



## AGING AND THE INHERITED WEALTH OF NATIONS<sup>1</sup>

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### Introduction

An important premise of modern capitalism is the idea that anyone, regardless of their parents' wealth, can become rich with the right entrepreneurial skills. A recent surge in self-made billionaires is often considered to be the proof of this premise. Kaplan and Rauh (2013), for instance, report that the share of Americans included in the Forbes 400 list – which provides a list of the wealthiest people ranked by net worth – that grew up in wealthy families fell from 60 percent to 32 percent between 1982 and 2011.

Notwithstanding this observation, however, Thomas Piketty (2014) and his co-authors have argued that the role of inherited wealth is on the rise in advanced economies. Piketty and Zucman (2014a,b) show that although the inherited share of total wealth decreased steadily from the beginning of the 20th century until the 1970s in Europe (Figure 1 for France, UK and Germany), it began to increase again after that, a trend that has continued until the present day. Accordingly, the earlier reduction was driven by wars in the first half of the century, which impoverished the population across the board.

Those who died between 1950 and 1960 were reported to be the least wealthy in the 20th century. The increase in the inherited share of total wealth, on the other hand, stems from increasing *inter vivos* gifts. Although it is

not clear why such gifts started increasing, Piketty and Zucman (2014a) suggest that longer lives may have induced parents to transfer a portion of inheritance sooner to help their offspring. We can infer from this argument that the total bequeathed wealth (inheritance and *inter vivos* gifts) has also increased as a response to longer lives, which is the main motivation for our discussion here.

Demographic aging, indeed, provides a natural suspect for the increasing share of inherited wealth. Decreasing mortality and fertility rates, both of which lead to an increase in average age in a society, have led to dramatic changes in the demographic structure of societies, especially in high income countries, in recent decades. Figure 2 shows the survival curves from 1950 to 2010. Accordingly, a 60 year-old person could expect to live about 17 more years in 1950. S/he can expect to live about 23 more years nowadays. Accompanying the decrease in mortality, and perhaps more importantly, the fertility rate fell from about three children per woman to 1.8 children per woman in the same period. As a result, the share of older people (aged 60 years or over) in society (old age dependency ratio) increased from about 12 percent to nearly 22 percent within six decades. Obviously, this demographic transformation should lead to some adjustments in the wealth and income structure of the economy.

In this paper, we study how demographic aging could explain the evolution of inherited wealth over time.<sup>4</sup> In particular, we are interested in shedding light on the effects of a decrease in fertility and of an increase in longevity on three commonly used indicators pertaining to the relationship between inheritance and wealth:

1. Inherited share of total wealth (ISW),
2. The ratio of inheritance to real wages (RIW), and
3. Inherited wealth inequality (IWI).

In contrast to the implication made by Piketty and Zucman (2014), we find that aging in either form, a decrease in fertility or an increase in longevity, is not likely to explain the U-shaped pattern in the inherited share

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<sup>4</sup> See also Weil (1996).

Figure 1

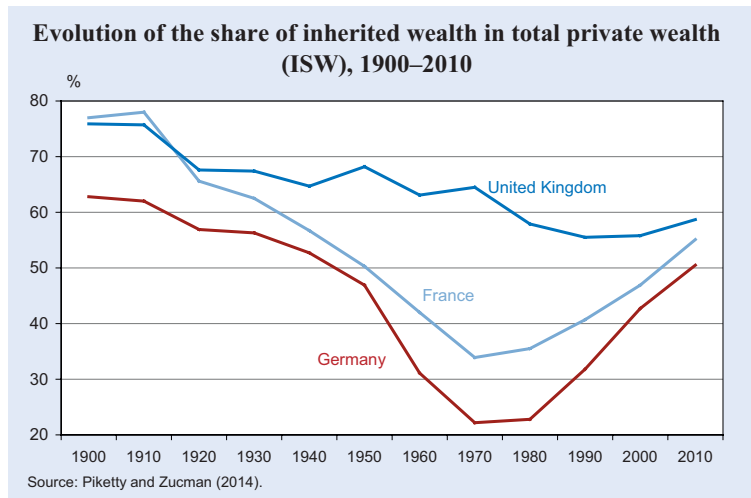
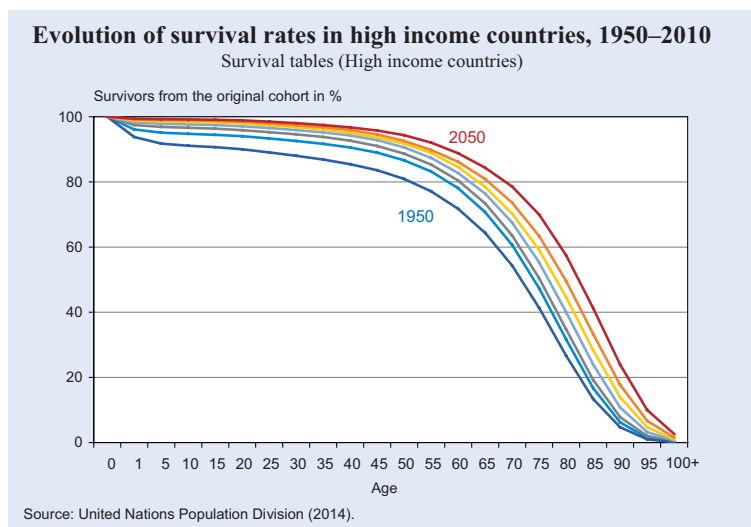


Figure 2



of total wealth in advanced economies. Both types of aging lead to a decrease in ISW. This is primarily because intentional bequests fall following a decrease in fertility, and although accidental bequests become larger with decreasing mortality, they also become less frequent, which dominates the effect on size.

Our results also suggest an alternative mechanism that could generate such a U-shaped pattern of the ISW after the Second World War: the rise and fall of retirement annuities. In many high-income countries, public and private defined benefit systems took up after the Second World War and the benefits provided by these systems increased steadily for several decades. Our simulations show that, other things being equal, an increase in such

annuitization could lead to a decrease in the ISW. Interestingly, however, the annuitization trend was reversed towards the end of the century, following a shift from defined benefit to defined contribution pensions.<sup>5</sup> Thus, the rebound of the ISW could be driven by such a progressive abandonment of annuitized retirement savings.

This paper continues with a discussion on how aging affects bequeathing at individual level in the next section. In the subsequent section we consider the effects of aging on the economy-wide indicators of inherited wealth with and without annuitization. The last section provides some concluding remarks.

### Aging and bequeathing

In order to understand how demographic aging may change bequeathing, we need to understand why bequests occur in the first place. However, untangling the motives behind any transfer in wealth from a parent, dead or alive, to a child is a daunting task. The first distinction we should be aware of is whether the transfers are intentional or not.

For instance, we may not know whether a bequest is left accidentally, because of the incompleteness of annuity markets, or intentionally, that is based on some type of altruism. Similarly, in the case of inter vivos gifts, it may be unclear whether the transfers are “true gifts” induced by altruism, or whether they involve some sort of exchange, i.e. the beneficiary provides some services like providing care to the donor. Thus, we shall inquire about each case separately. In a companion paper (Onder and Pestieau 2016a) we study the impact of a decline in fertility and of an increase in longevity on the level of wealth transfers more formally. In this short paper, we

<sup>5</sup> On this point, see Munnell, Aubry and Crawford (2014).

will limit ourselves to presenting just a selection of the results that arise from such an analysis.<sup>6</sup>

### *Intentional bequests*

There are three major motives that can be classified as intentional, which are explained as follows.

#### *Pure dynastic altruism (altruistic bequest):*

This represents a case where parents care about the likely lifetime utility of their children and hence about the welfare of future generations. Accordingly, wealthier parents make larger bequests, and holding parents' wealth constant, children with higher labor earnings will receive smaller bequests. There is also a tendency for parents to leave different amounts to different children in order to offset income inequality among them. With pure altruism, we are in the framework of Ramsey's optimal saving model that ends up with the modified golden rule in steady state. As a result, capital accumulation and inheritance depend on both the social rate of discount and the population growth rate. Whereas a decline in fertility could foster wealth transfers, changes in longevity do not play a major role.

#### *Joy of giving (paternalistic bequest):*

In this case, parents are motivated not by altruism, but by a direct utility that they receive from the act of giving. This phenomenon is also known as "warm glow" giving and can be explained by some internal feeling of virtue arising from sacrifice in helping one's children, or by the desire to control their life. *Ceteris paribus*, these bequests are subject to income and price effects, but do not have any compensatory effect, namely they are not intended to smooth consumption across generations. With this motive we expect the number of children to play a key role if the joy of giving arises from the per-child bequest, rather than the overall bequest.

#### *Exchange-related motives (strategic bequests):*

In their canonical form, exchange related models consider children choosing a level of "attention" to provide to their parents and parents remunerating them with

the prospect of bequest. The exchange can involve all sorts of non-pecuniary services and they can be part of a strategic game between parents and children. Strategic or exchange bequests depend on the wealth and the needs of the donor; they are not compensatory between parents and children and they do not need to be equal across children. The effect of aging on the size of the transfer depends on the specification of the model. In general, we expect that a longer life calls for more filial attention and, in return, more bequests. The impact of fertility is less clear. For example, in the strategic bequest example going from two to one child makes a big difference, as the parents lose part of their bargaining power and have thus to increase the level of their gifts to get a certain level of attention.

Please note that these motives can explain both bequests at the end of life and inter vivos gifts, with the exception of strategic bequests, which only concern wealth transfers made at the very end of life. The motives cited to date concern voluntary transfers. In the following, we briefly introduce unintentional or accidental bequests.

### *Accidental bequests*

The other type of bequest considered here is the unplanned or accidental bequest, which results from a traditional life-cycle model. Accordingly, people save during their working lives in order to finance consumption when retired. Bequests occur solely because the life span of some individuals happen to be shorter than they anticipated ex-ante, hence the "accidents". A necessary condition for such bequests to occur is that wealth should be held in bequeathable form that is transferable to the beneficiary like money or certain forms of assets. Thus, imperfections in annuity markets are implied.

With accidental bequests, we expect the effects of aging to be the opposite of those with pure altruism. The fertility rate should not play a direct role, but as the survival probability increases, we should observe larger (but also less frequent) accidental bequests.

### **Aging and inherited wealth**

We now focus on economy-wide implications of demographic aging and associated changes in individual bequests. In addition to affecting bequests, demographic aging also changes individual savings, capital per worker, and wage and interest incomes. Thus, we should

<sup>6</sup> Please note that we assume exogenous demographics in our analysis. It is clear that if both longevity and fertility were made endogenous, some of the results would have to change depending on the factors determining fertility and mortality. For more detailed analyses, see Zhang, Zhang and Lee (2001) and Leroux, Pestieau and Ponthiere (2011). But such considerations go beyond the scope of this paper.

take these effects into consideration. This requires us to specify the bequest mechanism explicitly. We draw our results from Onder and Pestieau (2016b), where we use a simple Diamond-style overlapping generation model to investigate the effects of aging on bequeathing. In that model, individuals are assumed to live two periods, consuming in both, and providing some labor in the first one. They retire in the second period, the length of which is not known ex-ante. There is a certain probability of surviving the first period. Population is increasing at a predetermined rate.

As it is not feasible, or meaningful, to include all motives in the same model at once, we focus on two types of bequests: accidental bequests and joy-of-giving related bequests. Individuals can derive some utility from transferring resources to their offspring. Thus, they save in the first period to finance their consumption in old age and to leave a bequest. As annuity markets are incomplete in case of premature death, their children will inherit both the intended bequests, but also the forgone second period consumption of their parents. We assume quasi-linear utility for the first period consumption so as to keep wealth distribution within a given reasonable range. We also introduce a given scheme of annuities, which may come from either social security or from defined benefit pensions.

In the following, we discuss the comparative statics exercises from this model to assess the effects of decreasing fertility rates and mortality (which is equivalent to an increase in longevity) on i) the inherited share of wealth (ISW), ii) inheritance to real wage ratio (RIW), and iii) inherited wealth inequality (IWI). As it turns out, the presence and the extent of annuity schemes like defined benefit pensions plays a major role in determining how these indicators behave in aging societies.

#### *Absence of annuity schemes*

When annuity schemes do not exist all savings are bequeathable. Our stylized specification leads to the following analytical results in such a case.

**Result 1.** The inherited share of total wealth decreases when mortality or fertility decreases.

This is the most important and rather robust result of our analysis. A decrease in fertility or an increase in longevity has a depressive effect on the relative importance of inheritance in wealth accumulation. Thus, this finding

does not support Piketty and Zucman's argument in this case.

**Result 2.** Intentional bequest to wage ratio decreases and accidental bequest to wage ratio increases with a decrease in fertility. However, they are both unaffected by changes in the mortality rate.

**Result 3.** Inequality of inherited wealth increases when fertility decreases. The effect of mortality is non-linear. Starting from high mortality (short longevity), a small decrease in mortality increases the inequality of wealth. The effect is, however, the opposite if the starting mortality level is low.

Please note that the third result is determined by how we specify uncertainty in the case of mortality and how we measure inequality. For the former, we assume a predetermined probability of having a full life span. For the latter, we use a variance-based indicator (coefficient of variation) to measure the dispersion. In this case, it is known that the highest variance is reached when the probability of survival is equal to 0.5.

Next, we introduce the case of annuities.

#### *Presence of annuity schemes*

Introducing annuities complicates the analysis, and we are no longer able to produce analytical results. Thus, we adhere to using numerical simulations with a wide range of parameter/variable values. The results are as follows:

**Result 4.** Demographic aging decreases the inherited share of wealth (ISW).

Figure 3 shows the effects of decreasing mortality and fertility on the ISW. As the color shifts from dark blue to light yellow in the graphs, the ISW increases. Both decreasing mortality and decreasing fertility reduces the ISW, however, for different reasons. Changes in fertility mainly affect the ISW through intentional bequests. The higher these bequests vis-à-vis voluntary savings, the higher the ISW. When fertility decreases, the number of children who benefit from bequests decreases. This naturally reduces the total intentional bequest each parent desires to leave. The decrease in fertility also reduces the voluntary savings because fewer children would benefit from them if they are bequeathed accidentally. However, this effect is relatively small, as accidental

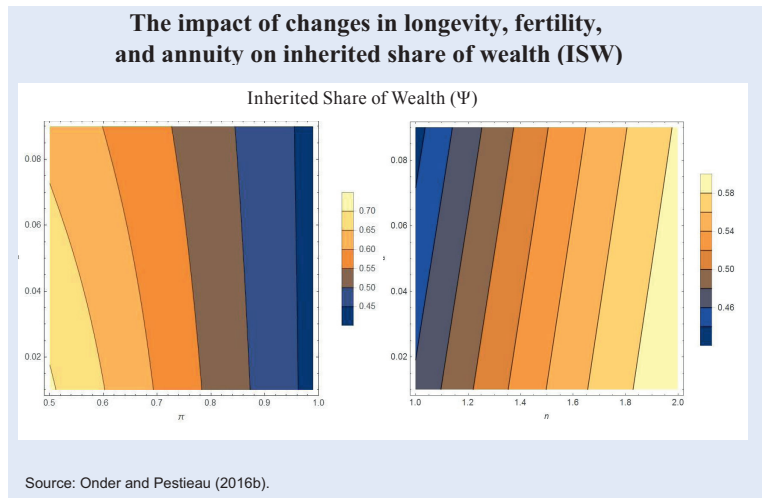
mortality is not a sure thing. As a result, with decreasing fertility, intentional bequests decrease faster than voluntary savings, reducing the intentional bequest to voluntary savings ratio, and eventually the ISW.

The effect of mortality on ISW is manifested through both intentional and accidental bequests. Other things being equal, the higher the intentional bequests vis-à-vis the voluntary savings, the higher the ISW. Similarly, the higher the mortality rate, the higher the ISW. A reduction in mortality makes accidental bequests less likely, but more sizable. To see evidence of this, please note that a decrease in mortality pushes up voluntary savings in order to finance consumption in a longer (expected) life. Thus, those who die early leave larger bequests. However, this happens less frequently after the reduction in mortality. In the end, the frequency effect dominates the size effect, and total accidental bequests decrease. Intentional bequests also decrease vis-à-vis voluntary savings in this case. However, this effect is relatively small compared to the direct effect of mortality. As a result, bequests grow less than proportionately in comparison to voluntary savings, and the ISW decreases.

**Result 5.** The inherited share of total wealth (ISW) decreases with a rise in annuities.

As clearly shown by Figure 3, an increasing annuitization of wealth at retirement leads to a decrease in the inherited share of wealth. This follows from the observation that annuities and voluntary savings are close substitutes in financing the second period consumption. An increase in annuities leads to a reduction in voluntary savings (but its effects on intentional bequests are ambiguous). This affects both aggregate wealth and inherited wealth through accidental bequests. Overall, the effect on accidental bequests dominates and

**Figure 3**



Source: Onder and Pestieau (2016b).

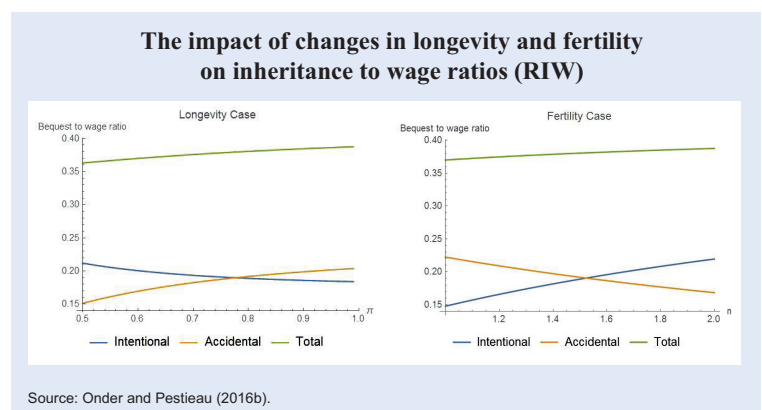
Notes: Horizontal axis shows the mortality rate ( $\pi$ ) in the left panel and fertility rate ( $n$ ) in the right panel. In both cases the vertical axes show the annuity values ( $a$ ). The contour curves show the iso-ISW values, and a move from dark blue to light yellow denotes an increase in the ISW.

the ISW decreases with a rise in annuities. Such a trend was indeed prominent in the post-war era in most advanced countries, where pensions coverage with defined benefits increased rapidly. Thus, this result suggests that an increase and a subsequent decrease in annuitization could help to explain the U-shaped pattern of inherited share of total wealth observed over the last half-century.

**Result 6.** Aging leads to an increase in the size of accidental bequests and a decrease in intentional bequests vis-à-vis real wages.

This result concerns the size of accidental and/or intentional bequests received by a single child in comparison to real wages.

**Figure 4**

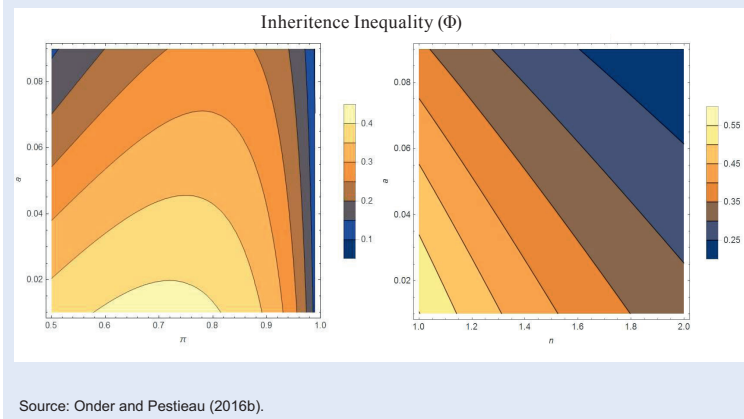


Source: Onder and Pestieau (2016b).

Notes: Horizontal axis shows the mortality rate ( $\pi$ ) in the left panel and fertility rate ( $n$ ) in the right panel. In both cases the vertical axes show the RIW.

Figure 5

### The impact of changes in longevity, fertility, and annuity on inherited wealth inequality (IWI)



Notes: Horizontal axis shows the mortality rate ( $\pi$ ) in the left panel and fertility rate ( $n$ ) in the right panel. In both cases the vertical axes show the annuity values ( $a$ ). The contour curves show the iso-IWI values, and a move from dark blue to light yellow denotes an increase in the IWI.

son to his/her real wage. Figure 4 shows our simulation results.

As accidental bequests are the savings that were intended for the parent's old age consumption, but are split among the children after the parent's early death, a decrease in the number of children has a direct positive effect on how much each child receives. In addition, it has indirect effects. For instance, it affects the parent's decision to save for future consumption. Taking into consideration the utility  $s$ /he receives from leaving accidental bequest, which is a function of the inheritance received by each child and the total number of children, the parent adjusts his/her voluntary savings down when  $s$ /he has fewer children. Another indirect effect, which follows on from the former, is the decrease in wages and interest rates that are brought about by the decrease in savings. Overall, the direct effect and wage adjustment together dominate indirect adjustments, and the accidental bequest to wage ratio increases when the fertility rate goes down.

Lower fertility also has a direct negative effect on intentional bequests. As in the case of accidental bequests, the utility received by a parent from leaving an intentional bequest is a function of the inheritance received by each child and the total number of children. Thus, the parent adjusts his/her total intentional bequests downwardly when  $s$ /he has fewer children, and this adjustment is larger than that which occurs in voluntary savings. Overall, when combined with higher wages, the intentional bequest to wage ratio decreases.

The effects of mortality changes on bequests work in similar ways, but have additional channels. A decrease in mortality leads to an increase in voluntary savings because consumption needs in old age become more likely and annuity benefits become lower. It also increases the wages with savings, but this is a second order effect. Overall, since savings are higher, early deaths generate larger bequests compared to wages.

Finally, a decrease in mortality affects intentional bequests less than accidental ones. This follows on from the fact that voluntary savings increase because both survival probabilities become

higher and annuity receipts become smaller. By comparison, intentional bequests respond only to the former. Overall, both kinds of savings lead to an increase in wages; however, since the change in intentional bequest is small, the intentional bequest to wage ratio decreases with lower mortality.

**Result 7.** A decrease in fertility increases inheritance inequality (IWI). The effect of mortality, however, is not monotonic: starting from high levels, a reduction in mortality initially increases the IWI; however, the IWI eventually starts decreasing when mortality becomes low enough.

Intuitively, a decrease in fertility reduces both accidental bequests (through voluntary savings) and intentional bequests. However, the impact on the latter is larger. Therefore, although the average inheritance size decreases, the dispersion between the two types of inheritances (a large inheritance that comprises of both accidental and intentional bequests and a small inheritance with only intentional bequests) increases because the smaller one decreases faster.

The effect of a change in mortality on inequality of inheritance depends on the size of mortality rates. With lower mortality, accidental inheritance becomes less frequent, but it increases as voluntary savings rise. Thus, both the mean and variance of total bequests could increase or decrease depending on the exact values.

Table 1

Summary of results: the effects of aging on indicators of inherited wealth				
	Declining fertility		Increasing longevity	
	With annuities	Without annuities	With annuities	Without annuities
Inherited share of wealth (ISW)	-	-	-	-
Intentional inheritance to real wage ratio (RIW-intentional)	-	-	-	No effect
Accidental inheritance to real wage ratio (RIW-accidental)	+	+	+	No effect
Inherited wealth inequality (IWI)	+	+	+/-	+/-

Source: The authors.

Table 1 summarizes our findings, where a positive sign denotes an increase in each indicator and a negative sign denotes a decrease.

### Conclusion

The purpose of this paper was to study the role, if any, that aging may have played in the upward trend seen in inherited wealth in recent decades. We also wanted to check whether the annuitization provided by defined benefits pension systems could also explain this phenomenon. Our conclusion is that aging, that is lower fertility and higher longevity, is not likely to explain the current bequeathing behavior, whereas annuitization could. Finally, a caveat is in order. In this exercise we have focused on two types of bequests, those relying on the absence of perfect annuity markets and those arising from some joy of giving. Implications of demographic aging may be different for bequests with other motives such as pure altruism and exchange.

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