Inheritance Flows in Switzerland, 1911 - 2009

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June 20, 2013

Abstract

This paper estimates Swiss inheritance flows as a fraction of net national income over the 20th century. It mainly follows Piketty (2011) for France, which documents the long-term evolution of inheritance flows. Very interestingly, even though Switzerland did not take part in the two world wars that devastated Europe, destroying a large share of households wealth, we still find a slightly U-shaped evolution of inheritance for this country. Effectively, inheritance flows go from 6.3% in 1911 to 3.8% in 1975, before increasing to a value of 8.85% of net national income in 2009. This pattern is however less pronounced than for France (Piketty, 2011) and Germany (Schinke, 2012) and we deem it unlikely that inheritance should become as economically important as in France. Nevertheless, an inheritance flow of almost 9% of net national income, as observed in 2009, is non negligible, since it represents more than CHF 39 billion.

Acknowledgments

1 Introduction and Related Literature

"The country of inheritance", so is called Switzerland in the title of a press release of the Swiss National Fund for Scientific Research presenting a recent research on inheritance by Stutz et al. (2007). This extensive empirical study documents the importance of inheritance in Switzerland and discusses distributional issues as well as how inheritance is perceived by the Swiss population. However, this study mainly focused on years 1997-2000 and authors did not present a long-term perspective on inheritance flows.

This paper extends their work by estimating the long-term pattern of inheritance flows over net national income for a given number of years over the 20th century. We find a slightly U-shaped pattern of inheritance, much less pronounced than what Piketty (2011) finds for France and what Schinke (2012) documents for Germany. The fact that the pattern is less pronounced in Switzerland might be explained by a higher continuity of inheritance flows, since it was spared from the two world wars.

The pioneer work on the long-term inheritance pattern estimation is the one by Piketty (2011) for France. Using numerous data sources and high quality data from French tax returns, he presents French inheritance flows since 1820 and finds a largely U-shaped pattern. He then relates this pattern to a simple $r > g$ logic. As he explains, there are basically two ways of becoming wealthy. One can either work or inherit. Accordingly, should the rate of return on wealth r be much larger than the growth rate in the economy g, then heirs will be advantaged. On the contrary, if wealth has a really low rate of return, then it is life time earnings that will matter the most to become richer.

Piketty (2011) provides two independent estimates of inheritance flows. A series on fiscal flows (based on fiscal data on gifts and bequests) and one on economic flows (based on an accounting equation combining national wealth estimates, mortality tables, and observed age-wealth profiles).

To assess the importance of inheritance in Switzerland over the 20th century, we closely follow Piketty's methodology. Since fiscal data on bequests and gifts are unfortunately not easily available for Switzerland (see Appendix Section 6.4), we combine numerous data sources to estimate the economic inheritance flows as a first approximation.

Following Piketty (2011), there is a burgeoning work on the estimation of long-term inheritance. We can for example cite the work of Schinke (2012) for Germany, as well as ongoing research for Sweden (Ohlsson et al., 2012) and the United Kingdom (Atkinson, 2012). This article is thus part of this important body of literature and provides insights into the evolution of inheritance in a non-war country.

The remainder of this paper is structured as follows. Section 2 documents the evolution of the legal framework of inheritance in Switzerland. Section 3 describes the methodology followed as well as the numerous data sources used to estimate Swiss inheritance flows. Section 4 presents the long-term inheritance pattern of Switzerland as a comparison to France and Germany. Then, Section 5 provides robustness checks as to assess the validity of our assumptions regarding missing data. Section 6 concludes.

2 Legal Framework of Inheritance

Given the focus of this paper on Swiss inheritance flows, it is important to first provide information on the legal framework of inheritance in this country as well as an international comparison. In Switzerland, inheritance rights are determined in the civil code, so that wealth at death cannot be entirely freely distributed. Minimal inheritance shares for direct descendants and other family members have to be respected. These depend both on the family structure and whether a will has been written.[1]

Concerning bequests and gifts taxation, as we shall see, Switzerland is a particular country in the sense that there is no inheritance nor estate taxation at the federal level. However, each canton can freely determine its taxation law.

This specific situation for example allowed Brülhart and Parchet (2010) to study intra-cantonal tax competition. They found no discernible relationship between tax burdens on bequests and the concerned tax base of wealthy elderly individuals.

In the context of the present research, however, the absence of a federal inheritance tax is more problematic, because no homogeneous fiscal data on bequest flows is available for this country.[2] This section briefly describes the history of bequests and gifts taxation at the federal level and gives an overview of the existing types of cantonal legislations.

2.1 *History of inheritance and estate taxation in Switzerland*

In Switzerland, taxes on bequests and inter vivos gifts are levied as a complement to wealth and income taxes. The share of fiscal receipts it represents, even though small, is non negligible. For example, in 2006, gifts and bequests taxes yielded :

Table 1: Fiscal receipts from taxes on bequests and gifts
Switzerland, 2006

Cantons	742	million CHF
Municipalities	99	million CHF
Total	841	million CHF

Source : Les impôts sur les successions et les donations (2009)

This sum represented 0.76% of total fiscal receipts and 1.43% of the fiscal receipts of cantons and municipalities.

2.1.1 *At the federal level*

Although no bequest and gift tax has been implemented at the federal level, several attempts to create a uniform legislation have been made. The first one was made in the period 1919-1932. A federal inheritance tax was proposed as a solution to the high debt level of the federal government, which had a higher level of spendings than before the first world war (even though Switzerland did not take part to the conflict directly). However, this project was abandoned as well as another project proposing the federal government's participation to the product of the cantons' taxes on inheritance.

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[1]Detailed explanations on divisible proportions are available on the Credit Suisse website : https://www.credit-suisse.com/ch/privatkunden/lebensphasen/en/geniessen/vermoegenswerte/rechtsfragen.jsp

[2]Appendix Section 6.4 documents this absence of federal Bequest and Gift data and provides an example of what would have to be done to construct such a database for the canton de Vaud.

The next effort was initiated by the "Alliance des indépendants" on the 19th of March 1974 in an initiative aiming at abolishing fiscal privileges and have a fair taxation system. Concerning inter vivos gifts and bequests taxes, the initiative required a uniform prescription determined by the federal government and the product of such taxes would have been redistributed to the cantons. However, following the advice of the federal council, the legislative authorities of Switzerland ("Conseil des Etats" and " Conseil National") rejected this proposition. Finally, the people as well as the cantons rejected this initiative on the vote held on th 21st of March 1976.

More recently, on the 16th of August 2011, a federal popular initiative was initiated by several political parties.[3] It proposes a uniform estate tax of 20%, with an exemption threshold of CHF 2 million, meaning that the tax would be assessed on the total amount of assets left by the decedent (including gifts superior to CHF 20'000 per year that happened within 5 years before death). The consequence of an estate tax in comparison to an inheritance tax (assessed on the amount received by each heir separately) is that there is no possible tax rate distinction with respect to the degree of parenthood. Such estate taxes are prevalent for example in Great Britain or the US, but at higher levels than the proposed 20%. Two thirds of the revenues from this tax would serve to finance the AVS, which is a social insurance for elderly and survivors and one third would go to the cantons as a compensation, since they would no longer be able to collect taxes themselves.

Since the initiative received more than the 100'000 required signatures before the $16^{t}h$ of February 2013, it will be voted by the people and cantons.[4] Hence, the topic of inheritance taxes is actively debated in Switzerland and a long-term perspective on inheritance flows could help to shed light on the current debate about the necessity of such taxes.

2.1.2   At the cantons' level

As stated before, cantons have the supremacy in determining modes and levels of taxation (this would however change, should the actual initiative be accepted). All cantons but Schwyz collect estate or inheritance taxes. Only two cantons, namely Soleure and Grisons, collect taxes based on the total estate left by the decedent. Other cantons collect taxes based on inheritance received by heirs, which, as described before, allows differentiating tax rates among degrees of parenthood.

Concerning inter vivos gifts, for most cantons the same principles apply as for bequests. However, the canton of Soleure does not impose gifts, and the cantons of Vaud, Fribourg and Grisons allow municipalities to collect extra taxes on both bequests and gifts.

The relevant tax base also differs across cantons. However, a common trend consisting in significantly cutting or even repealing bequests and gifts taxes on direct descendants emerged in the early 1990s. It rapidly spread across a majority of cantons, mainly under the alleged argument that it was necessary for tax competition (i.e reduce tax burden on wealthy taxpayers to retain them and attract additional ones) (Brülhart and Parchet, 2010). As a consequence, only 3 cantons still impose direct descendants' inheritance (Neuchâtel, Vaud and Appenzell Rhodes-Intérieurs). This inverted the increasing trend of bequests and gifts fiscal receipts. They exponentially increased from CHF 42 million to CHF 1.5 billion from 1950 to 1990, but then dropped to CHF 937 million by 2003 (Stutz et al., 2007).

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[3]The federal popular initiative is named "Imposer les successions de plusieurs millions pour financer notre AVS (Réforme de la fiscalité successorale)" and was launched by the following parties: Parti Evangéliste Suisse (PEV), Parti Chrétien Social (PCS), Parti Écologiste Suisse (PES), Parti Socialiste (PS) and the Union Syndicale Suisse (USS).

[4]Among the 111'146 deposited signatures, 110'205 were valid. More information is available on the Swiss administration website : http://www.admin.ch/ch/f/pore/vi/vis414.html.

2.2 International comparison

Due to the large heterogeneity in tax systems for inheritance and gifts tax (concerning notably tax rates and exemptions thresholds), it is difficult to provide a clear ranking of countries in terms of effective tax rates on inheritance. Effectively, Scheffler and Spengel (2004) document the differences in tax systems across countries and conclude that no common guideline can be identified.

An interesting European comparison of inheritance and gift taxes is made by AGN Europe.[5] Their sample consists in 28 European countries, including Switzerland. They compare, as of January first of each year, the levels of inheritance tax payable by a married individual who dies leaving a surviving spouse and two children. The assets owned at death are listed as follows : a house worth €600.000, cash of €1.000.000, quoted company shares valued at €300.000 and unquoted company shares valued at €700.000 (total asset value €2.600.000).

They find that only five countries, namely Austria, Cyprus, Estonia, Liechtenstein and Sweden do not tax inheritance nor gifts. Moreover, of the 28 countries, most exempt assets transferred to the spouse from taxation, but only approximately 50% dispense assets transferred to children from taxation. In this respect, we regard the recent wave of tax cuts on children heirs in Switzerland as making it a favorable country. The AGN report effectively ranks Switzerland as having an effective tax rate of 0% in this particular example.

Should the initiative for a federal inheritance and gifts tax be accepted, since no distinction in the tax rate would be possible among heirs, children and spouse would be the most severely impacted, the rate they face going from 0% to 20%, should they inherit more than the CHF 2 million threshold. However, this taxation rate of 20% is still below most advanced economies tax rates and is inferior to the socially optimal tax rate on inheritance estimated by Piketty and Saez (2012). Effectively, authors show that, under reasonable parameters assumption, the theory of capital taxation predicts an optimal tax rate of 50-60% on inheritance and gifts.

3 Methodology and Data Sources

Before presenting our estimates of the inheritance flows over the 20th century for Switzerland, we will describe our methodology as well as numerous data sources.

3.1 Methodology

The methodology used to compute inheritance flows in Switzerland closely follows Piketty (2011). In his paper, he estimates inheritance flows over net national income using two independent measures, namely fiscal flows (based on pure fiscal data) and economic flows (based on an accounting equation). Since fiscal data on bequests and gifts is unfortunately not easily available for Switzerland (see Appendix Section 6.4), we only estimate the economic inheritance flows. This method also requires information from estate tax data, because one needs to estimate the gift-bequest ratio over the whole period. Nevertheless, as we shall see, it is less demanding than the pure fiscal flow estimation.

3.1.1 General methodology

As explained by Piketty (2011), if all wealth were transmitted at death, resulting in inter vivos gifts being equal to zero, then economic inheritance flows would be represented by the following accounting equation:

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[5]http://www.agn-europe.org/tax/

$$\frac{B_t}{Y_t} = \mu_t \cdot m_t \cdot \frac{W_t}{Y_t}$$
$$\Leftrightarrow b_{yt} = \mu_t \cdot m_t \cdot \beta_t,$$

where B_t is the estimated aggregate value of inheritance, Y_t represents net national income, W_t is the aggregate private wealth and m_t measures the mortality rate over the adult population (defined as 20 years old or older).[6] Finally, μ_t is the non-corrected ratio between the average wealth of the deceased and the average wealth of the living.[7] This last parameter is the most difficult to estimate, since it requires data on age-wealth profiles of the individuals as well as on differential mortality, as we shall see in more detail in Section 3.1.2.

In reality, however, inter vivos transfers are not equal to zero. People tend to give away part of their wealth while alive, and this phenomenon most likely increases with life expectancy. Hence, if we do not correct the preceding equation for inter vivos gifts, older generations will look poorer than they really are (because we do not take into account the share of wealth which has already been given away). This would bias the μ_t ratio, since it is computed from age-wealth profiles data. It is therefore important to correct the preceding equation in the following way

$$b_{yt} = \mu_t^* \cdot m_t \cdot \beta_t.$$

This is the equation that we will then apply empirically, with $\mu_t^* = (1+v_t) \cdot \mu_t$. The parameter v_t represents the ratio of inter vivos gifts (V_t) over total inheritance (B_t) in a given year $\left(v_t = \frac{V_t}{B_t}\right)$. Fiscal data on gifts and inheritance is thus required to observe the parameter v_t and correct the basic accounting equation of economic inheritance flows.

If we assume that the same multiplicative correction factors apply for inheritance as well as the gift flows, concerning respectively tax exempts assets, tax evasion and non filers, then no further correction of this ratio v_t is needed. The estimation of economic inheritance flows is thus less demanding on tax data than pure fiscal flows.

The methodology behind the computation of β_t and m_t is straightforward. However, more calculations are required for the ratio μ_t. In this section, we thus detail the methodology behind this parameter's estimation, before turning to the description of the numerous data sources needed to estimate the long-term Swiss inheritance flows.

3.1.2   Estimating μ_t

As stated before, this ratio represents the non-corrected average wealth of decedents over the average wealth of the living. However, we do not dispose of the average wealth of decedents and thus have to express these variables differently.

Note that, in order to estimate this ratio, we must take into account differential mortality, or else we would face an upward bias. The rich, who are defined as the top fifty percent of the population by wealth, face different life conditions than the poor.

As a result, the poor, especially at younger ages, tend to have a higher mortality rate, which reduces the ratio μ_t. Effectively, if people who die are those with the lowest wealth, then the ratio of the wealth of decedents over the wealth of the living as well as the resulting inheritance flows will naturally be lower.

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[6]$m_t = \frac{N_{dt}^{20+}}{N_t^{20+}}$, where N_{dt}^{20+} is the number of decedents aged 20 or older and, symmetrically, N_t^{20+} is the number of living individuals aged 20 or older.

[7]This ratio is non-corrected in the sense that we are not yet taking inter vivos gifts into account. Throughout the whole paper, μ_t refers to the non-corrected ratio, whereas μ_t^* refers to the corrected one. The evolution of both parameters is presented in the Appendix 6.2.

Since differential mortality varies with age, it is important to first estimate the average wealth of decedents per age group ($w_{dt}(a)$) and the average wealth of the living per age group ($w_t(a)$) and then use it to find the aggregate ratio.[8]

$$\mu_t = \frac{\sum_a w_{dt}(a) \cdot N_{dt}(a)}{\sum_a w_t(a) \cdot N_t(a)}$$

Piketty (2011) starts from age-wealth profiles at death to then recover the μ_t ratio. However, we do not dispose of such data and hence start from the age-wealth profiles of the living. We thus follow his methodology, simply using a different starting point.

Estimation of the age-wealth profiles of the living

Before explaining Piketty (2011)'s methodology to compute the ratio between the average wealth of the deceased and the one of the living, we must describe our methodology to estimate our starting point, namely the age-wealth profiles of the living.

As will be described in more detail in Section 3.2.4, we use tax statistics from the canton of Zürich to dispose of age-wealth profiles of the living for 1934, 1945, 1969, 1975, 1987, 1995, 1999 and 2009.

However, for most of the above mentioned years, we do know the total wealth per age group and wealth bracket ($W_{t,a,w}$), which would allow us to compute the exact average wealth per age group $w_t(a)$ as

$$w_t(a) = \frac{\sum_w (W_{t,a,w})}{\sum_w (T_{t,a,w})},$$

where T is the number of taxpayers and W is the total wealth. As for subscripts, t is the year of estimate, a represents the age group and w represents the wealth bracket.

However, we know the number of taxpayers per wealth bracket and per age group ($T_{t,a,w}$) as well as the total wealth per wealth bracket ($W_{t,w}$). We thus compute the average wealth per wealth bracket $\left(w_{t,w} = \frac{W_{t,w}}{\sum_a (T_{t,a,w})} \right)$ and assume it to be constant among age groups to recover the approximated age-wealth profiles $w_t(a)^{approx}$ as

$$w_t(a)^{approx} = \frac{\sum_w (w_{t,w} \cdot T_{t,a,w})}{\sum_w (T_{t,a,w})}.$$

In reality, average wealth for a given wealth bracket might vary within age groups. Nevertheless, we believe this to be a good first approximation. Effectively, we dispose of more accurate data for 1995, which allows us to compare the estimated age-wealth profile using our approximation method with the "real" age-wealth profile (using the exact wealth per age group and per wealth bracket). Figure 1 illustrates that both series are relatively close. Hence, the impact of this assumption on inheritance flows should be negligible.

Another limitation is that these age-wealth profiles are computed over pre-specified age groups which differ over time. This doesn't bias the resulting age-wealth profiles estimates, but requires an extra assumption when computing the ratio of average decedent wealth over average wealth of the living. Effectively, we compute this ratio for people aged 20 years old and more ($\mu(20^+)$). Hence, we would ideally like the first category to contain people aged 0-19 so that we could simply ignore them. Fortunately, for year 1945, we dispose of detailed age groups categories, allowing us to compute the relations between $\mu(20^+)$, $\mu(25^+)$ and $\mu(30^+)$. We then assume these relations to be constant over time to recover $\mu(20^+)$ for all years, despite the changes in the first category's definition.

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[8]where $N_{dt}(a)$ is the total number of decedents per age group a and $N_t(a)$ is the living population per age group a.

Figure 1: Average age-wealth profiles of the living in 1995 (Zürich)
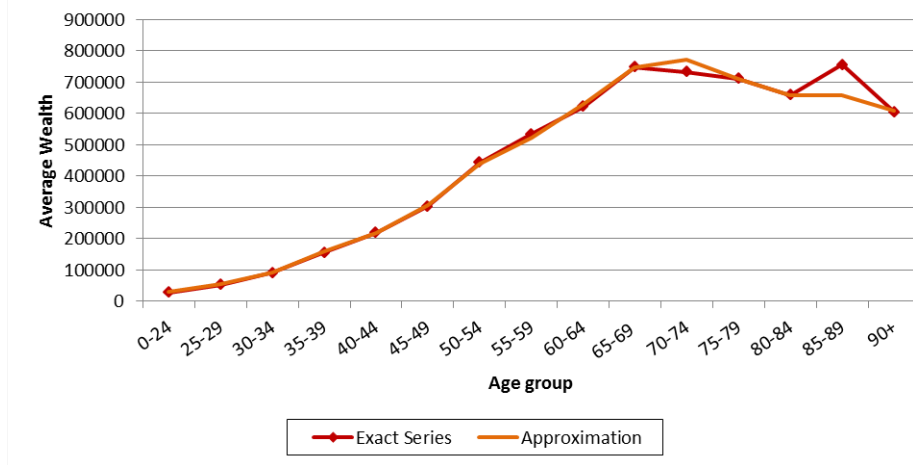
Since we showed how we approximate the average wealth of the living per age group, the next step is naturally to estimate the average wealth of decedents per age group. This is where we follow Piketty's methodology.

Estimation of the age-wealth profiles of the deceased from the age-wealth profiles of the living

For Switzerland, we do not have data on the age-wealth profiles of decedents. However, if we can estimate the ratio $\mu_t(a)$ from age-wealth profiles of living individuals using a mortality multiplier approach and taking differential mortality into account, then it is straightforward to recover the age-wealth profiles of the deceased $w_{dt}(a)$.[9]

To estimate this ratio $\mu_t(a)$ from age-wealth profiles data, it is necessary to take differential mortality into account, which characterizes the fact that the poor tend to have higher mortality rates than the rich at all age groups a $(m_t^p(a) \geq m_t^r(a))$. Here, the poor are defined as the bottom half of the wealth distribution, whereas the rich represent the upper one. Moreover, as we emphasized, differential mortality is age-dependent.

Effectively, as the population ages, wealth becomes less relevant in determining who is more likely to die.[10]

The differential mortality ratio is defined as

$$\delta_t(a) = \frac{m_t^p(a)}{m_t^r(a)} > 1$$

and the aggregate average mortality rate per age group, which is the ratio of the number of decedents over the number of living individuals equals :

$$m_t(a) = \frac{N_{dt}(a)}{N_t(a)} = \frac{m_t^p(a) + m_t^r(a)}{2}.$$

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[9]Indeed, by definition $w_{dt}(a) = w_t(a) \cdot \mu_t(a)$, since $\mu_t(a) = \frac{w_{dt}(a)}{w_t(a)}$.

[10]For example Kopczuk and Saez (2004) assume, based on Brown et al. (2002), that the ratio between the mortality rate of the rich and the aggregate mortality rate is constant below age 50 (approximately equal to 60%-70%) and then rises to 80%-90% at age 70 and finally reaches 100% above age 90. Hurd and Smith (2001) also find evidence that the mortality gap decreases with age.

It follows that

$$\frac{m_t^p(a)}{m_t(a)} = \frac{2m_t^p(a)}{m_t^p(a) + m_t^r(a)}$$
$$= \frac{2\delta_t(a)}{1 + \delta_t(a)} > 1,$$

and

$$\frac{m_t^r(a)}{m_t(a)} = \frac{2m_t^r(a)}{m_t^p(a) + m_t^r(a)}$$
$$= \frac{2}{1 + \delta_t(a)} < 1.$$

Piketty (2011) also defines $sh_t^p(a)$ as being the share of total wealth owned by the poor in year t, for each age group a. He then assumes this parameter to be constant over time and among age groups. The estimation of this parameter for Switzerland by Pareto interpolation is explained in Section 3.2.6.[11] Using this parameter, we can define, for each age group a, the average wealth poor $w_t^p(a)$ as well as the average wealth of the rich $w_t^r(a)$:[12]

$$w_t^p(a) = 2 \cdot sh_t^p(a) \cdot w_t(a),$$
$$w_t^r(a) = 2 \cdot (1 - sh_t^p(a)) \cdot w_t(a).$$

The average wealth of decedents of age group a can finally be expressed as

$$w_{dt}(a) = \frac{w_t^p(a) \cdot m_t^p(a) + w_t^r(a) \cdot m_t^r(a)}{m_t^r + m_t^p}$$
$$= \frac{[2 \cdot sh_t^p(a) \cdot w_t(a) \cdot m_t^p(a)] + [2 \cdot (1 - sh_t^p(a)) \cdot w_t(a) \cdot m_t^r(a)]}{m_t^r + m_t^p}.$$

Estimation of μ_t from the average age-wealth profiles

Since we estimated the age-wealth profiles of both the decedents and the living, we can recover the ratio $\mu_t(a)$ as[13]

$$\mu_t(a) = \frac{w_{dt}(a)}{w_t(a)} = \frac{[2 \cdot sh_t^p(a) \cdot m_t^p(a)] + [2 \cdot (1 - sh_t^p(a)) \cdot m_t^r(a)]}{m_t^r + m_t^p}$$
$$= \frac{m_t^p(a)}{m_t(a)} \cdot sh_t^p(a) + \frac{m_t^r(a)}{m_t(a)} \cdot (1 - sh_t^p(a)).$$

Hence, we now dispose of all the elements to estimate inheritance flows over net national income. As previously described, age-wealth profiles of the living can be multiplied by the non-corrected $\mu_t(a)$ to obtain the age-wealth profiles of decedents. From this, we can recover the aggregate non-corrected ratio of the average wealth of decedents over average wealth of the living as

$$\mu_t = \frac{\sum_a w_{dt}(a) \cdot N_{dt}(a)}{\sum_a w_t(a) \cdot N_t(a)}.$$

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[11]A detailed explanation of the Pareto interpolation methodology can be found in the Appendix, Section 6.5.

[12]Think for example of a situation where the total wealth $W_t(a) = 1000$ and the total population equals 100 (so that the average wealth is $w_t(a) = 1000/100 = 10$), with $W_t^p(a) = 200$ and $W_t^r(a) = 800$. Then $sh_t^p = 200/1000 = 0.2$ and the average wealth of the poor $w_t^p(a) = 200/50 = 4$ which is indeed equal to $w_t^p(a) = 2 \cdot sh_t^p(a) \cdot w_t(a) = 2 \cdot 0.2 \cdot 10$.

[13]These equations can be found in Appendix A of Piketty (2011), p.83.

Finally, μ_t can be replaced into to the basic accounting equation for inheritance flows, together with the correction for the existence of inter vivos gifts ($1 + v_t$)

$$b_{yt} = \underbrace{(1 + v_t)\mu_t}_{\mu_t^*} \cdot m_t \cdot \beta_t.$$

Now that we understand the methodology behind the estimation of inheritance flows over net national income, we will discuss the necessary data to recover these flows over the long-run.

3.2   Data description

This section describes the necessary data to estimate economic inheritance flows for Switzerland, as well as the data sources used in this project.

3.2.1   Private wealth

Following Piketty (2011), the definition of wealth for this study covers all assets at current market prices (as January first of each year) net of all liabilities.

For Switzerland, no wealth estimate is reported in National Accounts (Dell et al., 2005). Hence, this paper uses wealth estimates from tax data.

The main advantage of tax data over wealth surveys (used for example by Schinke (2012) to estimate German inheritance flows) for long-term economic studies is that they have been compiled over a longer period and that, for some years, they cover the whole population.[14] Moreover, tax series are easily comparable and contain a clear definition of wealth. On the contrary, from wealth surveys it is not always clear which definition of wealth individuals have in mind when they answer the questionnaire.

However, before the work of Piketty(2001), economists did not consider tax reports as a natural candidate to study income nor wealth distributions. It was criticized for the fact that wealth (or income) may be underestimated because of tax evasion and real estate undervaluation. Effectively, people would tend to report less wealth than what they own, in order to pay less taxes. This phenomenon would be even more pronounced for wealthy households, thus depending on the structure of the tax system. Fortunately, it is less likely to be problematic in Switzerland, which never established a very progressive tax structure and has low top wealth tax rates (Dell et al., 2005). Moreover, this is a drawback economists have learned to overcome, just like the poor representativity of wealthy individuals in wealth or income surveys.

Several federal wealth taxes have been levied from 1913 to 1957, although not regularly. An extensive description of wealth tax data available for Switzerland over the 20th century has been written by Dell et al. (2005).

As authors explain, *"those wealth taxes were based on family net worth as of January 1st, 1915 (for the first federal wealth tax, impôt de guerre), as of January 1st, 1921, 1925 and 1929 (for the second federal wealth tax, Nouvel impôt fédéral de Guerre Extraordinaire), and as of January 1st, 1934, 1936 and 1938 (for the third federal wealth tax, Contribution fédérale de Crise). Special federal wealth taxes were also levied on net worth as of January 1st of 1940 and 1945 (Sacrifice de guerre). Finally, a more regular wealth tax (impôt fédéral pour la Défense Nationale) was imposed every two years from 1947 to 1957 (always based on the family net worth as of January 1st of the corresponding years). After 1957, the federal wealth tax was eliminated."*

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[14]Foellmi and Martinez (2012) extensively discuss the advantages and disadvantages of tax data over surveys for the study of income distributions.

For 1913, 1919, 1969, 1981, 1991, 1997 and 2003-2009 there exist wealth distributions covering the entire adult population with net worth superior to CHF 1000.[15] These tabulations were compiled from cantons' wealth tax statistics.[16] To these years, which were used by Dell et al. (2005) until 1997, we add wealth estimates for 1900 and 1910 based on the assumption that wealth of private households represented 80% of the taxable capital (which contains the wealth of both physical and non-physical entities).[17] Data for these two years can be obtained from the Annuaire Statistique de la Suisse 1920 (p.395).

For the remaining years, families with a fortune inferior to the exemption thresholds are not included in the statistics. Dell et al. (2005) extrapolated wealth estimates for the whole population from the wealth of filers, by assuming that non filers' share of wealth in years for which the population coverage is incomplete is identical to their share in the closest complete coverage year.[18] We simply use their estimates for the period 1913 to 1997, without further modification and add the wealth tax statistics of 2003-2009 to their sample.

This allows us to have reliable wealth estimates for most of our years of interest. Important data points are missing for 1987 and 1999. However, we dispose of reliable data for 1981, 1991, 1997 and 2000. We proceed by linear interpolation between these points in time to recover a private wealth estimate for 1987 and 1999 and hence have an estimate for all desired dates.[19]

It is worth noting that Stutz et al. (2007) estimate that wealth reported in tax statistics should be upward corrected by 12.3% in years 1997-2000. This emphasizes the fact that wealth tax statistics underestimate total real wealth since it covers only individuals with a positive net worth superior to CHF 1000 (which was not taken into account by Dell et al. (2005)) and since real estate is potentially largely undervalued. We do not apply this upward correction for our baseline estimation of inheritance flows since we don't know what it should be for earlier years. However, it is important to keep in mind that we might underestimate the total wealth of the Swiss population. This will be discussed further in Section 5 for robustness checks. For year 2000, we take the value estimated by Stutz et al. (2007) without the upward correction of 12.3%, to be consistent with the remainder of our sample.

3.2.2   Net national income

Following Piketty (2011), we use the concept of national income as denominator for our estimated inheritance flows ratio.

Before describing its data sources, it is important to remind its definition and the difference with other concepts of national accounting.

The most used concept for international comparisons in national accounting is the Gross Domestic Product (GDP). It measures value added in the economy, which one could define as the difference between output and intermediate consumption. There are three ways of measuring GDP from the System of National Accounts definitions (SNA, 2008). The first one consists in summing gross value added of producer units from residents and then adding taxes and subtracting subsidies on products which are not included in the output valuation. The second definition is the sum of the final uses of goods and services (excluding intermediate consumption) measured at purchasers' prices, minus the value of imports of goods and services.

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[15]Dell et al. (2005) describe this data as covering the entire population with positive net worth. However, it is worth mentioning that individuals with a net wealth inferior to CHF 1000 are reported as having no wealth in these statistics.

[16]The compilations for 1913 and 1919 are available in the Annuaire Statistique de la Suisse 1914 (p.226) and 1920 (p.395). The ones for the remaining years have recently been made publicly available by the Swiss federal fiscal administration : http://www.estv.admin.ch/dokumentation/00075/00076/00717/index.html?lang=fr.

[17]This ratio was respectively equal to 81% and 79% for years 1913 and 1919, hence the approximation of 80% for 1900 and 1910. Since we are interested in the aggregate private wealth, we do not want to consider the wealth of non-physical entities, but rather uniquely households' wealth.

[18]This correction thus doesn't account for the potential wealth undervaluation in the tax reports.

[19]Private wealth data for the years of interest can be found in Appendix Table A1.

Finally, GDP can also be computed by summing primary incomes distributed by resident producer units.

Another well known concept is the Gross National Income (GNI), which is a concept of income rather than value added. The GNI is equal to GDP less primary incomes payable to non-resident units, plus primary incomes receivable from non-resident units.[20]

The concept we use in this paper is the Net National Income (NNI), which is the net counterpart of the GNI. That is, one simply has to deduce the consumption of fixed capital from the GNI. This concept is the most suited for the analysis of inheritance flows, since it excludes the consumption of fixed capital, which does not represent newly created value. Moreover, since National Income is an income rather than production concept, it is more meaningful to express it in net terms (ESA 1995).

To obtain long-term series on net national income, various sources are used, depending on the period concerned. We couldn't find yearly estimates of net national income over the whole study period. However, such values exist for a large number of years. For years 1906-1938, we directly take Andrist et al. (2000)'s estimates. The authors used these net national income estimates from past studies to recover the real output in Switzerland for the inter-wars period. Then, yearly net national income evaluated at current market prices for the period 1938-1956 is available in the Annuaire Statistique Suisse 1957 (p.347). Estimates for the period 1965-1995 are taken from the statistical office of Switzerland (OFS).

Finally, for the most recent period, since the OFS series stops in 1995, we use data from OCTSTAT (years 1998-2005) and BAKBASEL(years 2001-2012).[21] Since data from these two sources exactly coincide for years 2001-2005, we believe it is highly reliable.

This allows building a series covering most of our years of interest, except 1911 and 1969. However, we do have data for years 1910 and 1970. Therefore, we proceed by linear interpolation to recover estimates for all desired dates. We do not believe that a major change in the net national income is to be expected between two consecutive years in these two periods.

3.2.3 Estimation of the ratio between gifts and bequests (v_t) for Switzerland

Lacking on fiscal data for bequests and gifts, we cannot precisely estimate this ratio for Switzerland for all our years of interest. However, Daepp (2003) estimated this ratio for a few cantons in the period 1995-2002. Table 2 presents his estimates.

Table 2: Ratio between gifts and inheritance

| | Zürich | Bern | Ticino | Vaud |
		(Percentages)		
Year				
1995		30.6		
1996		41.8		
1997		42.2	42.4	
1998	49.1	39.3	31.1	
1998*	36.9			
1999		27.5	40.2	
2000		23.4		
2001		34.4		17.9
2002		33.5		43.9
Average		**33.5**	**36.5**	**30.4**

Source : Daepp (2003).
1998* excludes all wealth transfers larger than CHF 200 million.

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[20]This measure is the same as Gross National Product (GNP). The difference is that the GNP is based on a production-side measure, whereas the GNI is based on an income-side measure.

[21]http://www.be.ch/portal/fr/veroeffentlichungen/statistiken.searchresult.html?theme=4

Daepp (2003) concludes that the Swiss ratio of gifts over inheritance was around 33% in the late 1990s. Moreover, the statistical office of the canton de Vaud kindly provided us with data for this ratio covering years 1998-2004. For years 2001 and 2002, it matches Daepp (2003) estimates, confirming the reliability of his computations. This ratio seems very volatile, due to the influence of large estates being transmitted in some years. For 2004, the ratio in the canton de Vaud was around 42%.[22]

Given the lack of Swiss data covering the total length of our sample, we assume that the value of the ratio between gifts and inheritance for Switzerland until 2002 corresponds to the values of Germany provided by Schinke (2012) and reproduced in Table 3.[23] This assumption is based on two arguments. First, as we can see, the value of 34% for Germany in 2002 corresponds to the value estimated both by Daepp (2003) and Stutz et al. (2007) around this period. Second, it is argued by Piketty (2011) in his appendix that the increase in the values of this ratio for the last decades for France, given its timing, is likely not to be due only to changes in taxation but rather on the life expectancy increase. Effectively, people who live longer would tend to give more gifts to their children so that they can enjoy this extra wealth at important moments in their lives. If the path of the ratio between gifts and bequests effectively depends primarily on the evolution of life expectancy, then Switzerland is likely to follow a similar trend as Germany. Effectively, as can be seen from Figure 2, life expectancies in these two countries are similar.

However, after 2002, we do not believe that the Swiss ratio increased as much as what was observed in Germany. Effectively, Schinke (2012) justifies this large increase by saying that "public awareness for the issue of inheritance, taxes and ways to circumvent them has risen considerably during the time".

In Switzerland, however, this cannot hold since there has been a wave of inheritance tax cuts on direct descendants as documented in Section 2, so people had no incentive to try to avoid taxes. Hence, from 2002, we assume that the Swiss ratio is a linear extrapolation of the German values based on previous years. This leads to a moderate increase in the ratio v_t (which is consistent with the observed increase in life expectancy).[24]

Table 3: Ratio between gifts and inheritance for Germany

Year	1911	1961	1973	1978	2002	2007	2009
v_t	0.08	0.18	0.30	0.30	0.34	0.58	0.59

Source : Schinke (2012)

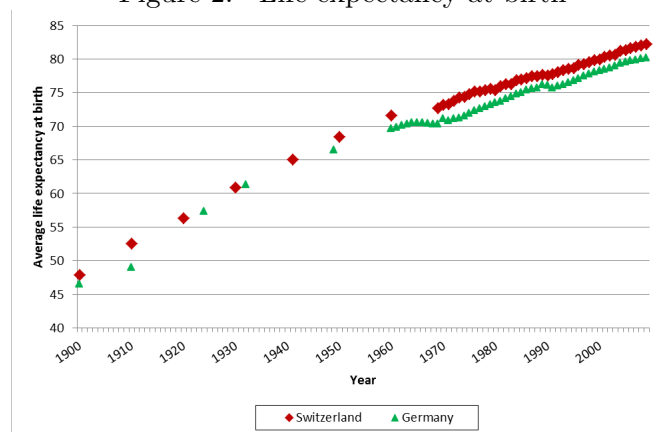### 3.2.4 *Estimating the age-wealth profiles of the Swiss population*

The computation of the non-corrected ratio between the average wealth of decedents and the average wealth of the living (μ_t) requires age-wealth profiles either of the former (as Piketty (2011)) or the latter. We make use of tax statistics of the canton of Zürich to dispose of age-wealth profiles of the living for years 1934, 1945, 1969, 1975, 1987, 1995, 1999 and 2009. This implicitly assumes that these profiles are representative of the whole country. It is the availability of this data that restrains our study period and does not allow us to compute estimates of inheritance flows for a larger number of years.

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[22]We do not use estimates from 1998-2000, because they are not based on calendar years. Estimates for years 2001 and 2003 are much smaller (18% and 17% respectively), but this is likely to be due to particularly large estates of a few decedents in these years.

[23]Since German data do not exactly correspond to our years of interest, we proceed by linear interpolation to recover estimates for the desired dates.

[24]The implied ratio for 2009 is equal to 38.8%, instead of the 59% observed in Germany. Robustness checks regarding this assumption can be found in Section 5.1. The data we assume for v_t, covering our years of interest, can be found in the Appendix Table A2.

Figure 2: Life expectancy at birth

Source: Statistical offices of Switzerland and Germany respectively.

Regrettably, age-wealth profiles before 1934 are not available, which prevents us from estimating the ratio of average decedents wealth over the average wealth of the living in 1911. To overcome this issue and compute a first approximation of inheritance flows in this year, we define μ_{1911} as being the linear extrapolation of this ratio based on years 1934 to 1987. Not considering years after 1987 avoids creating a bias due to the large increase in this ratio over the last three decades.[25]

Looking at Figure 3, we see that this assumption implies an increasing pattern of this parameter, as opposed to France. As we can see, there is a large drop in this ratio for France due to the first world war and it only starts recovering after 1945. A more continuous evolution in Switzerland seems credible since it did not suffer severe capital shocks from the two world wars. The same figure, but corrected for the ratio between gifts and bequests ($\mu_t^* = (1 + v_t) \cdot \mu_t$) reinforces our conclusion. Effectively, the French μ_t^* almost entirely recovers its initial level after the first world war.

Figure 3: Evolution of ratio μ_t in Switzerland and France

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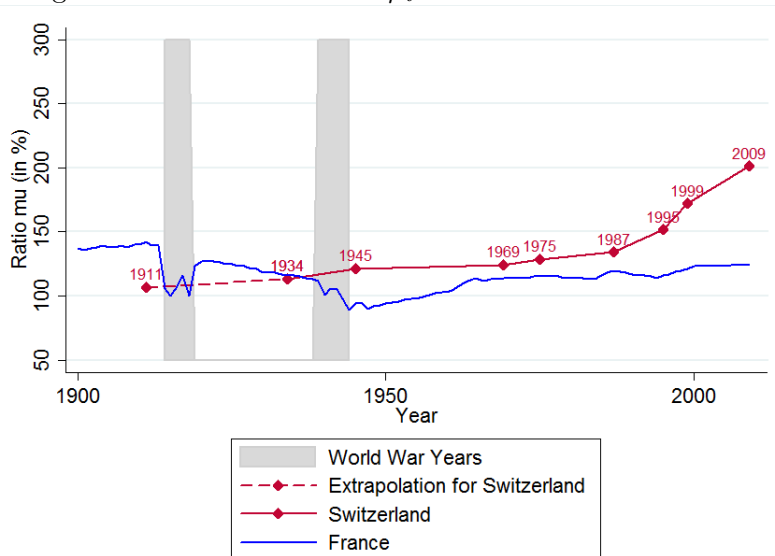
[25]The inheritance flows long-term pattern is robust to basing the extrapolation on the whole sample period (1934-2009). The resulting μ_{1911} would equal 94.6% instead of 106.3%.

Figure 4: Evolution of ratio μ_t^* in Switzerland and France
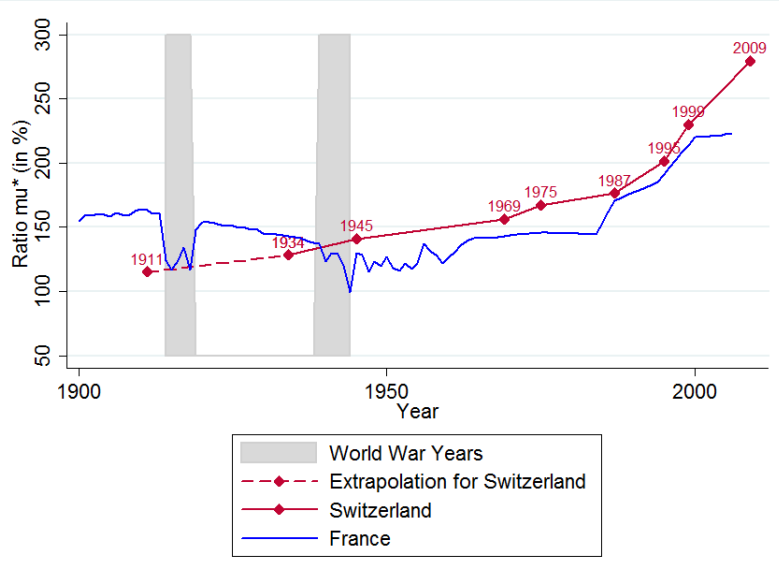
The slight decrease in μ_t^* between the two world wars cannot be interpreted as a proof that the Swiss ratio should also have decreased, because it might be due to the assumption of Piketty (2011) that v_t in France was constant and equal to 25% between 1918 and 1942. Since life expectancy was increasing during this period, we believe that this ratio should have increased at least slightly, compensating the observed decrease in μ_t.

We interpret the large increase in the μ_t^* ratio for Switzerland as opposed to France in the recent decade as the fact that, in the former country, there is a particularly high level of wealth concentration at high ages, as documented by Moser (2002).

Nevertheless, it could also be the case that Switzerland in fact faced a non-monotonic increase in the μ_t ratio over the 20th century.

Section 5.2 provides robustness checks regarding the implications of this assumption on the pattern of inheritance flows as a fraction of net national income and aggregate private wealth respectively.

We now return to our age-wealth profiles estimates. Shorrocks (1975) describes that two main aspects are susceptible to bias the resulting estimates from cross-sectional data. Firstly, there might be important cohort effects, since there is a direct relationship between age and the birth cohort. For example, should the younger generation be richer at all ages (for example if they didn't suffer the war but their predecessors did) then the resulting age-wealth profile might give the illusion of wealth decumulation at later ages. Here, since age-wealth profiles from cross-sectional data are computed at several points in time and show the similar average wealth patterns, we believe that birth cohort effects are not significantly biasing the estimates.

As an illustration, Figure 5 shows these profiles for years 1995 and 1999, which are the years with the most disaggregated age groups.

Secondly, differential mortality (defined as the fact that the poor are more likely to die young) can bias the estimates upward at higher ages, because only the rich remain and hence look more wealthy on average. In this study, we correct the ratio of the average wealth of decedents over the average wealth of the living for differential mortality, as will be explained in Section 3.2.6. However, since our interest is not directly in age-wealth profiles per se, we do not present the corrected profiles.

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Figure 5: Age-wealth profiles for the canton of Zürich
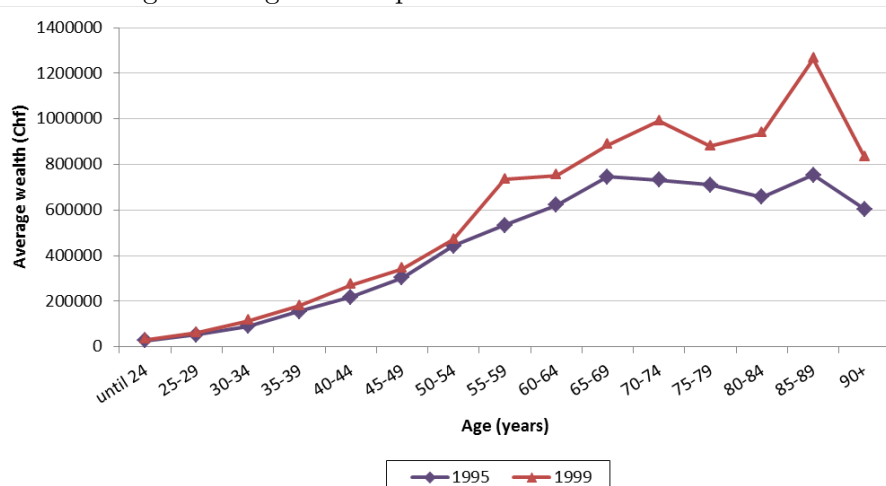
Looking at Figure 5, we see that age-wealth profiles for the canton of Zürich's residents resemble the profiles of Germany estimated by Schinke (2012). Average wealth increases before the retirement age and then decreases slowly.

We also find a second peak of average wealth at a later age, probably due, as he explains, to the concentration of wealth on the remaining spouse and on the fact that at higher ages only wealthier individuals remain due to differential mortality. We attribute the decrease in average wealth of people over 90 as an indicator of increasing health expenses at higher ages.[26] Birth cohort effects seem less important than what Schinke (2012) found for Germany, which is in line with the fact that Switzerland did not take part in the two world wars.

3.2.5 Demographic data

In order to estimate inheritance flows over the long-run, we need accurate demographic data. Firstly, to compute the mortality rate (which is simply equal to the number of decedents over the living population for each year), we need the total population as well as the number of decedents per year. Since we compute this rate over the adult population only, we also use the share of decedents being less than 20 years old as well as the fraction of living individuals under 20.[27] This data essentially comes from four sources. First, we use the Swiss adult population numbers from Dell et al. (2005) for years 1900 to 2000. The number of decedents by age groups for years 1900 to 1991 is taken from Siegenthaler (1996). Another important source of data is BEVNAT, which is a database computed by the statistical office of Switzerland, containing information on population movements (for example births, deaths, marriages and divorces) per age, gender, nationality and civil status. Finally, the database "Historical statistics of Switzerland on-line" contains demographic data covering a large time span and which is readily available.[28]

The combination of these data sources allowed us to assemble reliable yearly estimates between 1900 and 2009. The resulting estimated Swiss adult mortality rates are shown on Figure 6. We also show this ratio for France as a comparison.[29]

We can see that this ratio has been decreasing over time for both countries.

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[26]Note that the peak for age-group 85-89 is not due to the number of individuals per age bracket.

[27]Computing the mortality rate over the adult population follows Piketty (2011) and serves to avoid a bias due to high children mortality rates in the beginning of the 20th century.

[28]http://www.fsw.uzh.ch/histstat/main.php

[29]French data is taken directly from the Appendix of Piketty (2011) Our years of interest are 1911, 1934, 1945, 1969, 1987, 1995, 1999, 2009. They represent years for which we have the necessary data to estimate Swiss inheritance flows.

Figure 6: Mortality rate over the adult population (20^+)
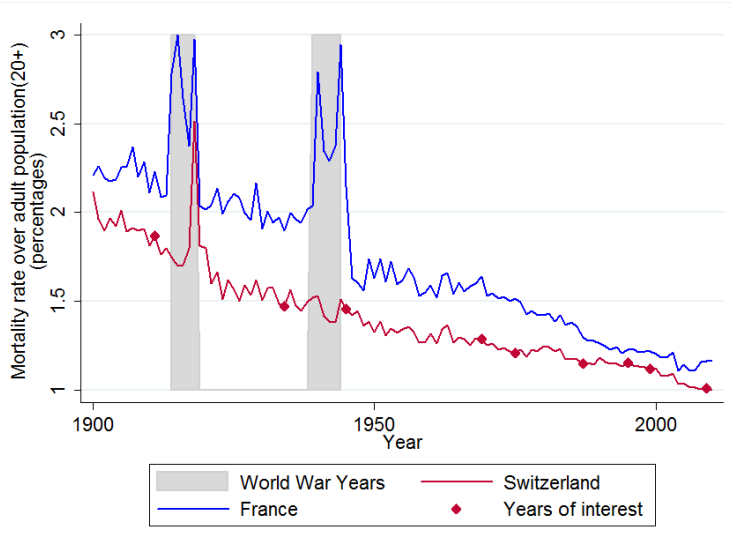
In Switzerland, it went from 2.1% in 1900 down to 1% in 2009. Except for the year 1918, which was characterized by the worldwide "Spanish flu" pandemic that did not spare Switzerland, this country did not suffer from increases in the mortality rates during the two world wars, confirming the fact that this nation has been spared from most of the wars damages.[30] Moreover, the Swiss mortality rate has always been slightly smaller than in France, even though the two series seem to be converging.

Secondly, still in order to compute the ratio μ_t, we need the number of decedents per age group for the above mentioned years of interest for the canton of Zürich. Since the age-wealth profiles of the living for each of these years were not aggregated over the same age groups in the zürcher statistics, we could not use readily available data of the number of decedents per age group.[31] We thus made use of mortality tables from the Swiss statistical office to compute the share of decedents per age category (we were able to compute these shares for each year aggregating over any age class) and simply multiplied them by the total number of decedents per year. The number of living individuals was taken directly from the tax statistics of Zürich, together with the age-wealth profiles. It is worth noting that we only take the number of living individuals owning a wealth superior to CHF 1000, to be consistent with our wealth estimates for Switzerland, which are taken from tax statistics.

3.2.6 Data on the share of wealth owned by individuals below median wealth (sh_t^p) and differential mortality

This section presents the estimation procedure and assumptions of two parameters that are important to consider to compute economic inheritance flows. However, they are not determinant for the overall pattern of inheritance, as we shall see.

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[30]Note that since we do not estimate the inheritance flow for year 1918, the extreme mortality rate for this year has no influence on the long-term inheritance pattern.

[31]Age-population data is generally only available for the main age categories, which do not necessarily match the tax statistics categories.

The parameter sh_t^p estimated by Pareto interpolation

Firstly, the wealth share of the bottom 50% of the population is necessary for the computation of the ratio μ_t, which represents the ratio between average decedents' wealth and the average wealth of the living.

Estimating this parameter from tax data proved difficult. Effectively, from tax data, the number of people with a positive net worth inferior to CHF 1000 is generally reported but their wealth is estimated as being 0. Since for earliest years the majority of people belong to the wealth bracket CHF 0-1000 , the resulting estimate of sh_t^p would be zero. Since we have no information on the net worth of people with a wealth inferior or equal to CHF 1000, we do not include them in the estimation of the share of wealth owned by the poor. Hence, the parameter we compute is an upper bound to the real sh_t^p.

Our estimations are based on wealth distributions for the canton of Zürich, which have been assembled by the fiscal administration for internal use. This implicitly assumes that the wealth distribution of Zürich is representative of the whole country.[32]

If anything, wealth would be more concentrated in Zürich, compensating part of the overestimation due to the fact that we only consider people with a wealth superior or equal to CHF 1000. However as will be shown later on, the ratio μ_t is robust to variations in the parameter sh_t^p.

The wealth distributions of Zürich contain the total wealth of people in each wealth bracket as well as the number of individuals in each bracket. Hence, proceeding by Pareto interpolation, we are able to deduce an average value of 4.25% for sh_t^p over the studied period, which is lower than the 10% assumed by Piketty (2011) for France. Since wealth concentration is known to be larger in Switzerland than France, this finding comforts us in the validity of this estimation.

Pareto interpolation became the most natural way of estimating top income shares since the work of Piketty (2001) and Dell et al. (2005). We follow their methodology, summarized in Foellmi and Martinez (2012) and apply it to the wealth distributions of Zürich for years 1913, 1934, 1945, 1969, 1975, 1987, 1995, 1999 and 2007 to recover sh_t^p for each of these dates.[33] Table 4 presents our estimates.

Table 4: Share of wealth owned by individuals below median wealth in Switzerland

Year	1911*	1934	1945	1969	1975	1987	1995	1999	2009*	Average
sh_t^p (in %)	3.43	5.28	5.43	3.98	4.91	4.52	4.11	3.31	3.19	4.25

Source : Pareto interpolation from wealth tax statistics of the canton of Zürich.
The 1911* share is estimated using 1913 wealth statistics.
The 2009* share is estimated using 2007 wealth statistics.

Given the lack of more accurate data, we assume this share to be constant over all age groups within each year. This assumption is also motivated by the fact that wealth concentration seems independent of the life cycle. Atkinson (1983) for example finds that top wealth shares broken down by age groups are of equivalent sizes in the UK.

We also tried to compute the μ_t ratio (representing the non-corrected average wealth of decedents over the average wealth of the living) by assuming respectively that sh_t^p was equal to zero percent (which would be the case for most years if we considered people with a net worth inferior to CHF 1000 as having an average wealth of zero) and 10% (as Piketty assumes for France).

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[32]This is a standard assumption for Switzerland, which was also made for example by Stutz et al. (2007) and Moser (2002).

[33]An explanation of the Pareto interpolation methodology, as well as a detailed example for year 1913, can be found in Appendix Section 6.5.

The resulting μ_t estimates are shown on Figure 7 and we can see that this ratio is very robust with respect to changes in the estimated pattern of sh_t^p.

Figure 7: Ratio μ_t for different assumptions concerning sh_t^p
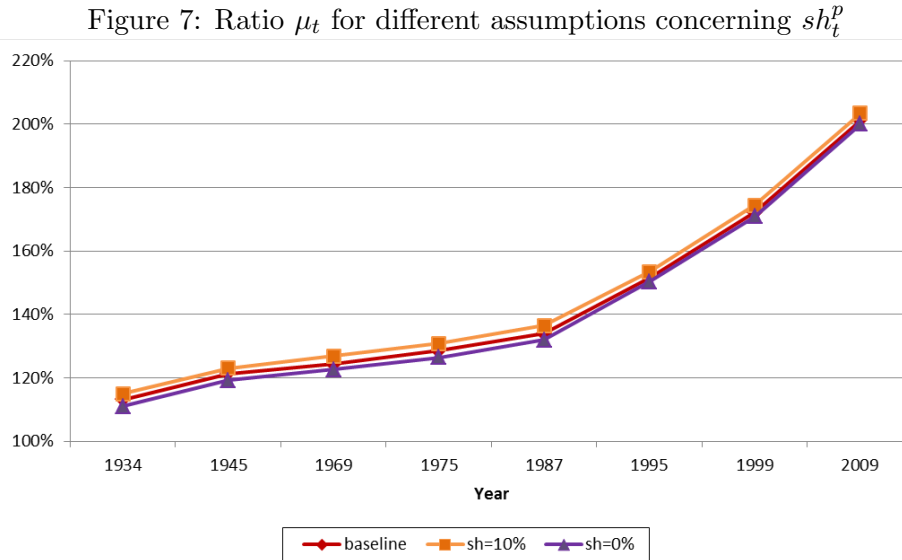
Note: μ_t is not corrected for the ratio between gifts and inheritance.

Differential mortality estimates

Secondly, in order to compute the non-corrected ratio between the average wealth of the deceased and the one of the living, we must take differential mortality into account, or else this ratio would be upward biased. The rich, who are defined here as the top fifty percent of the population, face different life conditions than the poor. As a result, the poor, especially at younger ages, tend to have a higher mortality rate, which reduces the ratio μ_t. Effectively, if people who die are those with the lowest wealth, then the ratio of the wealth of decedents over the wealth of the living as well as the resulting inheritance flows is naturally lower. Since differential mortality varies with age, it is important to estimate this parameter for each age group used to compute the ratio μ_t.

For Switzerland, Wanner and Lerch (2012) provide a detailed survey of the existing literature as well as an extensive study on differential mortality by different socioeconomic factors. In general, differential mortality studies have been rare in Switzerland, due to the lack of longitudinal data. Recently, the Swiss National Cohort database, funded by the Swiss National Science Foundation has been created to overcome this lack of data. It is suitable for longitudinal studies, since it is based on the linkage between the 1990 and the 2000 population census and contains information from the mortality records for years 1991 to 2008, hence following the Swiss population over 10 years.

A major study on differential mortality by education, based on the German-speaking part of Switzerland, was made by the one by Bopp and Minder (2003). Authors find evidence of differential mortality by educational level, particularly at lower ages. Another important study on differential mortality by profession was made by Gubéran and Usel (2000), but only concerns the canton of Geneva.

Unfortunately, there has not yet been an explicit study on Swiss differential mortality by wealth, which would be best suited for this study. However, Wanner and Lerch (2012), document, by comparing diverse studies on differential mortality, that the latter is likely to be similar in Switzerland to what is observed for France and at a lower level than what is observed for northern Europe and Anglo-Saxon countries.

For this paper, due to the lack of suitable Swiss data, we use the same differential mortality estimates as Piketty, which are taken from Attanasio and Hoynes (2000).
These authors use the Survey of Income and Program Participation (SIPP) in the United States to provide estimates of differential mortality by wealth and show that there is a strong relationship between these two variables.

Since their study concerns the US, it constitutes an upper bound on the Swiss differential mortality parameter. Accordingly, the real μ_t ratio should lie in between the two curves on Figure 8. Indeed, it shows the difference in the non-corrected average decedents wealth over the average wealth of the living, between assuming uniform mortality or correcting for differential mortality by wealth, which corresponds to our baseline scenario. As expected, the uniform mortality assumption biases the parameter μ_t upwards. We conclude that even though this correction is important to consider, its level does not impact the general pattern of the ratio μ_t and thus will have a negligible impact on the long-term evolution of inheritance flows.

Figure 8: Non-corrected decedents' wealth over wealth of the living (μ_t)
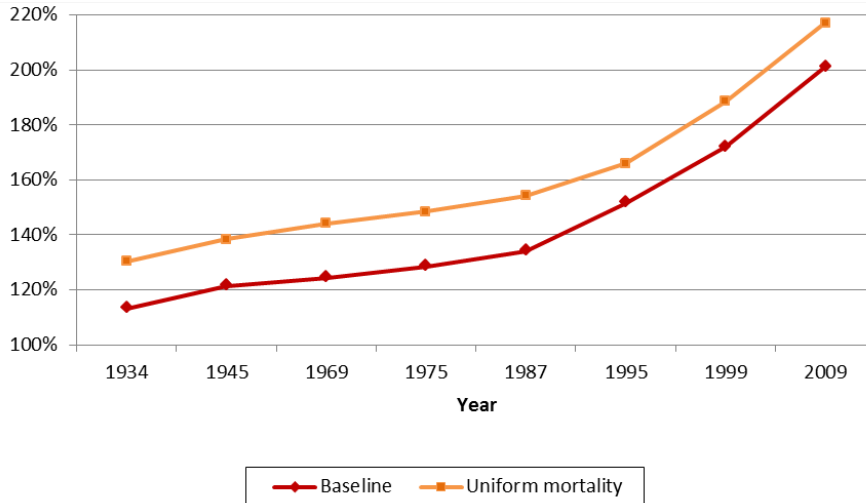
Following Piketty (2011), we assume these differential mortality estimates to be constant over time, which might not be the case in reality. If anything, differential mortality by socioeconomic status seems to have been increasing over the last decades.[34] Kopczuk and Saez (2004), who assume constant differential mortality to recover top wealth shares in the US from estate tax returns, analyze differential mortality changes over time in their appendix. They conclude that no obvious trends in the evolution of differential mortality are detectable. Mesrine (1999), analyzing differential mortality in France, finds that it stayed remarkably stable over the last 3 decades, in opposition to other countries.
Hence, we do not regard the assumption of constant differential mortality as being likely to bias our results on the long-term pattern of inheritance flows in Switzerland.

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[34]See for example Vallin et al. (2001) for Europe and Hattersley (1999) for the UK.

3.3 Summary Table of the main parameters' data availability

As we have seen, our estimation of long-term inheritance flows relies on numerous data sources as well as several assumptions on the data. Therefore, before turning to the analysis of our empirical results, it is important to summarize the data we are using for the main components of the inheritance flows equation

$$b_{yt} = \frac{W_t}{Y_t} \cdot m_t \cdot (1 + v_t)\mu_t.$$

The data series for these parameters, covering our years of interest, can be found in the Appendix 6.1.

Table 5:   Main Parameters used to Estimate Long-Term Inheritance Flows in Switzerland

Summary and Data Sources

Parameter	Short Description	Data Source	Years Covered
W_t	Aggregate private wealth of households	Swiss data from tax statistics	Several years from 1901 to 2009
Y_t	Net national income	Swiss national accounts data	Several years from 1906 to 2009
m_t^{20+}	Mortality rate over adult population	Computed from Swiss demographic data	Yearly estimates from 1900 to 2009
v_t	Ratio between gifts and bequests	German data from Schinke (2012) until 2002 and linear extrapolation for later years	1911, 1961, 1973, 1978, 2002, 2007 and 2009
μ_t^{20+}	Non-corrected ratio between average decedents' wealth and average wealth of the living	Computed from age-wealth profiles of the canton of Zürich	1934, 1945, 1969, 1975, 1987, 1995, 1999 and 2009. Extrapolated for 1911.

4 Empirical Evidence

After presenting our methodology and data sources in detail, we can turn to the analysis of the long-term determinants of the evolution of inheritance in Switzerland.

4.1 The ratio β_t

Before describing the evolution of inheritance flows over net national income, it is interesting to see the pattern of the ratio between private wealth and net national income in Switzerland. As we can see from Figure 9, this ratio seems to have followed a more continuous evolution in Switzerland than in France. Note that we do not plot the values of this ratio outside our years of interest. However, the value of β_t in 1913 and 1915 was larger than in 1911, reaching respectively 385% and 375%. Considering 1913 and 1915 in the analysis would not change the conclusion of a U-shaped pattern on inheritance in Switzerland. However, inheritance flows would respectively be equal to 8.05% and 7.5% of net national income, preventing us from firmly concluding that the inheritance flows level in 2009 are significantly higher than before the first world war.[35]

The sharp increase in this ratio since 1991 (from 183% in 1991 to 314% in 2009) is attributed to a larger increase in aggregate private wealth than in net national income.[36]

An interesting thing to note is that the ratio of wealth over national income seems to be lower in Switzerland than in France. It could be argued that this is due to a potential underestimation of the private wealth. However, if we use estimates from Stutz et al. (2007), this ratio would be equal to almost 309% in year 2000, compared to a ratio of 355% for France at the same date.[37] Hence, this phenomenon seems to persist even if wealth is corrected upward. Finally, we conclude that the Swiss ratio is slightly U-shaped, which may drive the pattern of inheritance flows as we will see in the next subsection.

Figure 9: Private wealth as a fraction of net national income

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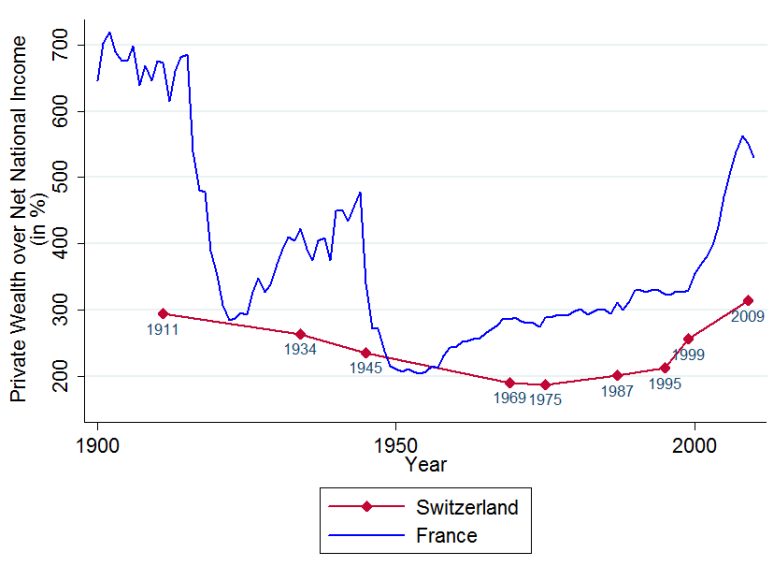
[35]Only year 1911 was selected in our final analysis, because the net national income data in this year seem more reliable and we can directly compare it to Germany.

[36]Aggregate private wealth more than doubled in this period, going from CHF 542 billion in 1991 to CHF 1387 billion in 2009, whereas net national income was only multiplied by a factor 1.5 (going from CHF 296 billion to CHF 442 billion in the same time interval).

[37]The ratio of 309% estimated by Stutz et al. (2007) for year 2000 is higher than the ratio of 263% we obtain for year 1999, notably since Stutz et al. (2007) apply an upward correction on wealth issued from tax statistics.

4.2 Pattern of inheritance flows in Switzerland

We now turn to the analysis of the main point of interest of this paper, the evolution of inheritance flows in Switzerland.

Inheritance flows as a fraction of net national income

Firstly and most importantly, we will discuss the evolution of inheritance flows over net national income. As can be seen from Figure 10, under our assumptions, the Swiss pattern of inheritance is slightly U-shaped, although much less than what Piketty (2011) found for France and what Schinke (2012) found for Germany.[38] Effectively, it goes from 6.3% in 1911, down to a minimum of 3.8% in 1975 and then increases up to a value of 8.85% in 2009. However, as previously emphasized, we cannot firmly conclude that the 2009 level is higher than what was observed in the beginning of the 20th century.

Figure 10: Inheritance Flows as a fraction of Net National Income
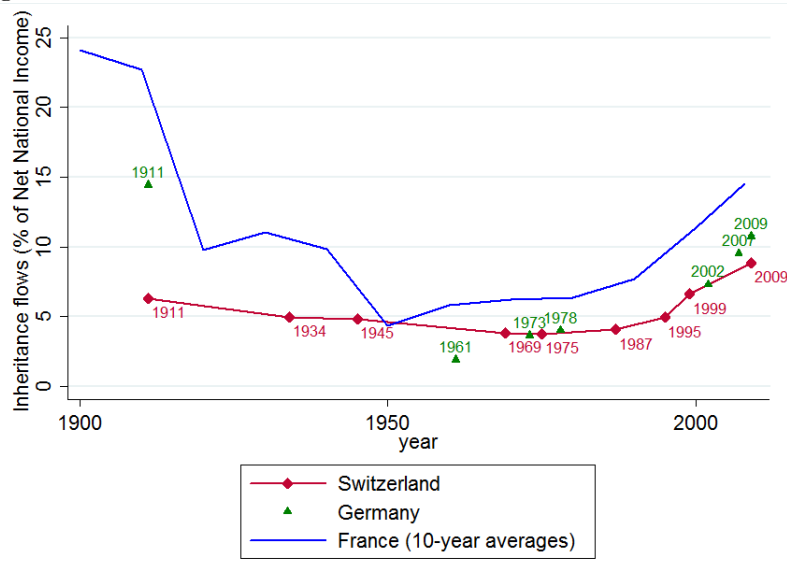
This evolution is a very interesting result and, as we will see in the next section, it is robust to alternative assumptions on the main parameters.

Switzerland did not suffer from severe capital shocks during the two world wars as was the case for its neighboring countries. Hence, one could expect the inheritance flows to be flat or monotonically increasing over the 20th century, which was not entirely true. A potential explanation for this is that Switzerland is known to be a small open economy, hence strongly relying on its neighboring countries.

Therefore, even if there were no direct capital shocks in Switzerland, households still have suffered indirectly from the two world wars. This explanation is consistent with the less pronounced non-monotonic pattern we observe.

Swiss inheritance flows have been close to the German ones from 1969 to 2002, and then have become lower, mainly due to our assumption that the ratio of gifts over inheritance increased less than what was observed for Germany after 2002.[39]

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[38]French inheritance flows are presented as decennial-averages, following Piketty (2011)'s main figures. Figures with annual data are available in the Appendix 6.3.

[39]See section 3.2.3 for the description of this assumption and 5.1 for robustness checks.

We deem it unlikely that Swiss flows should become of higher economic importance than in France, notably because the growth rate of inheritance flows is higher in the latter country.

Concerning the evolution of inheritance in Sweden, early estimates from Ohlsson et al. (2012) show that it went from about 15% of net national income in 1910 down to about 5% in the early 1980s and has since probably increased again up to around 10%.[40] The Swedish pattern of inheritance can therefore be seen as being close to the one of Germany and more U-shaped than what we observe for Switzerland.

Next, it is interesting to discuss in more details which parameters are most likely to drive the pattern of inheritance in Switzerland. As emphasized by Piketty (2011), the accounting equation

$$b_{y,t} = \beta_t \cdot \mu_t^* \cdot m_t$$

allows for a clear decomposition of the changes in aggregate inheritance flows.

The initial decrease observed over the first half of the century is mainly due to the deterioration in the ratio between private wealth and net national income (β_t), as was visible from Figure 9. It can also be explained, to a lesser extent, by the reduction in adult mortality rates, which went down from 2.11% in 1900 to 1.32% in 1950.

Concerning the steep increase in inheritance flows over net national income in the last decades, it is attributable to both the increase in μ_t^* and β_t, which largely compensates the decrease in adult mortality rates. Effectively, the average wealth of decedents over the average wealth of the living (corrected for gifts) was multiplied by more that 1.5 within 30 years (It went from 176% in 1987 to 279% in 2009) and the ratio between private wealth an net national income increased from 200% to 314% in the same time interval. As an illustration of this decomposition, we rescaled the main parameters at 100 in 1911, as can be seen in Figure 11.[41] The vertical line corresponds to 1975, when inheritance flows reached their minimum value.

Figure 11: Main parameters of the inheritance flows' equation rescaled at 100 in 1911
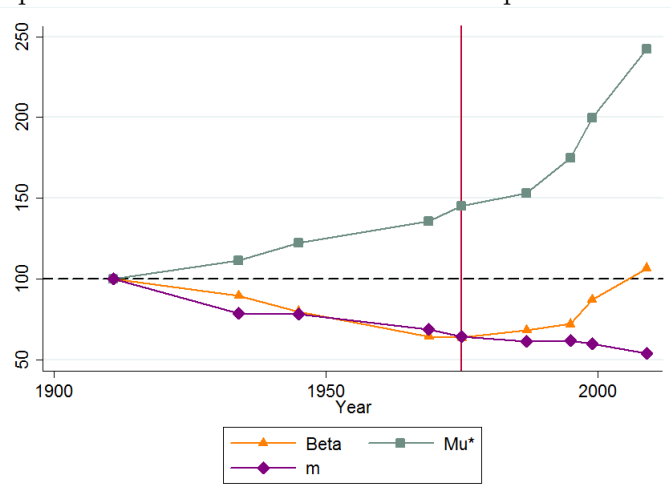
Relating our findings to the history of inheritance taxation in Switzerland, we conclude that the initiatives proposing a federal inheritance tax do not necessarily correspond to periods where inheritance flows over net national income were high. While the first initiative, made in the period 1919-1932, corresponded to flows over 6% of net national income, the second one, launched in 1974, concurred with the lowest level of inheritance flows (about only 3.8% of net national income).

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[40]piketty.pse.ens.fr/files/Roineetal2012.ppt
[41]The same figure using French data from Piketty (2011) is available in the Appendix 6.3, Figure 22.

As of the most recent initiative, it does coincide with relatively high inheritance flows, since they were equal to 8.85% of net national income in 2009, our last year of estimates. This flow, even though lower than in other countries for which estimates are available, is non negligible, since it represents more than CHF 39 billion.

Concerning the recent initiative, it is worth mentioning that it severely impacted inheritance flows in the year 2011 and thus will affect the future pattern of inheritance. Since the uniform inheritance tax rate of 20% of total bequest would be retroactive, only gifts and inheritance made before 2012 would be spared from this tax. As a result, in year 2011, donations massively increased in Switzerland. The Swiss Notaries Federation for example reported the 2011 donations to have reached CHF 40 to 50 billion, of which CHF 10 billion were made in the canton of Zürich. Therefore, inheritance flows in 2011, if we could estimate it, would reach an unprecedented height, since the ratio v_t exploded. However, this is entirely due to the fear of the recent initiative and is not sustainable in the long-run.[42] Effectively, since parents gave away most of their wealth in 2011, they will have no wealth to transfer at time of their death, so that inheritance flows will look unusually low (children won't make anticipated gifts as their parents did, since the fear of the initiative would no longer be present). Economists trying to estimate inheritance flows for Switzerland for the future generation thus have to be careful in considering this initiative's impact. Effectively, even if the federal inheritance tax law was finally rejected, donations have already been made and cannot be taken back without being taxed, so the impact on inheritance flows will persist no matter the results of the votes.[43]

Inheritance flows as a fraction of aggregate private wealth

Another interesting figure to look at, even if it is not the primary focus of this paper, is the evolution of aggregate inheritance flows over private wealth, which, by definition, is defined as

$$b_{wt} = m_t \cdot \mu_t^*$$

Looking at Figure 12, we see that the evolution of this ratio follows the same U-shaped pattern as in France. It is worth noting that, in opposition to inheritance flows over net national income, which are still much lower that what is observed in France, inheritance flows over private wealth are larger than the French ones since 1999.

The validity of our estimate is confirmed when comparing our estimation of $b_{w,1999} = 2.6\%$ to the value of 2.8% estimated by Stutz et al. (2007) for Switzerland in 2000.

However, given the importance of the parameter μ_t^* for the pattern of this ratio, it is important to remind that the year 1911 is our most uncertain estimate since we linearly extrapolated the 1911 value based on years 1934-1987, leading to a monotonically increasing μ_t ratio. Should this assumption prove incorrect, then the U-shaped pattern of inheritance over private wealth would be more pronounced, as will be discussed in Section 5.2.

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[42]The initiative was launched on the 16th of August 2011. Hence, the extreme increase in donations only took place at the end of year 2011 and did not persist after the 01.01.2012. Effectively, the tax is retroactive so donations after the 31st of December 2011 would be taxed, should the initiative be accepted.

[43]Even if the tax was not implemented, since donations from children to parents are taxable wealth transfers, it is unlikely that parents would ask back their wealth from children. We hence can consider the 2011 donations as being irreversible.

Figure 12: Inheritance flows over private wealth

5   Robustness Checks

In this section, we review the main assumptions under our inheritance flows estimation and provide some robustness checks as to assess the validity of our baseline scenario.

5.1   Assuming different patterns for the evolution of the parameter v_t

The most important assumption made in this paper, as explained in Section 3.2.3, is to consider the Swiss ratio between gifts and bequests to be equal to the values estimated by Schinke (2012) for Germany until 2002, and then to a linear extrapolation for remaining years.

One would be right to ask what exactly is the impact of this assumption on the estimated pattern of Swiss inheritance flows.

Figure 13 provides an answer to this essential question. It compares the estimated inheritance flows over net national income for four different scenarios. The red line corresponds to our baseline estimation.

As we saw in Section 3.2.3, the ratio for Germany increased a lot over time, going from 8% in 1911 to 59% in 2009. Piketty, for France, also found an increase in this ratio, which was even more dramatic (going from 19% in 1911 to 82% in 2009). Had Switzerland followed such a strong upward trend, the U-shaped pattern of inheritance would be accentuated. This scenario is represented by the violet dashed curve, where we assume German values for Switzerland over the whole period (and not only before 2002). It implies $v_{2009} = 59\%$ rather than the 38.8% from our baseline assumption. However, since there have been tax cuts rather that tax increases in Switzerland in the last decades, we deem this scenario unlikely. Our view that $v_{2009} = 59\%$ would be excessive for Switzerland is supported by Mr. Chappuis from the tax administration of Zürich and is more consistent with the smooth evolution of life expectancy as well as the evolution of inheritance taxes in this country.

In contrast, shouldn't Switzerland have followed an upward trend in the v_t ratio, the evolution of inheritance flows would be represented by the orange curve, where we assume that v_t was constant and equal to 33% over the whole period.[44] This scenario is not the most convincing, since it would imply that the evolution of the ratio between gifts and inheritance is completely independent of life expectancy.

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[44]33% being the value estimated by Daepp (2003) for the period 1998-2002 in Switzerland.

Finally, the light brown curve represents the inheritance flow as percentage of net national income, hadn't we corrected the series for the ratio v_t. Remember that this scenario is likely to underestimate the wealth of the deceased, since it doesn't take into account the share of wealth they gave away during their life time.

Overall, we conclude that correcting for the ratio v_t is important for the inheritance flows estimation. However, the evolution of inheritance and particularly the slightly U-shaped pattern found for Switzerland is very robust to changes in this parameter, which comforts us in our findings.

Figure 13: Robustness check for the ratio v_t
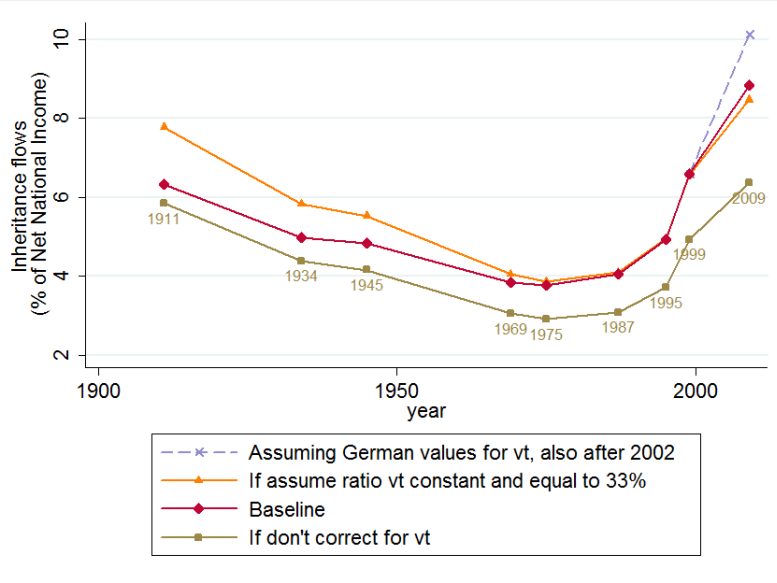
5.2   Alternative assumptions for μ_{1911}

As explained in Section 3.2.4, for year 1911, we assume that the non-corrected Swiss ratio between the average decedents wealth and the average wealth of the living is equal to a linear extrapolation based on years 1934 to 1987, so that the slope is not biased by the large increase in the ratio observed in the last decades.[45] However, even if we deem it unlikely, there is no formal proof that Switzerland did not follow the same U-shaped pattern as France in terms of the parameter μ_t.

In this section, we explore two different alternative specifications to assess the impact both on the parameter itself and on aggregate inheritance flows.

The first alternative considered is to assume that μ_t was constant between 1911 and 1934, which implies $\mu_{1911} = \mu_{1934} = 113\%$ (Instead of the 106% in our baseline scenario).

The second alternative, which is more extreme, assumes that the ratio of decedents wealth over the living's wealth was equal to its French counterpart in 1911 (except that we replace sh_t^p by the Swiss value in Piketty (2011)'s calculations). This results in a higher estimate, namely $\mu_{1911} = 132\%$. Figure 14 compares the shape of μ_t under these various alternatives. Only the last alternative implies a U-shaped pattern of this parameter.

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[45]The U-shaped pattern of inheritance is robust to basing the extrapolation on the whole period. The inheritance flow over net national income would be equal to 5.6% in 1911. Figure available on request.

Figure 14: Non-corrected decedents' wealth over wealth of the living (μ_t)
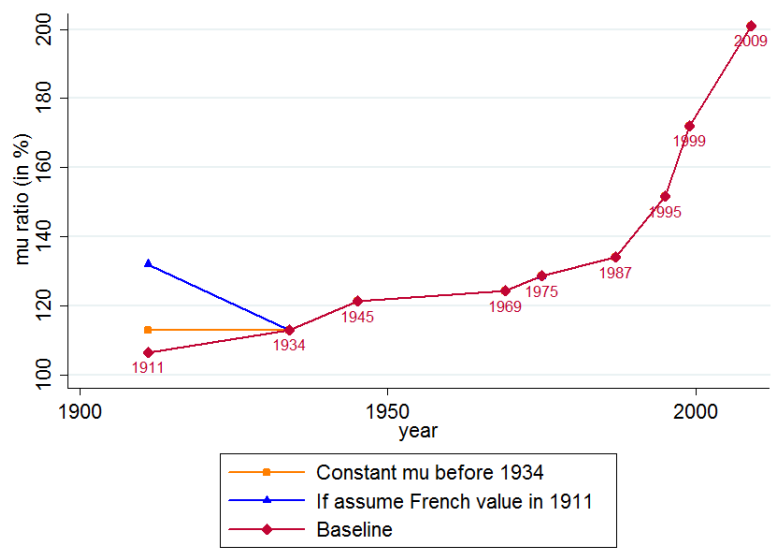

Thus, it is interesting to see how the general U-shaped pattern of inheritance flows over net national income is accentuated under our alternative assumptions. Figure 15 provides an answer to this interesting question.

Figure 15: Inheritance flows over net national income
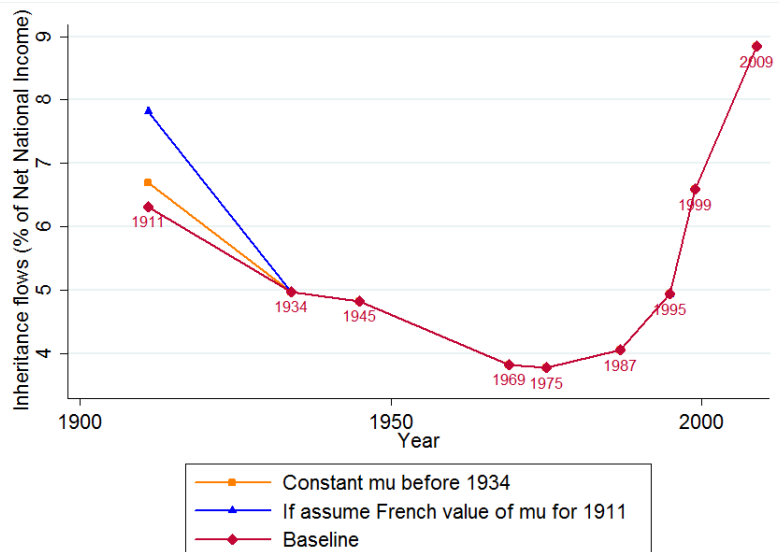
As we can see, the U-shaped pattern is more pronounced under the assumption that the μ_t ratio should follow a non-monotonic pattern as in France, which is intuitive. However, the inheritance flow would only go from 6.3% to 7.82% of net national income, which is still much smaller than the 24.5% observed in France in 1911.

Regarding the ratio of inheritance flows over aggregate private wealth, as discussed in Section 4.2 and due to its accounting definition, it relies more heavily on the ratio μ_t and thus would be more severely impacted, as can be seen from Figure 16. The U-shaped pattern appears stronger under our two alternative assumptions, but the impact is still small, the flows going from 2.14% of private wealth under our baseline assumption to only 2.66% under the assumption of a U-shaped μ_t parameter.

Figure 16: Inheritance flows over private wealth
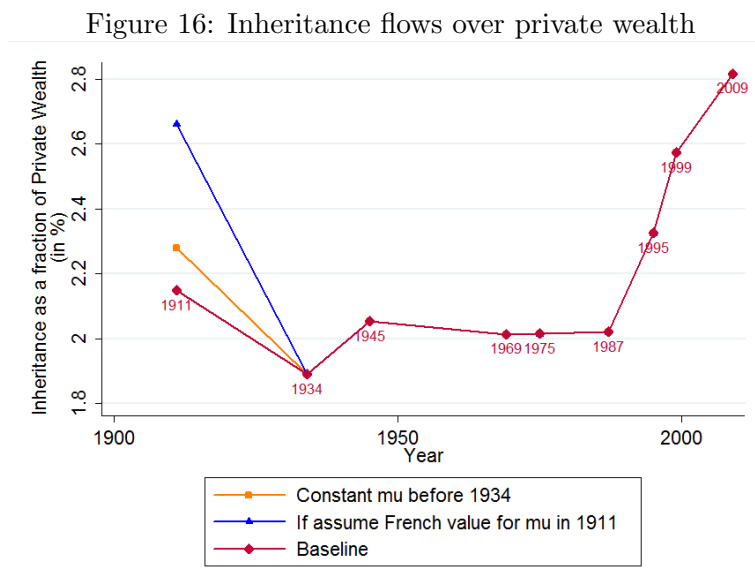
5.3 Upward correction for wealth from tax statistics

As discussed in Section 3.2, we do not apply an upward correction to wealth tax statistics. The reason is that we have no information on the potential wealth of individuals with a fortune inferior to CHF 1000. Hence, the level of the upward correction would be ad hoc. However, this is likely to lead to an underestimation of the true private wealth. Effectively, Stutz et al. (2007) estimated that wealth from tax statistics for the period 1997-2000 should be increased by 12.3% to reflect the real amount of private wealth. This correction also incorporates the potentially large undervaluation of real estate assets.

We assume, as a first approximation, that this correction is constant and equal to 12.3% over the 20th century.

As we can see from Figure 17, the ratio of private wealth over net national income would slightly increase, but would remain lower than the French ratio for most years.

Moreover, it is important to remind that we are not interested in the level of inheritance flows per se but rather on their long-term evolution, which is not impacted by this correction, since we assume it to be time-invariant.

However, this correction might not be constant over time, but its long-term trend is ambiguous. First, one would think that the correction for earlier dates should be higher, because the poor were likely to be poorer than today.[46] Nevertheless, real estate was less undervalued and tax evasion was less common, which, on the contrary, would lead to a lower correction. Our intuition is that these two last effects would dominate.

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[46]Naturally, a net worth of CHF 1000 was much less common in 1911 than in 2000. Hence, more people were excluded from the tax statistics.

Therefore, the upward wealth correction estimated by Stutz et al. (2007) for years 1997-2000, provided that is is correct, is likely to constitute an upper bound for the correction in earlier dates.[47]

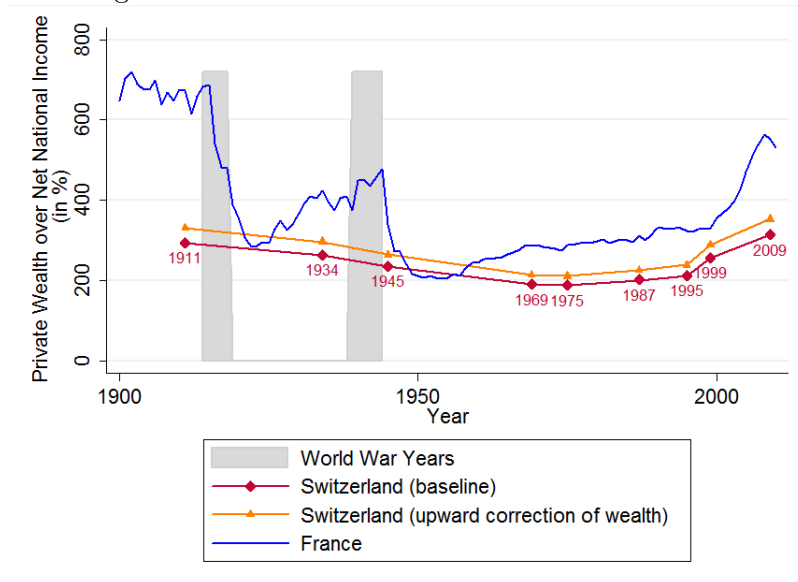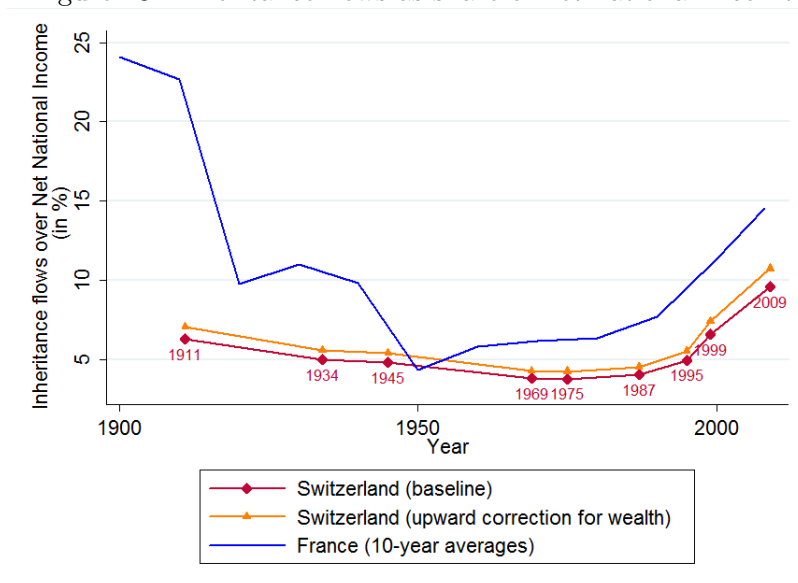Figure 17: Private wealth over net national income

Figure 18: Inheritance flows as share of net national income

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[47]The correction applied by Piketty (2011) for tax statistics is indeed increasing over time.

6   Conclusion and Perspectives

This paper combined numerous data sources to provide a first approximation of the long-term pattern of inheritance in Switzerland. Even though data availability is much more restrained than for France, robustness checks showed that our findings are robust to alternative assumptions for missing data.

Overall, we find the Swiss evolution of inheritance flows as a fraction of net national income to be slightly U-shaped, even though much less than what Piketty (2011) shows for France and Schinke (2012) documents for Germany. Effectively, inheritance flows as a fraction of net national income go from 6.3% in 1911 down to a minimum of 3.8% in 1975 and then steeply increase up to 8.85% in 2009.

In the last decades, inheritance flows seemed to evolve in a similar manner in the three countries, Switzerland being close to Germany but at a lower level than France. Given this evolution, we deem it unlikely that inheritance flows should take on a larger economic importance than in France in the near future. Nevertheless, an inheritance flow representing 8.85% of net national income is non negligible, since it corresponds to more than CHF 39 billion.

On distributional issues, this article has little to say, because we do not dispose of distributions of bequests and gifts. However, given the increasing importance of inheritance in Switzerland, this would be a promising area of research, would someone be able to access fiscal data. Stutz et al. (2007) study some of these issues for years 1997-2000. They find that the bottom 50% of heirs receive only 2% of total wealth transferred at death, whereas the top 10% receive three quarters of total inheritance. However, even though small, inheritance is also important for the poor. Moreover, Stutz et al. (2007) emphasize that, except for the wealthiest individuals, inheritance is not the main factor for the transmission of social inequalities from one generation to the next. We believe that a long-term perspective on inequalities with respect to inheritance would be an interesting complement to studies concerning the evolution of top wealth shares such as Dell et al. (2005).

We also emphasize that initiatives trying to implement a federal inheritance tax did not always coincide with high inheritance flows. Effectively, the second initiative, launched in 1975, corresponds to the lowest inheritance flows estimated in our sample. Concerning the most recent initiative, which received the required number of signatures before February 2013, it is in accordance with the increasing inheritance flows observed since the end of the 80s. In addition, the proposed uniform tax rate of 20% of the total estate is still below most advanced economies tax rates and is inferior to the socially optimal tax rate on inheritance estimated by Piketty and Saez (2012). Effectively, authors show that, under reasonable parameters assumption, the theory of capital taxation predicts an optimal tax rate of 50-60% on inheritance and gifts.

Regarding this initiative, we also assert that it had an irreversible impact on inheritance flows in 2011, which will severely affect future flows. Effectively, donations exploded in this year, representing between CHF 40 and 50 billion according to the Swiss Notaries Federation, so that the 2011 inheritance flows probably reached an unsustainable level and will be unusually low when this "Gifts-makers" cohort will die. Economists trying to estimate inheritance flows for Switzerland for the future generation thus have to be careful in considering this initiative's impact.

Finally, the U-shaped pattern of inheritance in France, Germany and Sweden seems robust even in a non-war country, as we emphasized by studying the long-term evolution of inheritance flows in Switzerland.

We also estimated that Swiss inheritance flows are lower than in the other countries for which we have data. This suggests that the significant wealth concentration at high ages as well as the recent increase in inheritance flows are not enough to qualify Switzerland as being mainly a rentier society, self-made wealth still being a large contributor to inequalities.

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Appendix

6.1 Data series for our years of interest

Table A1 : Wealth and Income Series (in billion CHF)

Year	Private Wealth (W)	Net National Income (NNI)	Ratio β_t (in %)
1911	11.627	3.954	294
1934	20.016	7.599	263
1945	31.682	13.468	235
1969	137.712	72.400	190
1975	228.556	121.945	187
1987	453.187	225.655	201
1995	680.769	320.598	212
1999	885.521	345.686	256
2009	1386.781	441.758	314

Sources: See section 3.2

Table A2 : Additionnal Parameters Series (in Percent)

Year	μ_t	v_t	m_t^{20+}
1911	106.61	8.00	1.87
1934	113.09	13.48	1.47
1945	121.31	16.10	1.46
1969	124.33	25.64	1.29
1975	128.57	30.00	1.21
1987	134.01	31.50	1.15
1995	151.63	32.83	1.15
1999	172.08	33.50	1.12
2009	201.09	38.85	1.01

Sources: See section 3.2
μ_t is the non-corrected ratio of average wealth of decedents over the average wealth of the living.
v_t is the ratio between gifts and inheritance.
m_t^{20+} is the mortality rate over the adult population (20 years and older).

Table A3: Estimated Swiss Inheritance Flows (in Percent)

Year	1911	1934	1945	1969	1975	1987	1995	1999	2009
b_{yt}	6.32	4.98	4.83	3.83	3.78	4.06	4.94	6.59	8.85
b_{wt}	2.15	1.89	2.05	2.01	2.01	2.02	2.32	2.57	2.82

b_{yt} represent inheritance flows over net national income and are estimated using the following accounting equation: $b_{yt} = \beta_t \cdot m_t \cdot (1 + v_t) \cdot \mu_t$.
b_{wt} represent inheritance flows over aggregate private wealth and are estimated using the following accounting equation: $b_{wt} = m_t \cdot (1 + v_t) \cdot \mu_t$.

6.2 Corrected ratio between average decedents' wealth and average wealth of the living

Figure 19: Comparison between μ_t and μ_t^* in Switzerland
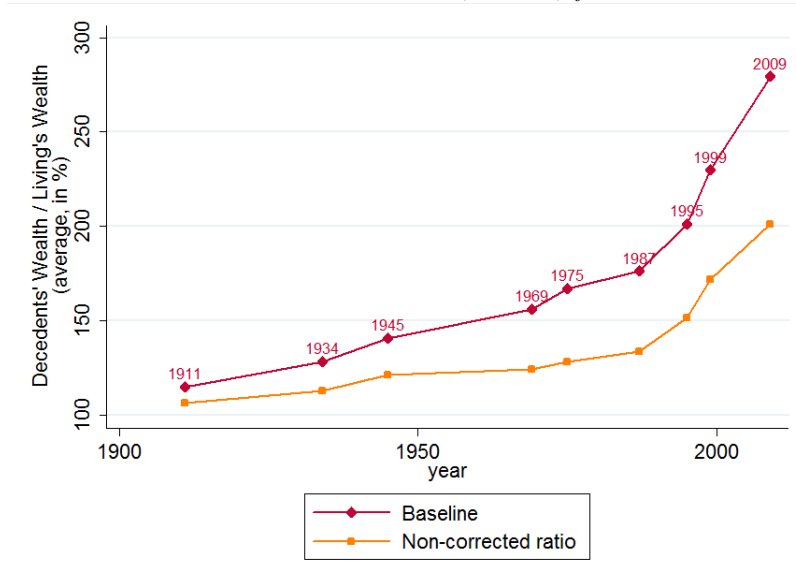
6.3 Inheritance flows using annual values for France

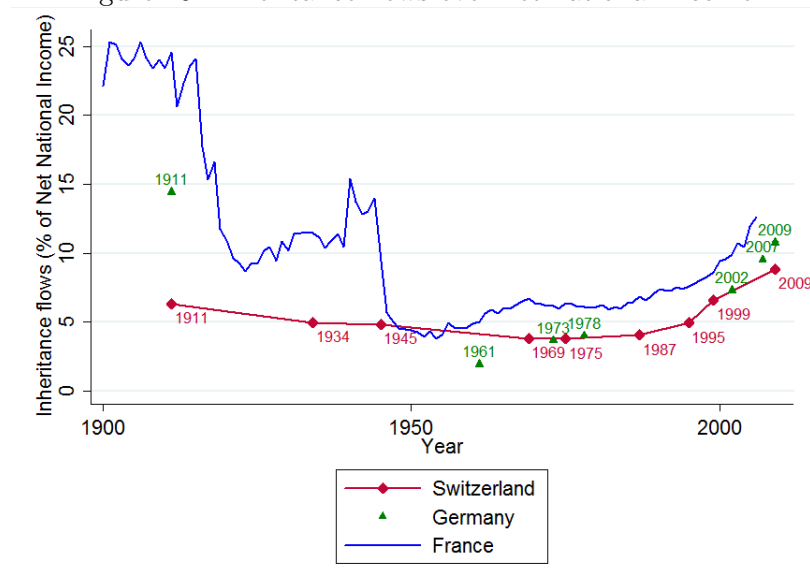Figure 20: Inheritance flows over net national income

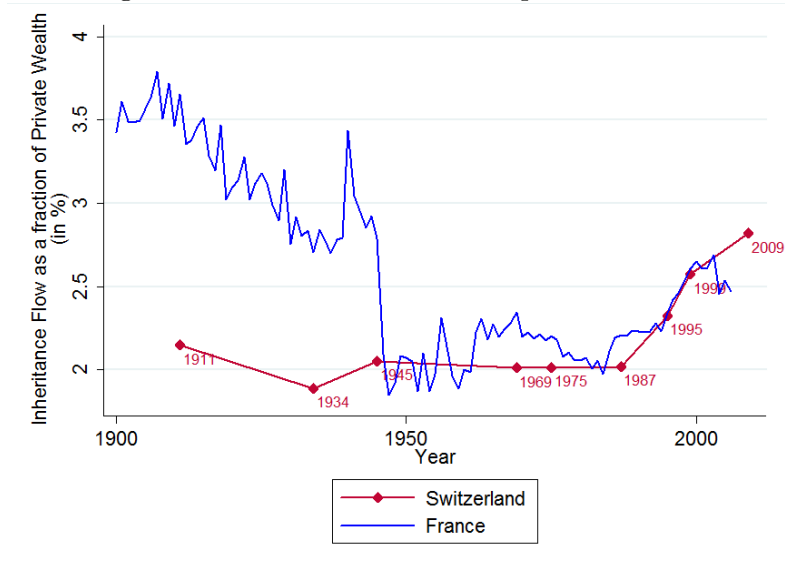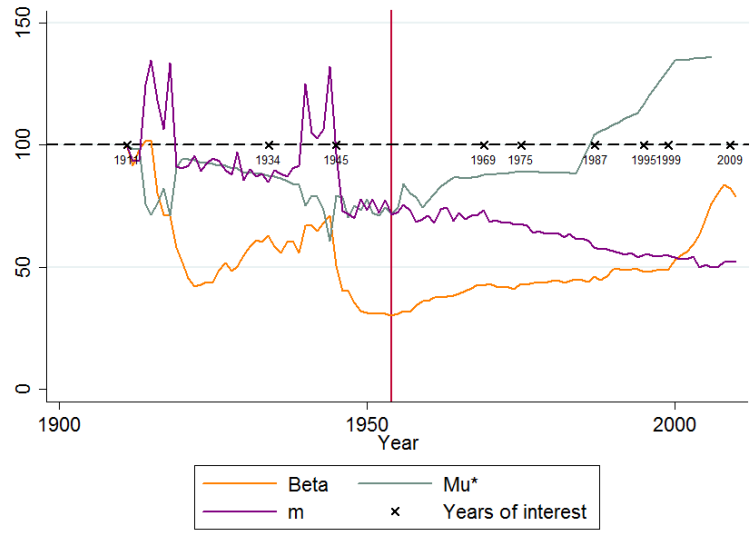Figure 21: Inheritance flows over private wealth

Figure 22: Main parameters rescaled at 100 in 1911, French data

The vertical line represents 1954, when inheritance flows reached their minimum value in France over the period 1911-2009.

6.4 Absence of data on bequests and gifts at the federal level

Unfortunately, no fiscal data on bequests and gifts exists at the federal level for Switzerland, which complicates the task of estimating inheritance flows at the country level. Some data can be found at the cantons' level. However, such data is very disaggregated and constructing an homogeneous database of inheritance, even for a few cantons, would go far beyond the scope of this paper, which aims at providing a first approximation of the long-term evolution of inheritance flows in Switzerland.

As an example, we will describe the various data sources of the Canton de Vaud, as well as what would have to be done in order to aggregate this data. Note however that this might not be representative of other cantons' data availability.

Data from the Archives of the Canton de Vaud.[48]
In principle, the "Justice de Paix" of each of the 19 districts of the Canton de Vaud delivers inheritance certificates to heirs resident in their district. However, the amounts of bequests and gifts generally do not appear in the"Justice de Paix" records nor in decedents wills. The only source of information with respect to wealth transferred at death can be found in the after death inventories ("Bénéfices d'inventaires" or "Inventaires Successoraux") with no warranty that all of them have been preserved. Effectively, these inventories are established following heirs' requests, as to list all assets and liabilities contained within the inheritance. The judge ("Juge de paix") is responsible for the establishment of these inventories and can delegate the procedure to a notary or an expert, should it be too complex. Within one month after the inventory completion, heirs have to state whether they repudiate the succession (in which case they are no longer responsible for the decedent's debts) or rather accept it.

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[48]The Inventory of these archives is available on-line at www.davel.vd.ch. We are grateful to the Archives Cantonales Vaudoises for their useful comments on data availability and consultation procedures.

These inventories might not be representative of the whole population, since their establishment is not compulsory and tends to be requested only in cases where a high level of debt is suspected. Moreover, access to recent documents is restricted and a written authorization delivered by the "Archives Cantonales Vaudoises (ACV)" is required.[49]

Another data source, also partly stored in the cantonal archives, is the "Minutes de Notaires" records and tabs, which are also organized by districts.[50] Notaries have always been under the central authorities supervision. After the first of July 1837, all acts were regrouped in tabs and transcribed in records. There exist two series of records and tabs : "Actes en vifs" (containing donations) and "Dispositions pour cause de mort" (containing wills and agreements as to succession). These are freely available only 50 years after their instrumentation. Nevertheless, a demand to consult more recent records can be asked from the "Archives Cantonales Vaudoises (ACV)".[51]

By merging these two data sources, one should be able to construct a database on inheritance for the canton de Vaud in the XXth and XXIst centuries. However, this would be a cumbersome task. The data is spread over many records and would first have to be aggregated by district for each selected year and then summed over the 19 districts.

The ideal situation would be to have access to data from various cantonal fiscal administrations. Effectively, they detain data on inheritance and gifts. It is however highly confidential and we could not access it so we do not know exactly in which format the data would be available.

6.5 Example of the estimation of sh_t^p wealth by Pareto interpolation for year 1913

As an example of the Pareto interpolation methodology, we describe year 1913 estimation in details.

From the Annuaire Statistique de la Suisse 1914 (p.220-226), we find the wealth distribution as it was in the 31st of December 1913.

Table A4: Wealth Distribution of the canton of Zürich, 1913			
Wealth bracket (CHF 1000)		Number of people	Total Wealth assessed (CHF)
Lower bound	Upper bound		
-	10	53835	183,187,897
10	20	8910	126,774,703
20	30	3351	87,513,800
30	50	3142	128,531,000
50	100	2744	202,283,600
100	300	1867	326,240,900
300	500	372	146,361,700
500	1000	232	164,742,700
1000	3000	141	223,787,500
3000	5000	8	28,200,000
5000	∞	4	23,800,000
Total		74,606	1,641,423,800

Source : Annuaire de la Statistique Suisse 1914, p.220-226

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[49]See " Loi sur l'archivage (LArch), article 12, alinéa 2. : freely available 10 years after the death or 100 years after birth if the death date cannot be established, or 100 years after the file's opening. In any case, the ordinary notice of 30 years must be respected.

[50]The inventory (in French) of these series until 1921 can be found under Section D at http://www.davel.vd.ch/detail.aspx?ID=269 and subsequent years under Sections S and SB.

[51]Loi sur le Notariat : LNo, art.87

As can be seen from this table, more than 70% of the people belong to the first wealth bracket, thus not coinciding with the percentage group of interest, which is 50% in our case. Hence the need of a Pareto interpolation to recover the parameter sh_t^p.

First, we compute the local Pareto parameter b_s and k_s corresponding to the lower s bound of each wealth class of the reported tax statistics:

$$b_s = \frac{\bar{w}_s}{s}$$

with $\bar{w}_s$ being the average wealth of individuals who reported a wealth superior or equal to s. b_s can be referred to as the "Inverted Pareto Coefficient" (Atkinson et al., 2011) with a higher b_s meaning a fatter upper tail of the wealth distribution. The Pareto parameter is then

$$a_s = \frac{b_s}{b_s - 1}$$

And the parameter k is defined as

$$k_s = s \cdot p_s^{1/a_s}$$

where $p_s = 1 - F(s)$ represents the share of the population with a reported wealth superior or equal to the threshold s.

Then, using the local parameters corresponding to the wealth class where the population share p_s is the closest to the population share of interest ρ (which equals 50% of the total population N in our case), we can compute the wealth threshold T_p to belong to the top 50%:

$$T_\rho = \frac{k_s}{\rho^{1/a_s}}$$

The average wealth per individual above this threshold is given by

$$\bar{y}_\rho = T_\rho \cdot b_s$$

The total wealth of the richest ρ is then

$$W_\rho = \bar{y}_\rho \cdot \rho \cdot N$$

Dividing this estimate by the total wealth of the population leads to the share of wealth of the richest. Then it is straightforward to find the wealth share of the bottom 50% of the population as

$$sh^p = 1 - \frac{\bar{y}_{0.5} \cdot 0.5 \cdot N}{W_T}$$

where W_T is the wealth of the entire population.