that the reproduction rate r is clearly increasing with wealth all over the period. This come from the fact that top wealth holders had a higher probability to have children and those who had children had larger sibships than in the rest of the population. Despite some variation of h and p_0 over time the hierarchy between the top and the rest of the population stays the same over one century (see table 1).

"Table 1 about here"

How can we explain these huge differences between the different groups of Parisian wealth holders? Marital Status at death do not seem to play a role. There is small difference in the proportion of singles/married individuals in the different groups. The vast majority of heirless were married in all the classes. However a key element is the heterogeneity of age of marriage. It is well known that age of marriage was a key regulator of fertility in France since at least the end of XVIIIth century (Weir (1984), Murphy (2015)). Parisian middle class individuals seem to have regulated their fertility by marrying significantly later than the individual of the top percentiles. Age of first marriage[1] was particularly high in the middle class: 26.7 in 1872-1882, 27.6 in the Interwar Period. By comparison in the top 1% it was 22.9 in 1872-1882 and 24.8 in the Interwar Period. In the middle class a large proportion of individuals married too old to have children.

One is also struck by the extremely low levels of reproduction of wealth holders in Paris since XIXth century. Below top 5% wealth holders have a reproduction rate significantly below one which is the rate that assures population stability over time (if life expectation do not vary from one generation to the other). Without immigration a population with $r = 0.5$ would be divided by two at each generation. By comparison the top percentiles have reproduction rates closer to 1 which means that population stability is almost attained in these categories. Still the rates are below one in this group, except in the years 1947-1952.

2.2 Estimating reproduction of top wealth holders in French départements, 1929-1955

We do not dispose of joint distributions of wealth at death and family structures for other French départements as we do for Paris. Nevertheless for the years 1929, 1930 and 1955 the fiscal administration has published tabulations that enable us to estimate r_{top} and r_{rest} at département level. One the one hand we dispose of the distribution of successions by tax bracket and by département. On the other hand for each département we dispose of information on successions by number of children. We can observe how many successions were filed with n children and the corresponding amount of wealth.

Combining the different sets of information we can compute the distribution of

[1] I excluded from the computation individuals married twice or more to have a measure of the age at first marriage

sibship size in successions of the top 5% and the rest of the wealth holders. The estimation is possible by considering the hypothesis that within top 5% and the rest of wealth holders the number of children does not increase with the level of wealth. With this simplifying hypothesis the $p_{i,top}$ and $p_{i,rest}$ are the solutions of systems of two equations and two unknowns[2]. The estimations we obtain for the Seine département - in which Paris made about half of the population - are coherent with what we observe in the Paris estate data. For example in 1929 we find a rate of heirlessness of 25% in the top 5% and of 37% among the other wealth holders. Average sibship is 2.7 in the top and 2.1 outside the top. The order of magnitude of $r_{top} - r_{rest}$ is about the same as in the Paris estate data set (above 30 percentage points).

Our estimation gives a general picture of demographic distinction in France in the first half of XXth century. The first result is that in the vast majority of French territory top wealth holders were less likely to be heirless than the other wealth holders. In 1929 $p_{0,top}$ was inferior to $p_{0,rest}$ in 75% of the départements. This proportion increases to 86% in 1955. At this time only a few rural départements of the west and center of the country have a larger proportion of heirless (or a lower proportion of direct successions) among the top.

There is more heterogeneity between territories when it comes to differences of sibship size. A higher h in the top does not mean necessarily a higher p_0 although we find a (small) positive correlation between $h_{top} - h_{ref}$ and $dir_{top} - dir_{ref}$ (0.27 in 1929 and 0.22 in 1955). In 1929 the country is split in two halves as only 42% of the départements have larger sibships in the top. As we can see in figure 3 this group contains the major urban areas of Paris, Lyon, Marseille. In these three cities $h_{top} - h_{rest}$ was equal to 0.5 or more. At the same period in about 20% of the départements we observe $h_{top} - h_{rest} < -0.35$. Between 1929 and 1955 the proportion of territories where sibship are more numerous at the top increases sharply, from 42 to 61%. Paris, Lyon and Marseille are still in this category, joined by a lot of départements in the North of France. Some regions like Brittany experiences however a change in the opposite direction. The reasons of these changes are not studied in the paper. Such a study would require good information on economic

[2]The identification strategy is presented in detail in the appendix.

and cultural changes of the different territories as well as a good understanding of the demographic consequences of World War One.

"Figure 3 about here"

Finally we have computed the difference of reproduction rate between the top 5% and the other wealth holders. Figure 4 shows the repartition function of French départements according to $r_{top} - r_{rest}$ for available years. In 1929 reproduction rate is decreasing with wealth in about 45% of the départements. The proportion decreases sharply to 20% in 1955. We see a clear shift to the right of the repartition functions over time, but variance stays about at the same level. The difference of level of reproduction rate distinction observed between the highest and lowest quartile of départements remains relatively constant over time.

"Figure 4 about here"

Finally we show in table 2 the difference of reproduction rate for France's largest urbain areas. Lyon and Paris are clearly in the highest quartile of départements at both periods.

"Table 2 about here"

2.3 Elite demography in France, 1898-1950

In order to estimate the demographic structures in France we have used the tabulations published on successions by number of children for years 1898, 1929, 1930, 1949 and 1950. We note that French demography of wealthholders was very stable for generations deceased in the first half of XXth century. The average number of heirs was 2.5 in 1899, 2.45 in 1929, 2.44 in 1949 and 2.42 in 1950. The proportion of heirless in the successions is also stable over time 26% in 1898, 23% in 1929, 23.4% in 1930, 24.9% in 1949, 24.5% in 1950.

One can be surprised again by the high proportion of heirless individuals. The importance of this phenomenon is however well known by historical anthropologists since the work of Goody (1983) that showed that a large proportion of elite members have died childless in European societies from the medieval era to the XVIIIth century. Goody gives the figure of 20% of heirless in nobles families, a figure which is often cited by historical anthropologists (Nassiet (1995)). We see here that the same kind of proportions are observed in France until XXth century, a phenomenon thas been understudied by economists and economic historians.

Table 3 shows our estimates of r_{top} and r_{rest} at national level. According to our computations reproduction rate was about the same in the top and the rest of the wealth holders in 1898. It was significantly higher in the top in 1929-30 and even more so in 1949-1950[3]. As we can see the higher reproduction rate at the top after 1929 is explained both by larger sibships and larger proportion of direct successions (i.e. lower share of heirlessness). We also computed an estimation of reproduction rate for the very top of wealth distribution in France (top 0.5%) in 1949-1950. We see that this rate is significantly larger than the rate of top 5% at the same period. We note that the gap between top 0.5% and wealth holders outside top 5% is as high as 0.25 at national level.

"Table 3 about here"

2.4 Demography and inequality: a cross-regional analysis

We present now the first empirical evidence of a correlation between demographic distinction within a generation and wealth concentration in the following generation. This evidence is provided by the analysis of the data on wealth and demography at French local level between 1929 and 1955. The first step is to have a measure of the evolution of wealth concentration over time from one generation to the other. Thanks to tabulations of wealth by tax bracket we have measured the average share of top 5% in total wealth in 1929-1930 and in 1954-1955, so two periods separated

[3]The estimation technique for years 1898 and 1929-1930 is the same than the one used for the departemental data and is explained in the appendix. The estimation for 1949-1950 are based on data of number of children by tax bracket at national level.

by one generation[4]. The results are presented in Figure 5. Our measure of the evolution of wealth concentration is simply the difference between the two shares. Demographic distinction is measured by $r_{top} - r_{rest}$, $h_{top} - h_{rest}$ or $dir_{top} - dir_{rest}$ (with $dir = 1 - p(0)$) in 1929-1930. We regress the evolution of wealth concentration on demographic distinction using an OLS model.

"Figure 5 about here"

The variation of top 5% share is also regressed on several control variables at département level that can explain the evolution of wealth concentration between 1929 and 1955. The first one is the initial level of the top 5%'s share observed in 1929-1930. We also add a fixed effect for Paris Region (nowadays Ile-de-France). We control also for the evolution of the proportion of the deceased with a succession observed between 1929-1930 and 1954-1955. This proportion has been stable in France during the first half of XXth century (50% in 1900, 55% in 1929 and 51% in 1955), but it is not necessarily the case at the local level. For example in rural areas the proportion of successions decreased sharply over time until World War One due to the crisis of small land-ownership and the development of the working class (Bourdieu *et al.* (2008)). Finally we control by two measures for local inheritance policy: the proportion of successions set by will (in 1928) and the proportion of wealth transmitted through inter-vivos gifts (observed in 1900). Although equal division of inheritance was implemented nationaly at the end of XVIIIth century, some differences in inheritance practices survived until XXth century. For example early donation was common in the southern part of France to favor one inheritor in XIXth century (see Rosental (1991)), a fact still observable in the data of 1900.

The result of the regressions are summed up in table 4. We obtain statistically significant estimates of the demographic variables. An increase of one point of $r_{top} - r_{rest}$ is associated with a decrease of about 4 percentage points of the share of top 5% in the département. We obtain a negative effect of sibship size gap ($h_{top} - h_{rest}$), and of direct succession gap ($dir_{top} - dir_{rest}$) on the top 5%'s share. More children in the top - in the form of larger sibship or of lower rate of heirlessness -

[4] Top 5% share is computed in 1929, 1930, 1954 and 1955 thanks to Pareto interpolation technique (see appendix).

is associated with a significantly lower concentration of wealth. It is also interesting to note that inequality increases with the level of unequal sharing of inheritance (measured by the wills or donations), and decreases as the share of the dead with successions increases.

"Table 4 about here"

We have seen in section 2 that differences of reproduction rate between the elite and the rest of the wealth holders are common in historical data, and seem to have an effect on wealth distribution. In the following section we develop a simple model of inheritance to understand the long term effect of demography, in comparison with other equalizing or unequalizing forces.

3 Modelling the effects of class demography

In this section we construct a model to capture the effects of demographic distinction on wealth inequality in the long run. The growth model of Stiglitz (1969) considers the possibility of a different reproduction rate between the poor and the rich. But in the model $r_{poor} \neq r_{rich}$ means the disappearance of one of the two group in the long run. This comes from the construction of the model itself, in which population is divided into groups with no inter-marriage between groups. Hence when for example the richest group has a reproduction rate below average, it gradually disappears and is replaced numerically by the poorest group. Eventually the poorest group represents almost all of the population. Nevertheless in this situation - as Stiglitz notes - the declining richer group maintains a significant share in total wealth.

We have adopted the more simple and flexible model of inheritance developped by Cowell (1998). In his paper Cowell considers a simple model of multiple generations in which all individuals of all the generations have the same characteristics except their number of heirs. During their life individuals accumulate wealth at a rate β, and marry one individual. At the end of their life all individuals have i heirs with probability p_i. The heterogeneous number of children creates upward and downward mobility at each generation. Cowell shows that the equilibrium distribution of wealth of this model is *Paretian*. Moreover the level of wealth concentration is a function of the probabilities p_i to have i children (since all individuals are equal in all other dimensions of the model). In the long run the few single inheritors from single inheritors end up with large estates, whereas the many inheritors from generations of large sibships end up with small ones. A consequence is that a higher proportion of large families and/or families with one child gives a higher degree of wealth concentration of wealth. Cowell notes himself (p12) "Increasing the spread of family size increases the inequality of wealth distribution".

We use this model first to have an idea of the effect of the variation of h on the long-run distribution of wealth, when there is no demographic distinction. We have estimated the distribution of wealth by simulation of successive generations using the demographic parameters observed in the French data. We consider a population divided into two groups (the top 5% and the bottom 95%) with no demographic distinction between the two groups. Marriage are possible only within groups, inheritance is divided equally among heirs, and wealth is accumulated at a constat rate β[5]. The simulations consist of an iteration of the following steps for each generation t:

- Marriages in generation t within top 5% and bottom 95%.
- Inheritance from parents of generation t to children of generation t+1.
- Determination of the top 5% members of generation t+1.

Table 5 gives the long run distributions of wealth obtained thanks to simulations over 100 generations. We have considered three set of probabilities: the highest and lowest decile of French départements in 1929 ranked according to h and one intermediary case (respectively h=2.2, h=3.4 and h=2.8). For this set of parameters we see that wealth concentration decreases as h increases. This comes from the declining share of only children. But the effect of h is relatively small. An increase of h of almost 55% decreases the share of top 5% of about 9%. In the intermediary case ($h = 2.8$) the equilibrium share of top 5% is about 70%.

"Table 5 about here"

[5] β has been set arbitrary to one. According to our simulations it does not appear to play any role in this setting.

3.1 A model with family differentiation

We now introduce demographic distinction into the model. At each generation a member of top 5% (respectively of bottom 95%) has k children with probability $p_{k,top}$ (respectively $p_{k,rest}$). We begin with a situation where no individual dies heirless (This hypothesis will be relaxed at the end of this section). In the model the probability to have children of an individual depends exclusively on his relative position in the distribution of wealth. Familial history has no effect on individuals: drop-outs from the top behave the same way than individuals with parents who were in bottom 95%, promoted individuals behave as those with parents in top 5%. Again, as in the version without demographic distinction, heterogenous family size is the only force creating upward and downward mobility. There is no simple way to deduct the equilibrium repartition of wealth of this model analytically. The solution is to use simulations over multiple generations.

We consider a limited number of cases where $h_{top} \neq h_{rest}$ drawn from the measures obtained at the French départemental in 1929-1930. The case where $h_{top} = 3$ and $h_{rest} = 2.5$ corresponds to the average values of the quartile of départements where $h_{top} - h_{rest}$ is maximum. In the opposite case we have $h_{top} = 2.35$ and $h_{rest} = 2.8$. These are the values h_{top} and h_{rest} observed in the quartile of départements where $h_{rest} - h_{top}$ is largest. In a sense we focus on situations of rather moderate or realistic differentiation of reproduction (h_{top} represents 80% to 120% of h_{rest}), not on all the possible cases. In the different simulations we compare the effect of these configurations to one without demographic distinction (our intermediate case where $h = 2.8$).

In the following sections we start by considering a benchmark situation with equal division of inheritance, random marriages within groups (no intermarriage) and same lifetime wealth accumulation in the two groups. Then we relax each of these hypotheses and analyse how each one affects the outcome of the model. In the final part of the section we consider the case where a share of the population dies heirless. In the various scenarios we keep the same demographic parameters all along. For each set of hypotheses we compute the corresponding equilibrium distribution of wealth using simulations over a large number of generations[6].

[6]The simulations start with an egalitarian distribution of wealth. Our estimator of the equilib-

3.2 Benchmark Simulation

In the benchmark we consider three hypothesis. First, inheritance is divided equally among inheritors. Second, there is no marriage between groups, so individuals of top 5% marry with each other only. Third, the rate of accumulation of wealth of individuals is the same in the top 5% and in the bottom 95% ($\beta_{top} = \beta_{rest} = \beta$). At each generation an individual born of parent i and j in a sibship of k children inherits $\beta(W_i + W_j)\frac{1}{k}$, where W_i and W_j are the amount of wealth inherited by parent i and j.

Table 6 presents the result of these benchmark simulations. In the situation with no demographic distinction we have already noted that the share of top 5% in total wealth is around 70%. We see here that when reproduction is increasing with wealth the share declines very sharply. Simulation 1 - where $h_{top} > h_{rest}$ - gives a share of about 35%, about half as the situation without demographic distinction. When reproduction rate is decreasing with wealth on the contrary wealth concentrates totally within top 5%. Simulation 1 gives lower level of inequality than simulation 3, even if h of the whole population is larger in simulation 1. Demographic distinction has a much stronger effect than demographic growth itself in this modelization, at least for realistic demographic situations.

"Table 6 about here"

In the next sections we would like to compare the magnitude of this effect with those of others forces. The litterature has focused on many equalizing and unequalizing forces on wealth. For example the rich can accumulate wealth at a higher rate than the poor, due to higher saving rates (Stiglitz (1969)), or higher rate of return of investment (Piketty (2014)). Marriage technology can also affect wealth concentration (Cowell (1998), Goni (2013)). Last but not least some inheritance policies can exert a very strong effect on wealth inequality, as a lot of scholars have tried to show (see Atkinson (2013) for a discussion). In the next parts of section 3 the effect of these equalizing and unequalizing forces, one at a time. We show that demographic distinction has to be considered as a force as important as those traditionnaly studied in the litterature.

rium level of wealth corresponds to the average obtained of generation 90 to 100.

3.3 Intergroup marriages

We begin by studying the interaction between demographic distinction and marriage technology. In the benchmark simulation we have no inter-group marriages. We relax here this hypothesis by allowing a proportion of the top 5% wealth holders to marry outside the group[7]. In the various simulations presented in table 7 we consider a proportion of inter marriage varying from 15% to 50%.

"Table 7 about here"

Intermarriage plays as an equalizing force on wealth distributions in our model as we can see in table 7. It is to note however that only large proportions of intermarriage are likely to attain the kind of effect with found for a 20% demographic distinction. In the case $h_{top} < h_{rest}$ (simulation 3) a proportion of intermarriage of 15% do not prevent the share of top 5% to converge to 100%. Even when 50% of top 5% marries outside the group the concentration of wealth remains high when $h_{top} < h_{rest}$ (in this case the share of top 5% is as high as 50%). Without demographic distinction a proportion of intermarriage of 50% gives a share of top 5% of 35%. This corresponds roughly to the share observed in the benchmark when $h_{top} > h_{rest}$. Finally we see that even when the proportion of intermarriage is very large (50%), demographic distinction create important differences of wealth concentration.

3.4 Unequal division of wealth

We now pass to the effects of unequal division of wealth among inheritors. We consider that the first born of each family (in the top 5% and in the bottom 95%) receives x% of the parents' wealth. The rest of the wealth is then divided equally among the other heirs. We consider the cases where x is equal to 50, 65, 75 and 100.

We see in table 8 the strong effect of unequal inheritance policies on wealth concentration in the model. In order to compare this effects of inheritance rules and demographic distinction, let us focus on the case where reproduction rate is increasing with wealth (simulation 1). In this case when the first borns receive two thirds of total wealth, the share of top 5% is equal to 69%. This is about the share

[7]We simulate the marriages with the constraint that the average number of heirs remains equal to h_{top} among top 5% members, and to h_{rest} in the rest of the population.

of top 5% in the benchmark with no demographic distinction. Eventually when the first born receives 100% of wealth (full primogeniture), demographic distinction does not play any role in the long run.

"Table 8 about here"

3.5 Heterogeneous wealth accumulation

Heterogeneous wealth accumulation patterns correspond in the model to $\beta_{top} \neq \beta_{rest}$. This can correspond to different saving patterns between the top 5% and the rest of the population, or to different rate of return on investment. We see clearly in table 9 that even small differences of wealth accumulation create huge effect on wealth concentration. In particular when accumulation is 25% lower in the top than in the rest of the population then the share of top 5% is close in the three simulations. When $\beta_{top} > \beta_{rest}$ however the concentration of wealth is significantly lower when reproduction is increasing with wealth.

"Table 9 about here"

3.6 Heirless individuals

We finish the theoretical analysis of the effects of demographic distinction by focusing on the issue of heirless individuals. This question has been under-studied, although it has implications for inequality and taxation. We have seen that a large proportion of individuals die without children in the French case. Yet the wealth of heirless individuals is not lost for the next generation. It is indeed transmitted within extended family. Hence a higher p_0 in a population increases the proportion of wealth transmitted in collateral lines and increases the average inheritance per capita. We want here to measure the long term effect of a different probability to die heirless in the top and in the rest of the population.

To study this question we introduce in the model a proportion of individuals dying with no child. For simplicity we consider that these individuals transmit their wealth randomly to one married couple of their group (top 5% or bottom 95%)

and generation[8]. An important hypothesis in the model is that individuals with no surviving children at death accumulate wealth at the same rate than others. This position is supported by the work of Hurd (1987) who shows that childless individuals do not save less than the rest of the population[9].

We introduce a difference of proportion of heirlessness in the top and in the rest of the population. The members of the elite can be heirless with probability $p_{0,top}$ or marry and have k children with a probability $p_{k,top}$. The individuals outside the top die heirless with probability $p_{0,rest}$ or marry and have k children with a probability $p_{k,rest}$. For the simulations we have kept the three distributions of number of children of the benchmark (one with $h_{top} > h_{rest}$, one with $h_{top} = h_{rest}$ and the last with $h_{top} < h_{rest}$). We simulate a higher rate of direct succession in the top, considering that $p_{0,rest} = 0.25$ and $p_{0,top} = 0.18$. These are the parameters observed in the quartile of French départements with largest $h_{top} - h_{rest}$ in 1929.

The outcome of the simulations are presented in table 10. We see that a rather small gap of heirlessness creates significant differences of wealth concentration in the long run. In the case where $h_{top} = h_{rest}$ for example we obtain a share of top 5% of 41% when $dir_{top} > dir_{rest}$, which is significantly inferior to the 70% of situation in absence of difference of heirlessness (benchmark situation presented in 3.2). The heirlessness gap we simulate does not have any effect on wealth concentration when $h_{top} = 2.3$ and $h_{rest} = 2.8$ (the share of top 5% maintains at 100% in the long run). In this case the simulated heirlessness gap is not sufficiently strong to overcome the sibship gap. But it considerably slows down the phenomenon of wealth concentration. Actually a difference of proportion of direct succession has the same equalizing effect of a difference of sibship size.

"Table 10 about here"

Section three has shown that demographic distinction created by higher/lower sibship size or heirlessness in the top has important effect on the concentration

[8] A consequence of this hypothesis is that the proportion of heirless individuals does not affect wealth inequality in the model if the proportion dir is the same in the top and in the rest of the population.

[9] Inheritance tax rates vary according to kin relationship in a lot of countries (Beckert (2008)), which is not taken into account in the model. Studying wealth transmission in a context of high taxation would require to include several inheritance taxation schemes in the model as well as elasticities of wealth with respect to taxation rates.

of wealth in the long run. We note that this effect is - at least in our model - significantly larger than the effect of demographic growth of the whole population. Larger demographic growth is associated in the economic litterature with more equal distribution of wealth. While this effect exists we want to discuss the fact that high levels of population growth have been associated historically with below average reproduction rate at the top. This is the case during the episodes of demographic transitions. For this reason we think that larger demographic growth is likely to be associated with more unequal distributions of wealth. We discuss this question in the last section.

4 Further comments on Demographic Growth and Demographic Distinction

The model of inheritance based on the Solow Growth model used among others by Stiglitz (1969) and Piketty (2011) predicts that a larger population growth means a lower level of wealth inequality. This is explained in the model by the fact that population growth decreases the ratio of inherited wealth per capita and increases the growth of the economy. Poorer individuals are then more likelly to catch up with the richer one through savings on wages.

We want to discuss the fact that this simple relationship may actually not hold if there is a link between demographic growth and demographic distinction. Empirical as well as theoretical elements suggest indeed that higher demographic growth can be associated with higher levels of inequality. Historically the contexts of high rate of population growth - such as demographic transition - were characterized by below average reproduction rate among the elite ($r_{top} < r_{rest}$).

First of all at French local level départements we find a negative correlation between the average reproduction rate r of all wealth holders and $r_{top} - r_{rest}$, in 1929 and 1955 (see figure 6 for year 1929). In other words when r increases then r_{top} decreases relatively to r_{rest}. This result gives evidence of a relationship between demographic growth and demographic distinction, at least during demographic transitions.

"Figure 6 about here"

The comparison between France and England seems to confirm the link between demographic growth and demographic distinction. Contrary to England and the rest of Europe France has experienced a very early demographic transition, and was characterized by low fertiliy rates by international standards during XIXth century. Until World War II Population growth was very rapid in England and very slow in France as we can see in figure 7. French population plateaud between 1860 and 1950 at about 40 million whereas English population doubled from 20 to 40 million. Demographic transition began at the end of the XVIIIth century and was almost completed in the middle of the XIXth century (Weir (1984)). By comparison the English Demographic Transition lasted one century and was completed in the middle of the XXth century (Rothery (2009)).

"Figure 7 about here"

Yet the higher level of population growth has not make England more equal than France as far as wealth is concerned. On the contrary wealth inequality increased more rapidly in France than in England during XIXth century as we can see in table 11[10]. This contradicts the prediction of the Solow-based model, although other variables could explain this divergence (England was marked by unequal inheritances and married women could not inherit property until 1882 according to Rubinstein (1981)). However we think that higher population growth in England than in France resulted actually in higher level of inequality in England because of demographic distinction[11].

"Table 11 about here"

We know since the work of (Hollingsworth (1964)) that English wealthy class (at least in the nobility) had significantly lower reproduction rate than average in the middle of the XIXth century. The results of this study have been largely confirmed

[10] We focused on the share of top 1% among top 5% in the table. Actually only 10% of wealth holders were taxed at death in XIXth century England which prevents us to compute the share of top 5% in the very long run.

[11] Cross-regional data shows also that a high r among wealth holders in 1929 is associated with larger inequality in 1955, contrary to the prediction of the Solow-based inheritance model.

and refined since then. Reproduction rates were increasing with wealth until XVIIIth century and decreasing after (Clark and Hamilton (2006)).According to Rothery (2009) fertility rates decreased in the landed gentry very early and confirms the vision of elites being forerunners of the demographic transition. We note that according to Anderson (1998) that the reduction of the rate of reproduction of the elite was created by an increased rate of heirlessness. The estimations of reproduction rate by Hollingsworth are presented in table 12. $r_{top} - r_{rest}$ ranges from -0.1 to -0.25 for generations born from the 1820s to the 1870s and (presumably) deceased between the 1880s and the 1920s.

"Table 12 about here"

In demographically stagnant France on the contrary we have observed in section 1 very little if any demographic distinction for the generation deceased at the end of XIXth century. Over time as demographic transition is completed the two countries seem to converge to the $r_{top} > r_{rest}$ configuration, as figure 8 shows.

"Figure 8 about here"

These empirical elements makes sense with theoretical model of the Unified Growth Theory proposed by Galor (2005). This model explains the transition from a malthusian economy to a modern economy with sustained growth of GDP by the increasing amount of physical and human capital per capita. An indirect prediction of this model is that societies in demographic transition are likely to be characterized by $r_{top} < r_{rest}$. In other words richer individuals are the forerunners of demographic transition (they are the first to reduce their fertility). Richer individuals have indeed an incentive to reduce the division of physical capital among inheritors, which is not the case of poor individuals. Unified growth theory framework has been confirmed so far by a few historical works on demography (Murphy (2015)) and needs to be tested with more empirical material. We believe however that this mechanism is a strong candidate to explain the empirical relationship between demographic transition and demographic distinction.

Theoretical as well as empirical evidence in France and England suggests a link between population growth and demographic distinction. Reproduction rate seem to be increasing with wealth before and after the demographic transition and decreasing during demographic transition. A consequence of this result is that demographic transitions are likely to be periods of larger levels of inequality.

5 Conclusion

This paper shows the importance to study demographic structures to understand the dynamic of wealth inequality. It considers the effect of a gap of reproduction rate between rich wealth holders and the rest of the population. We present original measures of survival rates among top wealth holders in France during XIXth and XXth century, at national and local level. We show that reproduction rate of the top was above average at national level from 1898 to the 1950s. This reproduction gap seems to have increased signficantly over time. However demographic distinction was heterogeneous within France. In Paris reproduction rate of the elite is significantly above average since the beginning of the XIXth century. Large cities like Lyon and Marseille were also characterized by $r_{top} > r_{rest}$ during XXth century. In certain areas on the contrary reproduction rates was significantly below average. Between 1929 and 1955 more and more French départements seem to have converged to the $r_{top} > r_{rest}$ situation. This paper expands our knowledge of demographic distinction a topic for which so far only english data was available.

Second we have tried to show that demographic distinction matters for economic inequality. We have analyzed data of wealth concentration at French départemental level between 1929 and 1955. We show that the areas where $r_{top} < r_{rest}$ in 1929 are more unequal in 1955 all other things being equal. On the contrary areas where the elite has more children than average inequality is lower a generation later. A simple model of inheritance shows that even relatively small gaps of reproduction rate between the elite and the rest of the population has strong effect on the equilibrium level of wealth concentration. Inequality is significantly lower when sibship size are larger in the top. A lower proportion of heirless in the top results also in lower level of wealth concentration. We conclude that demography plays a role on inequality that is as important as inheritance policy or marriage technology in an economy.

In the last part of the paper we discuss the links between population growth and demographic distinction. Although the evidence are still limited we show that larger demographic growth in a population is associated with situations where $r_{top} < r_{rest}$ (this seems to be the case at least during demographic transitions). As a consequence larger demographic growth could be associated with larger degree of inequality.

This paper is a first step that will have to be completed by other studies to explain what drives demographic distinction in the first place. Demogaphy depends on economic factors but is also affected by cultural and historical factors. In a recent paper Murphy (2015) with data of French départements that demographic transition had economic but also religious reasons for example. Demographic distinction in a country or in a region is certainly affected by non-economic factors that need to be better understood.

After decades of precious work we now dispose of a measure of wealth inequality in relatively large number of Western countries in XIXth and XXth century. The present paper pleads for a development of comparative studies in order to explain the evolution of wealth concentration. This necessitates to have more information on wealth holders in the top and in the rest of the population. Cross-section data such as Censuses or wealth and inheritance taxation records are very good candidates in order to better understand the distribution of capital. Rather than large narratives on Capitalism or national cultures and preferences we need more understanding of the microeconomic forces that affect wealth concentration in the long run.

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Appendix

Identification of $p_{i,top}$ and $p_{i,m}$ at departemental level.

We present the identification of the demographic parameters at départemental level in 1929-1930 (the same methode was applied for year 1955). For each French département I observe p_i - the proportion of successions with i heirs - and W_i - the share of the successions with i heirs in inherited wealth. I make the hypothesis that within the top 5% and within the middle class the level of wealth has no effect on the probabilities of having heirs. Hence in each group the proportion of individuals with i heirs equals the share of these individuals in total wealth. In other words for all i we have:

$$\begin{cases} p_{i,top} = W_{i,top} \\ p_{i,m} = W_{i,m} \end{cases}$$

With $W_{i,top}$ and $W_{i,m}$ respectively the share of wealth of the top and the other wealth holders, detained by the individuals with i heirs. The hypothesis enables us to decompose p_i between $p_{i,top}$ and $p_{i,m}$. For all i, the estimates of $p_{i,top}$ and $p_{i,m}$ are computed by solving the following system of equations:

$$\begin{cases} p_i = p_{i,top}.P_{Top5} + p_{i,m}.(1 - P_{Top5}) \\ W_i = p_{i,top}.W_{Top5} + p_{i,m}.(1 - W_{Top5}) \end{cases}$$

With P_{Top5} the proportion of top 5% in the number of successions and W_{Top5} the share of the top 5% in total wealth.

The first information needed is the proportion of top 5% deceased in the number of successions (P_{Top5}). P_{Top5} is different from 5% because a large proportion of the deceased do not make any succession. In average in France in 1929-1930 the proportion of deceased without succession is about 50% of the population which means $P_{Top5} = 10\%$. This measure varies considerably from one area to the other. In Paris département (the *Seine*) in 1929 only a fifth of the deceased have a succession, so four fifths of the population are poor. As a consequence the proportion of the top 5% in the successions in the Seine is about 25%. I computed P_{Top5} with the number of successions and the number of deaths at departemental level. I observed the departemental data on annual deaths in 1929 and 1930, 1954 and 1955 in the *Annuaire statistique de la France* series. I observed the distributions of successions by number of siblings in the *Bulletin de Statistiques et Législation Comparée* series for 1929 and 1930 and in the *Statistiques et Etudes Financières* for 1955. W_{Top5} is estimated thanks to the Pareto interpolation technique described below.

Once P_{Top5}, W_{Top5}, p_i and W_i are known it is possible to compute $p_{i,top}$ and $p_{i,m}$ for all i. Let us take the example of Paris département. We have $p_0 = 0.3466$ and $W_0 = 0.257$ (averages of 1929 and 1930). In addition we have $P_{Top5} = 0.26$ and $W_{Top5} = 0.95$. To find $p_{0,top}$ and $p_{0,m}$, we solve the following system:

$$\begin{cases} 0.3466 = p_{0,top} \times 0.26 + p_{0,m} \times (1 - 0.26) \\ 0.257 = p_{0,top} \times 0.95 + p_{0,m} \times (1 - 0.95) \end{cases}$$

This gives $p_{0,top} = 0.2514$ and $p_{0,m} = 0.3747$.

Pareto interpolation technique

I use the classical Pareto interpolation technique presented Kuznets and Jenks (1953) and Piketty (2001) to compute the share of top 5% in total wealth of the deceased (W_{Top5}). This method consists of estimating the parameters of the following function F in five steps:

$$F(W) = 1 - k^{\alpha} W^{-\alpha}$$

- Identify in the fiscal tabulations the level of wealth $y(\sim 5\%)$ above which the proportion of the deceased is closest to 5%.
- Compute the average wealth $y^*(\sim 5\%)$ of individuals above the level $y(\sim 5\%)$.
- Compute α noting that $y^*(\sim 5\%)/y(\sim 5\%) = 1/(1 - \alpha)$ (by hypothesis of the Pareto distribution of wealth).
- Compute k using $y(\sim 5\%)$, α and the proportion of individuals above $y(5\%)$.

- Compute the share of top 5% in total wealth (W_{Top5}).

The distributions of successions by tax bracket at the departement level in 1929 and 1930 were observed in the *Bulletin de Statistique et Législation comparée* of 1930 and 1931, those of 1954 and 1955 in the appendix of the *Statistiques et Etudes Financières* of 1956 and 1957.

Tables

Table 1: Demography of top 1%, next 4% and below top 5% Parisian successions, 1872-1977.

	1872 - 1892	1927 - 1937	1947-1952	1977
r_{top1}	0.9	0.9	0.97	0.79
r_{next4}	0.74	0.73	0.74	0.79
r_{rest}	0.55	0.52	0.51	0.56

Source: author's computation based on Paris estate data set.

Table 2: Demographic distinction in French largest urban areas, 1929 and 1955.

Urban Area	1929			1955		
	r_{top}	r_{rest}	$r_{top} - r_{rest}$	r_{top}	r_{rest}	$r_{top} - r_{rest}$
Paris	1.02	0.67	0.35	0.97	0.55	0.42
Lyon	1.2	0.75	0.45	1.2	0.6	0.6
Marseille	1.1	0.94	0.16	0.8	0.71	0.09

Source: author's computation based on fiscal tabulations.
Urban area defined as the city's départements: Seine for Paris, Rhône for Lyon Bouches-du-Rhône for Marseille

Table 3: Demography of top 0.5%, top 5% and below top 5% French successions in 1898, 1929-1930 and 1949-1950.

Years	Below top 5%		Top 5%		Top 0.5%	
	$p_{0,rest}$	h_{rest}	$p_{0,top5}$	h_{top5}	$p_{0,top0.5}$	$h_{top0.5}$
1898	0.27	2.54	0.24	2.47	/	/
1929-30	0.23	2.67	0.22	2.74	/	/
1949-50	0.25	2.42	0.18	2.6	0.2	2.91
	r_{rest}		r_{top5}		$r_{top0.5}$	
1898	0.93		0.94		/	
1929-30	1		1.07		/	
1949-50	0.9		1.06		1.165	

Source: author's computation based on fiscal tabulations.

Table 4: Cross-Section analysis (OLS) of the evolution of top 5%'s share in total wealth at death, at département level.

	Dependent variable:				
	Δ top 5%'s share, 1929-1955 (percentage points)				
	(1)	(2)	(3)	(4)	(5)
Demographic variables of département (1929/30):					
$r_{top} - r_{rest}$	-0.04^{**}	-0.05^{**}			
	(0.02)	(0.02)			
$h_{top} - h_{rest}$			-0.04^{**}		-0.03^{*}
			(0.02)		(0.02)
$dir_{top} - dir_{rest}$				-0.12^{**}	-0.10^{*}
				(0.05)	(0.05)
Control variables at département level:					
Share of Top 5% in total wealth (1929/30)	-0.44^{***}	-0.39^{***}	-0.39^{***}	-0.41^{***}	-0.39^{***}
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Δ Share of Dead with succ., 1929-1955	-0.12^{**}	-0.18^{***}	-0.19^{***}	-0.18^{***}	-0.18^{***}
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
% of wealth transmitted through inter-vivos gifts (1900)		0.15^{***}	0.15^{***}	0.15^{***}	0.15^{***}
		(0.04)	(0.04)	(0.04)	(0.04)
% of succ. with will (1928)		0.16^{**}	0.15^{**}	0.14^{**}	0.16^{**}
		(0.07)	(0.07)	(0.07)	(0.07)
Constant	0.21^{***}	0.12^{***}	0.12^{***}	0.14^{***}	0.12^{***}
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Observations	88	85	85	85	85
Fixed Effects for Paris Region	Y	Y	Y	Y	Y
R^2	0.69	0.75	0.75	0.75	0.76
Adjusted R^2	0.68	0.73	0.73	0.73	0.73

Reading note: The evolution of Top 5%'s share in wealth at death of département is the difference between the average of 1954-1955 and of 1929-1930. r, h and dir stand respectively for reproduction rate, sibship and share of successions with children. The evolution of the proportion of dead with succession is computed using the number of death and successions in 1929-1930 and 1954-1955. The proportion of wealth transmitted by inter-vivos gifts is computed with data on successions of 1903 and data on donations of 1898 of the département. Due to data restrictions Corsica, and Belfort Territory are excluded from sample. For the same reason Alsace-Lorraine département are included in regression (1) only. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 5: Equilibrium distribution of wealth in simulations with $h_{top} = h_{rest} = h$.

						Share of group in total wealth			
simulation	h	$p(1)$	$p(2)$	$p(3)$	$p(5)$	Bottom 50%	P50-P75	P75-P95	Top 5%
1	2.2	0.42	0.28	0.13	0.17	5%	6.5%	14%	74.5%
3	2.8	0.29	0.25	0.15	0.31	5%	7.5%	16.5%	71%
5	3.4	0.18	0.19	0.16	0.47	7%	8%	16.5%	68.5%

Note: The distributions of family size in simulations 1,2,3,4 and 5 correspond respectively to those observed for lower decile, lower quartile, mean, higher quartile and higher decile of French departements in 1929 (see section 2). The sibships of 4 and more are simulated by sibships of 5.

Table 6: Equilibrium distribution of wealth in simulation with $h_{top} \neq h_{rest}$.

			Share of group in total wealth			
simulation	h_{top}	h_{rest}	Bottom 50%	P50-P75	P75-P95	Top 5%
1	3	2.5	14%	17.5%	34%	34.5%
3	2.8	2.8	5%	7.5%	16.5%	71%
3	2.3	2.8	0%	0%	0%	99.9%

Note: Simulation 1 corresponds to the quartile of French departments with largest $h_{top} - h_{rest}$ in 1929, simulation 2 to the quartile with largest $h_{rest} - h_{top}$.

Table 7: Share of top 5% according to proportion of marriage outside group.

			Share of top 5% according to % of marriage out top 5%				
simulation	h_{top}	h_{rest}	0%	15%	25%	33%	50%
1	3	2.5	34.5%	30%	28.5%	27%	24.5%
2	2.8	2.8	71%	52.5%	45.5%	41%	35%
3	2.3	2.8	99.9%	99.9%	90.6%	66%	52%

Table 8: Share of top 5% according to degree of unequal inheritance.

			Share of top 5% according to proportion of wealth of first born				
simulation	h_{top}	h_{rest}	equal inher.	50%	65%	75%	100%
1	3	2.5	34.5%	49.5%	69%	86%	99.9%
2	2.8	2.8	71%	94%	96%	98.6%	99.9%
3	2.3	2.8	99.9%	99.9%	99.9%	99.9%	99.9%

Table 9: Share of top 5% according to wealth accumulation in top (β_{top}).

			Share of top 5% according to β_{top}/β_{rest}				
simulation	h_{top}	h_{rest}	100%	90%	75%	110%	125%
1	3	2.5	34.5%	26.5%	22%	54.5%	77%
2	2.8	2.8	71%	38%	26%	99.9%	99.9%
3	2.3	2.8	99.9%	99.9%	35%	99.9%	99.9%

Table 10: Equilibrium distribution of wealth with $dir_{top} \neq dir_{rest}$.

					Share of group in total wealth			
simulation	h_{top}	h_{rest}	dir_{top}	dir_{rest}	Bottom 50%	P50-P75	P75-P95	Top 5%
1	3	2.5	82%	75%	18%	21%	36%	25%
2	2.8	2.8	82%	75%	13.5%	15%	29%	42%
3	2.3	2.8	82%	75%	0%	0%	0%	99.9%

Table 11: Share (%) of top 1% among top 5% in France and England in XIXth and XXth century. Differences between England and France in percentage points.

Decade	England	France	Difference
1810	64.3	61.8	+2.5
1870	72.7	63.9	+8.8
1910	79.3	70.8	+8.5
1920	73	66.8	+6.2
1930	71	66	+5
1950	62	54.6	+7.4
1960	57.3	54.4	+2.9
1980	50.5	46.2	+4.3
1990	50	47.7	+2.3

Source: Atkinson and Harrison (1978), Lindert (1985) and Piketty *et al.* (2006), cited by Ohlsson *et al.* (2006). Averages on all years available by decade. Computations for 1870 in France with 1867 and 1877. Decade 1940: no data available in England. Decade 1970: no data available in France.

Table 12: Reproduction rates by cohort of birth in the peerage and the average population in England and Wales.

Born	General Population	Nobility
1825-49	1.403*	1.298
1850-74	1.204	0.95
1875-99	0.867	0.933
1900-24	0.760	0.925

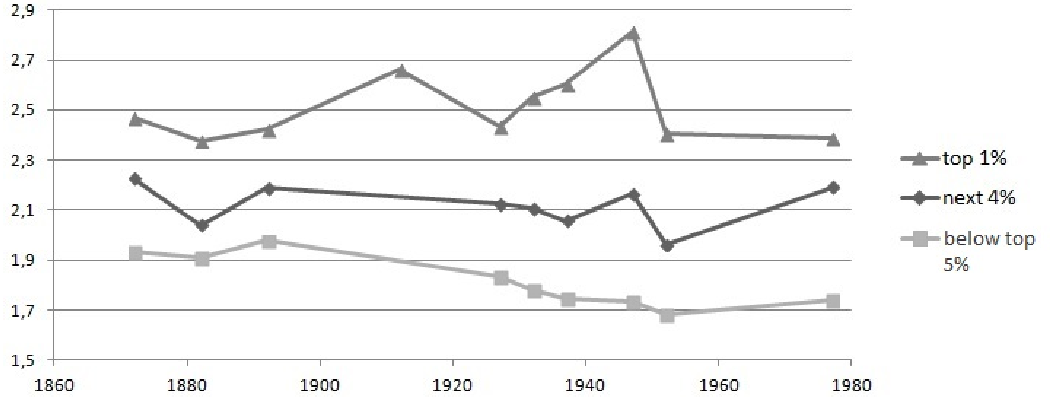
*Born 1838-49 only
Source: Hollingsworth (1964)

Figures

Figure 1: Proportion of heirless (p_0) in Paris top 1%, next 4% and below top 5%, 1812-1977.

Source: author's computation based on Paris estate data set.

Figure 2: Average sibship of heirs (h) in Paris top 1%, next 4% and below top 5%, 1872-1977.



Source: author's computation based on Paris estate data set.

Figure 3: Difference of sibship size of inheritors between top and other successions at département level, 1929-1955.

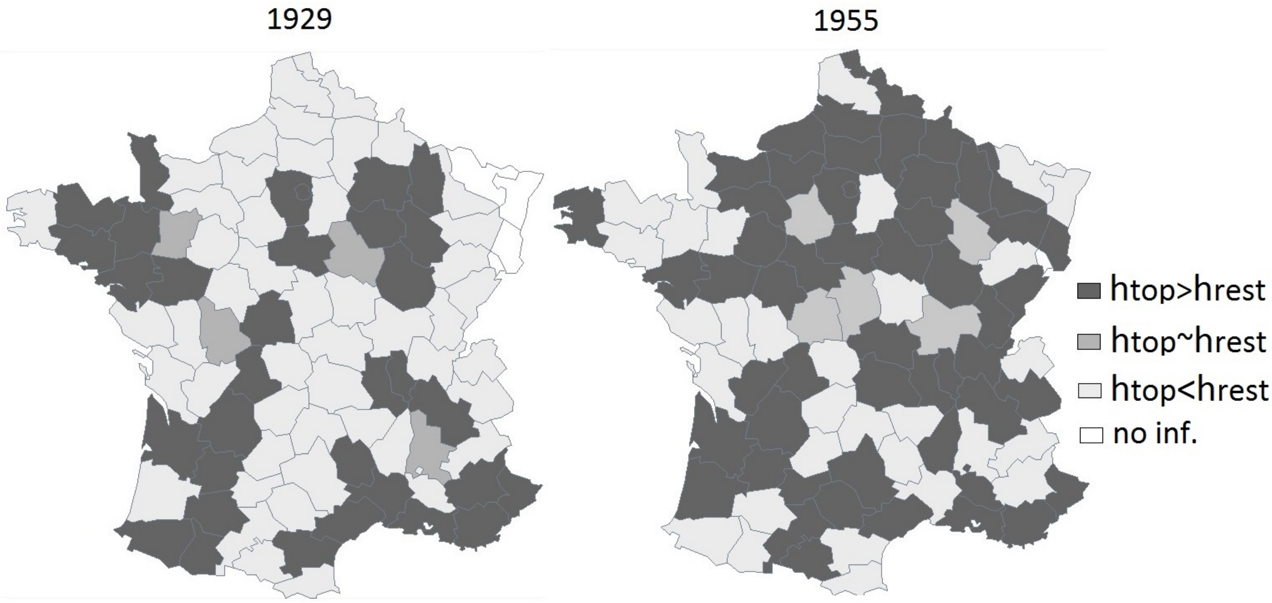


Figure 4: Repartition function of French Départements according to $r_{top} - r_{rest}$ in 1929 and 1955.

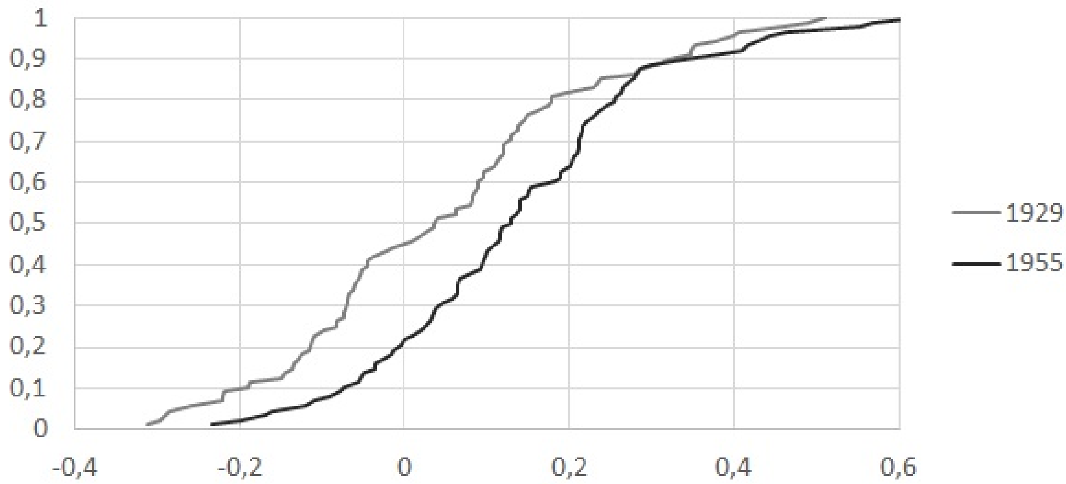
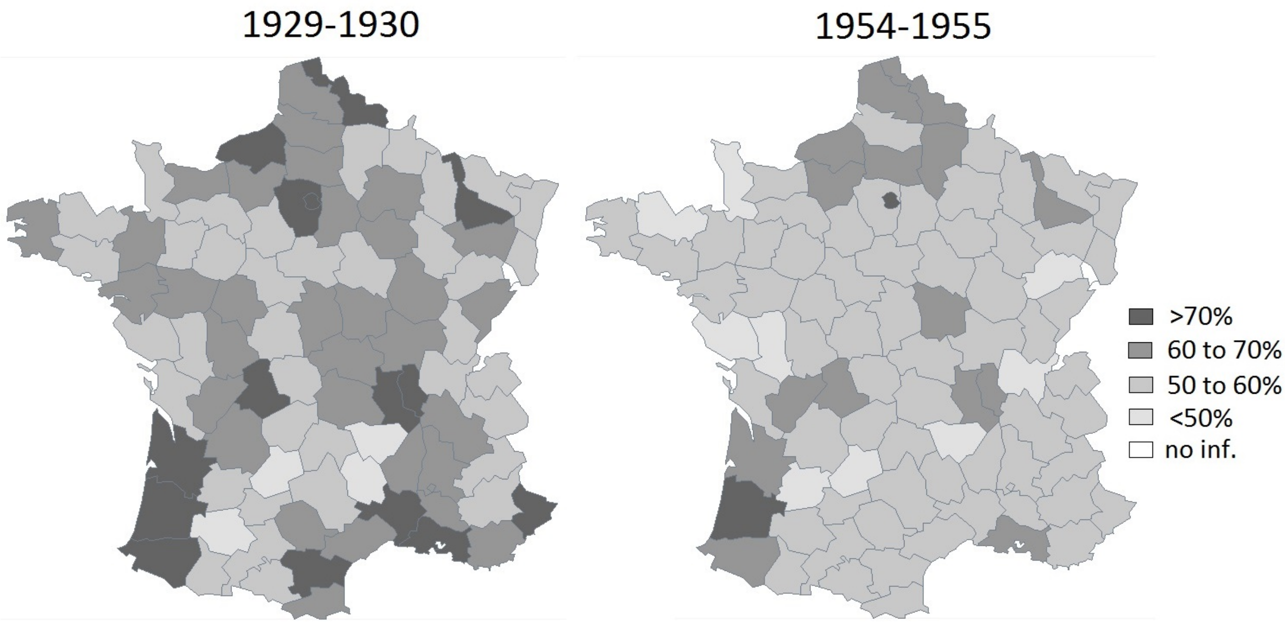


Figure 5: Share of top 5% in total wealth of the deceased by département, 1929-1955.



Source: author's computation based on the tabulations of successions by tax bracket.

Figure 6: Average reproduction and demographic distinction in French Départements 1929.

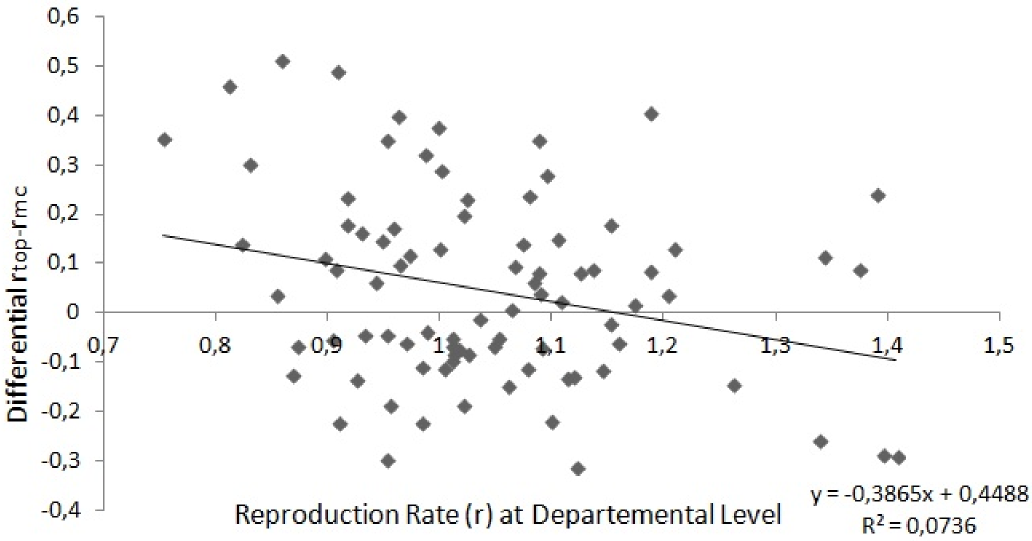
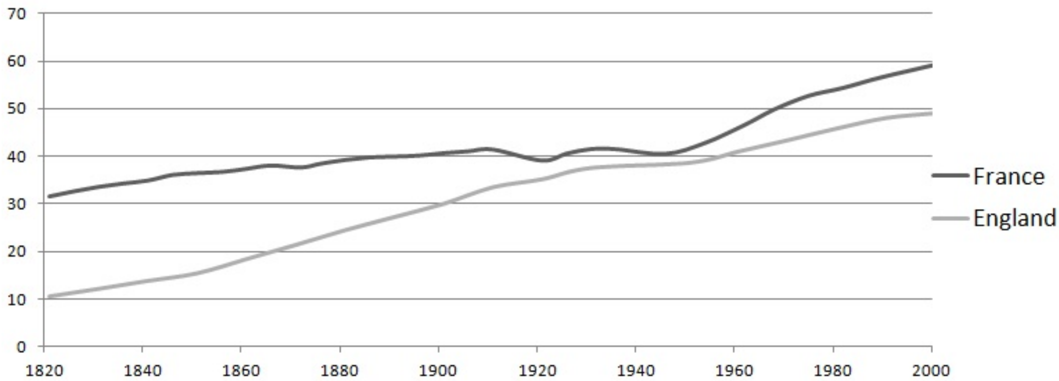
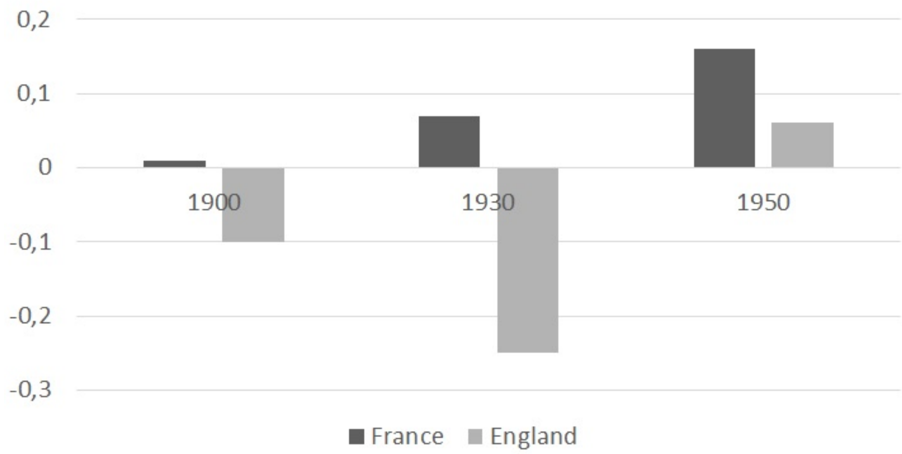


Figure 7: Evolution of population in France and England 1820-2000.



Data from National Censuses.

Figure 8: $r_{top} - r_{rest}$ by generation (year of death) in France and England.



Source: author's computation for France, Hollingsworth (1964) for England.
Reading Note: In the generation deceased in 1900, the reproduction rate gap between French top wealth holders and the rest of the population was equal to 0.1. Definition of top: top 5% wealth holders for France, english peers for England. Definition of the rest of the population: whole population for England, individuals with strictly positive wealth at death for France.