EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

Bertrand Garbinti, Simon Georges-Kot

On the retirement effect of inheritance: heterogeneity and the role of risk aversion

No 2222 / January 2019

Disclaimer: This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB.

Household Finance and Consumption Network (HFCN)

This paper contains research conducted within the Household Finance and Consumption Network (HFCN). The HFCN consists of survey specialists, statisticians and economists from the ECB, the national central banks of the Eurosystem and a number of national statistical institutes.

The HFCN is chaired by Ioannis Ganoulis (ECB) and Oreste Tristani (ECB). Michael Haliassos (Goethe University Frankfurt), Tullio Jappelli (University of Naples Federico II) and Arthur Kennickell act as external consultants, and Juha Honkkila (ECB) and Jiri Slacalek (ECB) as Secretaries.

The HFCN collects household-level data on households' finances and consumption in the euro area through a harmonised survey. The HFCN aims at studying in depth the micro-level structural information on euro area households' assets and liabilities. The objectives of the network are:

1) understanding economic behaviour of individual households, developments in aggregate variables and the interactions between the two;
2) evaluating the impact of shocks, policies and institutional changes on household portfolios and other variables;
3) understanding the implications of heterogeneity for aggregate variables;
4) estimating choices of different households and their reaction to economic shocks;
5) building and calibrating realistic economic models incorporating heterogeneous agents;
6) gaining insights into issues such as monetary policy transmission and financial stability.

The refereeing process of this paper has been co-ordinated by a team composed of Pirmin Fessler (Oesterreichische Nationalbank), Michael Haliassos (Goethe University Frankfurt), Tullio Jappelli (University of Naples Federico II), Juha Honkkila (ECB), Jiri Slacalek (ECB), Federica Teppa (De Nederlandsche Bank) and Philip Vermeulen (ECB).

The paper is released in order to make the results of HFCN research generally available, in preliminary form, to encourage comments and suggestions prior to final publication. The views expressed in the paper are the author's own and do not necessarily reflect those of the ESCB.

Abstract

This paper provides new insights on the effect of inheritance receipt on retirement. We build on lifelong information on inheritances received and labor market transitions available for respondents of the French Wealth Survey. This feature allows us to compare current retirement rates among current and future inheritors. Chances of current retirement are 40% higher among current inheritors than among individuals who will inherit in the next two years, but there is substantial heterogeneity in this effect across socio-demographic groups. The effect is also stronger for individuals with a higher risk aversion, which we interpret with a simple theoretical model.

Keywords: Retirement, inheritance, labor supply, risk aversion

JEL codes: J14, J26

Non technical summary

We analyze the retirement effect of private wealth by exploiting the receipt of an inheritance as a wealth shock. We find that, for any age between 55 and 65, chances of current labor market exit are about 40% higher among individuals who inherit at that age than among individuals who inherit in the next few years, consistent with a substantial impact of private wealth on retirement decisions.

We also show that this effect exhibits substantial heterogeneity among socio-demographic groups. The retirement effect of inheritance receipt is stronger for individuals with little education, for those with low socio-economic status, and for part-time workers, which suggests stronger effects on individuals with less attachment to the labor market. For individuals living in a couple, the effects are significant only for those whose spouse is already retired, consistent with the existence of leisure complementarities between spouses. We also investigate how the effect of inheritance receipt on retirement decisions varies with individuals' pension entitlement. As in many countries, public pensions make up most of retirees' financial resources in France, providing them with 75% of their pre-retirement income on average. An important question is whether the effect of inheritance receipt on retirement rates is concentrated on individuals who can already cash out their full pension, or on the contrary whether private wealth may act as a substitute for lower pension wealth. We find that the effect of inheritance receipt on instantaneous retirement is actually stronger for individuals who cannot yet unlock their pension. We also find strong and significant effects on individuals who happen to inherit at a moment where they have not yet worked long enough to be entitled to their full pension amount. This suggests that receiving an inheritance increases retirement rates, including for individuals whose labor market exit is costly.

Finally, we interpret our results using a simple model of retirement choice in which risk-averse agents receive an inheritance, but are uncertain about when and how much they will inherit. This model allows us to explore the respective roles of risk aversion and credit constraints in explaining our results. We show that, when agents are risk averse, or when credit constraints are binding for them, they will bring forward the date of their retirement after receiving an inheritance, even when they receive exactly the amount they expected. We show that this effect can be all the more important as individuals are risk averse, but that this depends on whether credit constraints are binding. Using several measures of risk, we are able to confront this model to the data. Consistent with the model's predictions, we find that the probability of instantaneous labor force exit following the receipt of an inheritance is increasing in individuals' risk aversion. This is consistent with the idea that pension risk may be an important determinant of retirement age.

1 Introduction

Understanding the determinants of retirement is key for the construction of many social policies. In particular, the extent to which individual wealth affects retirement decisions has important implications for the design of public pensions and labor market reforms. When the link between individual wealth and retirement decisions is weak, pension reforms may fail to fully change individuals' labor force participation. Reforms that postpone the legal retirement age may then instead generate more poverty and inequality at older ages, and fail to achieve their budgetary target.

While there has been extensive theoretical and empirical work on the retirement effect of pension wealth, the effects of private wealth have received much less attention.[1] However, in a context where unfavorable demographic trends are putting current pension systems under financial strain in many countries, private wealth may become increasingly important in shaping retirement decisions in the future. When investigating the retirement effect of private wealth, one issue is that wealthy individuals typically have distinct preferences, for example regarding leisure or time, both of which can in turn influence labor force participation. As a consequence, wealthy individuals may have different retirement behaviors, but it does not follow that these behaviors are caused by wealth. Moreover, finding exogenous sources of variation of private wealth is difficult, particularly if one requires these variations to take place around ages where individuals might prefer to completely withdraw from the labor market rather than to make adjustments at the intensive margin.

In this paper, we analyze the retirement effect of private wealth by exploiting the receipt of an inheritance as a wealth shock. Building on lifelong retrospective data available in the French Wealth Survey, we are able to compare the instantaneous retirement probabilities of individuals who inherit at a given age and of individuals inheriting a few years after. Doing so enables us to overcome the usual issue that inheritors may be fundamentally different from other individuals.[2]

We find that, for any age between 55 and 65, chances of current labor market exit are about 40% higher among individuals who inherit at that age than among individuals who inherit in the

[1] There is a long-standing literature on the imperfect substitutability of pension wealth and private wealth (see e.g. Attanasio and Rohwedder (2003) for a summary). For the effects of public pensions' incentives on labor force participation, see e.g. Burtless and Moffitt (1985), Krueger and Pischke (1992), Samwick (1998), Chan and Stevens (2004), Asch et al. (2005), Coile and Gruber (2007), Mastrobuoni (2009), Hanel (2010), Brown (2013) or Manoli and Weber (2016). Bloemen (2011) and Bloemen (2016) provide some evidence on the link between private wealth and early retirement.

[2] For example, in their study of the effect of financial constraints on entrepreneurship, Hurst and Lusardi (2004) find that future inheritances predict transition to entrepreneurship as much as past inheritances. This suggests that inheritors simply differ from other individuals on unobservable characteristics which are correlated to their taste for self-employment.

next few years, consistent with a substantial impact of private wealth on retirement decisions.[3] We also show that this effect exhibits substantial heterogeneity among socio-demographic groups. The retirement effect of inheritance receipt is stronger for individuals with little education, for those with low socio-economic status, and for part-time workers, which suggests stronger effects on individuals with less attachment to the labor market. For individuals living in a couple, the effects are significant only for those whose spouse is already retired, consistent with the existence of leisure complementarities between spouses.[4]

We also investigate how the effect of inheritance receipt on retirement decisions varies with individuals' pension entitlement. As in many countries, public pensions make up most of retirees' financial resources in France, providing them with 75% of their pre-retirement income on average (COR (2013)). An important question is whether the effect of inheritance receipt on retirement rates is concentrated on individuals who can already cash out their full pension, or on the contrary whether private wealth may act as a substitute for lower pension wealth. We find that the effect of inheritance receipt on instantaneous retirement is actually stronger for individuals who cannot yet unlock their pension. We also find strong and significant effects on individuals who happen to inherit at a moment where they have not yet worked long enough to be entitled to their full pension amount. This suggests that receiving an inheritance increases retirement rates, including for individuals whose labor market exit is costly.

Finally, we interpret our results using a simple model of retirement choice in which risk-averse agents receive an inheritance, but are uncertain about both the date of receipt and the amount that they will inherit. Agents are also unable to borrow against a future inheritance. This model allows us to explore the respective roles of risk aversion and credit constraints in explaining our results. We show that, when agents are risk averse, or when credit constraints are binding for them, they will bring forward the date of their retirement after receiving an inheritance, even when they receive exactly the amount they expected. We show that this effect can be all the more important as individuals are risk averse, but that this depends on whether credit constraints are binding. Using several measures of risk aversion available in the French Wealth Survey, we are able to confront this model to the data. Consistent with the model's predictions, we find that the probability of instantaneous labor force exit following the receipt of an inheritance is increasing

[3] We also show that similar results are obtained by comparing current inheritors with all other individuals, when properly controlling for important individual characteristics. We also provide evidence that there are marked differences in observable characteristics between the groups of inheritors and other individuals. This suggests that the effects of wealth shocks on retirement decisions measured in this paper may not necessarily extend to non-inheritors.

[4] See e.g. Goux et al. (2014) or Stancanelli and Van Soest (2016).

in individuals' risk aversion.

There exists a long-standing literature investigating the effects of private wealth on labor supply decisions. Several studies have documented that individuals' earnings or labor force participation decrease after a wealth shock.[5] However, previous works exploiting the receipt of an inheritance have often found contradictory results. While Holtz-Eakin et al. (1992) showed that a single person who inherits about $150,000 is four times more likely to leave the labor market than one who inherits less than $25,000, Joulfaian (2006) and Bo et al. (2013) found much smaller effects and Joulfaian and Wilhelm (1994) found inconclusive results on older workers altogether. The papers closest to ours are Brown et al. (2010) and Blau and Goodstein (2016). Using data from the Health and Retirement Survey (HRS), both papers show that individuals who inherit between two waves of the survey are also more likely to exit the labor market during that time. Our first contribution to this literature is to apply a different empirical strategy, which relies on the comparison of inheritors with other inheritors rather than with all other individuals.[6,7] Important for the design of public policies, we also show that there is substantial heterogeneity among socio-demographic groups in the retirement effect of inheritance receipt.

An important issue discussed in previous works concerns the theoretical reasons why the receipt of an inheritance may affect labor force participation. Authors have argued that, since inheritances are usually expected by agents, they may impact individuals' instantaneous behaviors only through their unexpected component. Using information on inheritance expectations available in the HRS, Brown et al. (2010) and Blau and Goodstein (2016) are able to explore whether the effects of inheritance receipt on labor force participation are driven by unexpected inheritance, and whether they are higher when individuals receive more than they expected. However, both papers find mixed evidence on this issue. For example, in Table 3 of their paper, Brown et al. (2010) show that expected inheritances also have a significant impact on the probability of current retirement. The second contribution of our paper is to provide theoretical and empirical evidence that risk aversion constitutes a likely channel for this finding.[8] By developing and testing a simple model of retirement decisions with risk averse agents, we contribute to a

[5] See for example Kaplan (1987) or Imbens et al. (2001) for their work on lottery winners, and Coronado and Perozek (2003), Sevak (2002) and Coile and Levine (2006) who exploit stock market variations.

[6] In France, only about two-thirds of deaths result in a declaration to the tax administration (CPO (2009)). This figure suggests that a substantial share of individuals receive no inheritance from their parents. These individuals are likely different from the rest of the population.

[7] This strategy is close in spirit to the one developed by Andersen and Nielsen (2012) in their analysis of the role of financial constraints on entrepreneurship. They compare the performance of entrepreneurs who start their business after receiving an inheritance with those who start a business right before receiving it.

[8] We are not the first ones to mention risk aversion as an explanation. However, to the best of our knowledge, we are the first to provide theoretical and empirical evidence on how risk averse agents' retirement decisions may be more affected by the receipt of an inheritance.

better understanding of previous results on the impact of expected inheritances.[9]

The rest of the paper is organized as follows. Section 2 presents the data used in this paper, section 3 describes our empirical strategy more in details, sections 4 to 6 present our results, and section 7 concludes.

2 Data

We use data from the French Wealth Survey (*Enquête Patrimoine*). The Wealth Survey is conducted by the French statistical office every 6 years on a sample of about 15,000 households. We pool data from the waves of 1998, 2004 and 2010. Those surveys provide detailed information on households' wealth and asset composition, as well as on the main socio-economic characteristics of the respondents. Some information on individuals' parents is also gathered, such as their profession, assets, and whether they are still alive at the time of the interview. In the 2004 and 2010 waves, a fraction of the individuals were also asked specific questions on their attitude towards risk. Specifically, individuals had to rank themselves on a scale from 0 (very careful) to 10 (likes to take risks), which we refer to as the *subjective* risk aversion measure. Interviewees were also proposed a simple lottery that we detail in Appendix D, which we use to classify individuals in low and high risk aversion groups (we call this the *lottery* risk aversion measure). In all waves, respondents are asked to report their main career changes over their life, such as any interruption of activity, change of labor force status (e.g. from employed to self-employed), part-time work, or retirement decision, along with the year at which these changes occurred. Individuals are also asked whether they received any inheritance at some point in their life. For each inheritance received, they are then asked the year in which they received it, as well as who they received it from (parents, distant relatives, ...), the amount and the nature of the inheritance (cash, real estate, ...).[10] We convert all amounts to 2010 euros using the GDP deflator provided by the French statistical office. The survey also provides data on respondents' relationship history. More precisely, individuals living alone are asked about the date of formation and dissolution of their last relationship (if any), and individuals living in a couple are asked about the date of

[9] There is also a large and long-standing body of research on the effect of inheritance on inequality (see e.g Davies (1982)), which has been revived by the recent work of Piketty (2011) (see e.g. Elinder et al. (2016)). This literature has long recognized that the effects of inheritance on inequality depend on whether future heirs are able to perfectly smooth out their inheritance through permanently lower labor supply over their life. Witnessing a discrete jump in labor supply after the receipt of an inheritance indicates that this may not entirely be the case.

[10] The survey also includes similar questions regarding donations inter vivos in a separate section of the questionnaire. In this paper, we focus solely on inheritances because they represent a wealth shock that is likely more exogenous.

formation of the current couple.

From these retrospective calendars, we build a database containing one observation for each year lived by each individual (i.e. for each individual, years between the reported birth year and the year of the interview). This new database contains time-invariant variables (e.g. household socio-demographic variables at the time of the interview) as well as time-varying variables such as the labor force and relationship status of each individual at each year, a dummy variable indicating inheritance receipt in that year, and the amount received. For each individual at each point in time, we also compute the number of contribution years left to reach full pension rights using the relevant legislation and the information available in the survey.[11] In France, most individuals can start to cash-out their public pension when they turn 60, and a minority of employees can do so as soon as they turn 55; most individuals are retired by the time they turn 65. We therefore focus on individuals aged 55 to 65 who are either employed or actively looking for a job. Active job seekers might be expected to respond to the receipt of an inheritance in much the same way as employed individuals, as receiving an inheritance might push them to exit the labor market completely rather than to keep looking for a job.[12] We consider that an individual has exited the labor market when she self-defines as either inactive or retired.[13] In the rest of the paper, we use the term *retirement* as a synonym for labor force exit, and *bequest* as a synonym for inheritance to avoid repetitions. Some descriptive statistics on the full sample are shown in the first column of Appendix table A1. Our sample consists of about 14,000 individuals contributing 73,000 observations. About 8.5% of individuals declare having received and inheritance between ages 55-67, and the average amount inherited is about 119,000€ (in 2010 value).

An important question for the rest of the paper is whether individuals accurately report inheritances in the French Wealth Survey. To shed some light on this issue, we computed the proportion of individuals who report at least one inheritance among those who do not have a living parent at the time of the interview. In theory, individuals without a living parent

[11] We detail the construction of this variable as well as the main institutional features of the French pension system in Appendix C.

[12] The unemployed make up slightly less than 10% of our sample. We tested that our results do not change much when they are excluded. The basic results are reported in Table A2 in appendix A.

[13] In 2008, the possibility was introduced for employers and employees to mutually agree on a conventional termination of the work contract between them (so called *rupture conventionnelle*). For employees, this can be an alternative to submitting their resignation (which does not give rights to unemployment insurance), while for employers it is cheaper and easier than a normal layoff. As workers who benefit from such a contractual termination are entitled to unemployment insurance, it is unclear whether they would self-declare as unemployed, retired or inactive. This could be a source of bias if individuals choose this particular channel to exit the labor market after the receipt of an inheritance. To be sure, we tested that restricting our sample to observations made before 2008, when contractual termination was not possible, does not change our results.

should technically report having received an inheritance at some point in their life (namely when their last surviving parent died), even though it may represent a very small amount of money. As it turns out, only about a third of individuals without living parents report an inheritance in the survey. The likely explanation for this discrepancy is that individuals omit very small inheritances from their response to the wealth survey. According to the tax administration, the average amount inherited by individuals is about 40,000€, which is much lower than the 119,000€ in our data. It is also estimated that only about two-thirds of all deaths are reported to the tax administration (CPO (2009)). The remaining third represents estates that are likely below the mandatory reporting threshold of 1,500€ (in the mid-2000s). This implies that the first inheritance tercile in the wealth survey should amount to a couple thousand euros, were all individuals to report inheritances accurately. Instead, we find that the first tercile is around 35,000€ in our data. Because our empirical strategy relies on the comparison of individuals inheriting at different ages among those who do report an inheritance in the Wealth Survey, the fact that small inheritances are underreported does not constitute a source of bias in our estimations. However, it may suggest that the results of this paper do not necessarily carry to individuals inheriting very low amounts.

3 Empirical strategy

Several papers before us have considered the receipt of an inheritance to be a plausibly exogenous wealth shock. However, some works have also argued against this idea. For instance, in their study of the effect of financial constraints on entrepreneurship, Hurst and Lusardi (2004) find that future inheritances predict transition to entrepreneurship as much as past inheritances, which suggests that inheritors may differ from other individuals on unobservable characteristics. If some of these characteristics are correlated to retirement behaviors, comparing inheritors with the rest of the population will lead to biased estimates of the retirement effect of inheritance receipt. To shed some light on this issue, appendix table A1 reports the observable characteristics of all individuals in our sample (first column) along with the characteristics of individuals who receive an inheritance between ages 55-67 (second column). As it turns out, this table shows that the sample of inheritors (which represents only about 8.5% of individuals older than 55) comprises more individuals working as managers (38.8% vs. 22.6%) and less production workers (13.9% vs. 25.2%) than the whole population. These individuals are also more likely to have a higher education level than the rest of the population (45% vs. 26%). This indicates that

individuals who do not receive an inheritance over ages 55-67 differ substantially from those who do on observable characteristics, which suggests that it may well be the case on unobservables as well. The basic idea behind our paper is therefore to compare inheritors with other inheritors rather than to use individuals who do not receive an inheritance as a control group.

To our knowledge, papers which study the effects of inheritance receipt have mostly been based on the comparison of individuals who receive an inheritance within a given time frame, determined by data availability (e.g. two consecutive waves of a survey), with all the other individuals in a sample. Implicitly, this control group can be seen as comprising three different types of individuals. The first type includes individuals who have already received an inheritance in the past, but have not reacted to it (e.g. in our setting, have not retired). We argue that these individuals are "already treated", and that as such they should be excluded from the control group. The second group of individuals is comprised of those who will never receive any inheritance, possibly because their relatives hold very little wealth. Individuals in that group differ from those who do receive an inheritance, be it in their education, occupation, personal wealth, or other characteristics (sometimes unobservable and so hardly possible to control for), in particular because of important intergenerational correlations in all those variables. The third group comprises individuals who have not yet inherited, but who will receive an inheritance at some point later. The first two types of individuals should be excluded from the control group, but this is impossible to do if the data at hand does not follow individuals throughout their whole life. If information is available only during a small time window, it becomes impossible to know whether the individual under consideration has already been "treated", or whether she will inherit later in her life. We tackle this limitation by taking advantage of the retrospective calendars available in the French Wealth Survey. At any age, this data makes it possible to compare individuals who receive an inheritance at that age with individuals who receive an inheritance in the next few years. The assumption behind this strategy is that the exact time at which individuals receive their inheritance is independent from other factors affecting the timing of retirement.

Econometrically, we build on the tools of duration analysis. We consider the standard Cox proportional hazard model:

$$h_i(t) = h_0(t) \exp(\alpha \text{Inh}_{it} + X_{it}\beta) \tag{1}$$

where $h_i(t)$ denotes the hazard rate for individual i at age t, i.e. the instantaneous retirement

probability of i conditional on still being employed at t. Inh_{it} is a dummy with value 1 if i receives an inheritance at t, and 0 if i receives an inheritance in a given age interval after t, say $]t, t+T[$. In other words, if we denote t_i^b the age at which i inherits, Inh_{it} takes value 1 when $t = t_i^b$ and 0 when t is in $]t_i^b - T; t_i^b[$. X_{it} is a vector of individual and potentially time-varying covariates. In this model, the parameter of interest is α: the probability of labor market exit at t is multiplied by $\exp(\alpha)$ when an inheritance is received at t.

The estimation of model (1) requires information in continuous time, which is not available in our data. Instead, we observe events grouped in 1-year intervals. In this context, it can be shown that model (1) can be rewritten as a binary model with a complementary log-log link function to accommodate interval data.[14] Therefore, we estimate the parameters of model (1) using the following specification:

$$y_{it}^* = \mu_t + \alpha \text{Inh}_{it} + X_{it}\beta + \epsilon_{it} \tag{2}$$

where y_{it}^* is the latent variable such that $y_{it} = \mathbb{1}_{\{y_{it}^* \geq 0\}}$ with y_{it} a dummy indicating that individual i retired during interval $[t, t+1[$. μ_t is an age-specific effect,[15] and the error term ϵ_{it} follows a complementary extreme value type I distribution (specifically, $P(\epsilon > x) = 1 - \exp(-\exp(-x))$). Inh_{it} is a dummy with value 1 if individual i received an inheritance between $[t, t+1[$, and 0 if she receives an inheritance between $[t+1, t+T[$. The parameters α and β identified by model (2) are the same as those in model (1).[16] In practice, we choose $T = 2$ in the rest of the paper, and we provide evidence that similar results are obtained for various values of T.

[14] See for example Garbinti (2014).

[15] The legal retirement age is constant over our period of analysis, therefore we do not expect baseline retirement probabilities at each age to vary over time.

[16] Note that, even though we use tools from duration analysis, our approach differs slightly from traditional survival models. In these models, all individuals are followed until they either retire, or exit the sample for possibly unknown reasons (censorship). Here, we do not follow individuals until their exit from the labor market, but rather keep only observations corresponding to individuals who either receive an inheritance between $[t, t+1[$ or do not receive their inheritance between $[t, t+1[$ but receive it between $[t+1, t+T[$. Had we used a standard survival model set up, all non-retired individuals would have been kept in the sample at every age t, including individuals whom we consider to be already treated and those who never receive an inheritance.

4 Inheritance receipt and retirement

4.1 Graphical Evidence

Before moving on to the econometric analysis, we illustrate our empirical strategy by providing simple graphical evidence on the effect of inheritance receipt on labor market exit. For each age $t \in [55, 65]$, we compute the proportion of individuals who leave the labor market at any time between $[t, t+1[$ among those still employed at t. Figure 1 reports this proportion computed separately for individuals who happen to receive an inheritance between $[t, t+1[$, and for individuals who have not yet received an inheritance but will receive one within the next two years, i.e. between $[t+1, t+3[$.

The figure first shows that the probability to leave the labor market varies significantly across ages. Individuals who are still employed at ages 60 and 65 have a 50% to 60% chance to retire at that age when no inheritance is received, whereas this conditional probability is quite stable outside those ages, around 10% between $[55, 60[$ and 20% between $]60, 65[$. As described in appendix C, 60 is the age at which most workers can start to cash out their pension and 65 is the age at which pension discounts are canceled, and consequently, many individuals wait until those ages to retire. This pattern is roughly unchanged when the proportion of labor market exits is computed among those who receive an inheritance at the age under consideration.

Figure 1 also shows that at most ages t, the proportion of individuals who withdraw from the labor market is higher among those who receive an inheritance at t than among those who have not yet received an inheritance. The degree to which this is the case varies substantially with age. For example, the probability to retire doubles when an inheritance is received at ages 55 and 64, but it is roughly unchanged at ages 58 and 60. Overall, these results are indicative that receiving an inheritance between 55 and 65 is associated on average with an increase in instantaneous retirement probabilities.

4.2 Econometric results

To go one step further, we turn to the econometric analysis described in section 3, which builds on the intuitions from Figure 1. The first two columns of Table 1 show the results of the estimation of model (2) on our sample. Consistent with the findings of Figure 1, we detect a very significant impact of receiving an inheritance at ages 55-65 on the instantaneous probability to retire. Specifically, column (1) reveals that individuals who receive an inheritance at age

$t \in [55, 65]$ are on average about 37% more likely to exit the labor market at t than those who have not yet received an inheritance, but who will receive one in the next 2 years. Column (2) of Table 1 shows that this estimate changes very little when we introduce a full set of controls for individual and parental characteristics, including own and paternal socio-economic status, diploma and spouse's diploma (if any), net worth, number of children and number of siblings. This suggests that the timing of inheritance receipt over a short period of time is indeed only weakly correlated with workers' characteristics, including those affecting retirement age.

Columns (3) and (4) of Table 1 report the results of the estimation of the same model as in columns (1) and (2), but comparing individuals who receive an inheritance at t with all other individuals employed at t. In these regressions, we simply replace Inh_{it} by a dummy which is 1 if i inherits at age t, 0 otherwise. If inheritance receipt is correlated with unobserved workers' characteristics influencing retirement age, this strategy should yield biased results. Those results may then also depend on the extent to which individual heterogeneity can be accounted for in the model. When excluding all controls, we find that individuals who receive an inheritance at age t are 32% more likely to retire that year than any other individual still employed during $[t-1; t[$. This figure is slightly less than the result from column (1). However, when controls are included, we find results that are very similar to the ones obtained with our previous strategy. Specifically, when controlling for basic socio-economic characteristics of the individuals, we find that workers who receive an inheritance at t are 44% more likely to retire that year than other workers. Overall, this indicates that comparing inheritors with other individuals may lead to a small downward bias in the estimation of the effect of inheritance receipt of retirement. It also suggests that this bias can be eliminated to some extent by controlling for the important socio-demographic characteristics of individuals and their parents.

These results are in line with those of previous American studies, although not directly comparable. Previous works have reported estimates based on logit or linear probability specifications, whereas our model directly estimates multiplicative effects. When we rescale our estimates taking into account the mean retirement probability in our sample, we get a marginal effect equivalent to a 5 percentage point decline in labor force participation following inheritance receipt.[17] This figure is slightly higher than Brown et al. (2010) (2.3 percentage point decline) but clearly in

[17] The mean retirement probability in our sample is 13%. We multiply our multiplicative effect (40%) by this sample mean in order to get closer to the way Blau and Goodstein (2016) compare results across studies. Their results are marginal effects that can be compared to the average probability computed over the whole span of ages. In the setting of our duration model, we allow the probability of exit to increase with age and thus our multiplicative effect is relative to the time changing baseline retirement probability (and not to the sample mean of the dependent variable).

line with Blau and Goodstein (2016), with effects ranging from a 3.8 to a 6.5 percentage point decline (depending on whether men or women are considered).

As it has been pointed out by a number of studies (e.g. Brown et al. (2010)), the results from Table 1 could be driven by the fact that the death of a relative has a direct effect on the labor market participation of an individual. For instance, some individuals might stop working after the death of one of their parents to have more time to take care of their surviving parent. Some individuals might also postpone the date of their retirement in the years preceding the death of a close parent for financial reasons. In both of these scenarios, our results would overestimate the effect of inheritance receipt on retirement. A way to shed some light on this issue is to explore whether the labor market response of individuals who inherit a given year varies depending on whether they receive their inheritance from their parents or from more distant relatives or friends.[18] Under the assumption that the death of a parent has a direct negative effect on labor force participation, or that the anticipation of this death has a positive impact on labor force participation, we would expect inheritances received from parents to be associated with a higher probability to withdraw from the labor market. To test this, column (2) of Table 2 reports the results obtained for the estimation of model (2), distinguishing between bequests received from parents or grand-parents and bequests received from other family members or friends. Those results first confirm that workers who inherit in a given year from a close parent are more likely to exit the labor force that year than individuals who inherit in the next couple of years. As it turns out, this effect is not less important and not statistically different when the inheritance comes from a more distant relative or from a friend (+116% vs. +38%). Overall, this result is not consistent with the hypothesis that the estimates of Table 1 would be entirely driven by labor market responses to the death of a parent.

A related concern is that some individuals might exit the labor force a few years *before* the death of a parent. For example, some individuals might take time off work to care for a parent suffering from a severe illness. If this is the case, at any given age t, the retirement probability of individuals who will inherit in the next few years will overestimate the baseline retirement probability at t, and our results will be biased toward 0. A way to test whether these effects are substantial is to compare our results with those obtained when considering a control group composed of individuals who receive an inheritance over a longer time horizon. Workers who inherit at $t+5$ should be less likely to exit the labor market at t to take care of their parent

[18] Brown et al. (2010) tackle this issue by controlling explicitly by the death of a parent. Unfortunately, we do not know the precise year of death of individuals' parents in our data.

than workers who inherit at $t+2$. If these effects are large, we should find that the impact of inheritance on current retirement increases when we consider an extended time horizon. In columns (3) to (5) of Table 2, we investigate how the results of Table 1 change when we consider inheritances received over a longer period of time. We estimate the same model as for column (2) of Table 1, but this time comparing the retirement probability in a given year for individuals who inherit that year and for those who inherit in the next 3 years (column 3), in the next 5 years (column 4), or in the next 10 year (column 5). The estimates do not increase, and actually change very little when we extend the time horizon considered. This is not consistent with the hypothesis that labor market response prior to a parent's death would be driving the results of Table 1. More generally, these estimates also indicate that our results are not driven by our choice to consider inheritances received in a two-year window.

5 Heterogeneous effects of inheritance receipt on labor force participation

The previous section has shown that receiving an inheritance between ages 55 and 65 is associated with a substantial increase in current retirement probabilities. In this section, we want to investigate whether this effect is entirely driven by specific groups of individuals, or whether it extends to most older workers. For example, it could well be that receiving an inheritance leads an individual to exit the labor force only when he or she already has weak ties to the labor market. A related concern is that the costs of leaving the labor market vary significantly across ages 55-65. Mandatory public pensions play a critical role in France, and in order to get their full benefits, individuals must work until they reach the necessary contribution length. In addition, most workers need to wait until they turn 60 to be able to unlock their public pension.[19] It could well be that receiving an inheritance leads an individual to leave the labor market only when she has the possibility to do so at very little cost. The opposite would indicate that individuals are ready to sacrifice a substantial part of their pension to retire earlier, which can have deep implication for the design of public pensions.

[19] French pensions are explained in more details in Appendix C.

5.1 Influence of socio-demographic characteristics

We start by exploring how the effect of inheritance receipt on labor force participation varies with the basic socio-demographic characteristics of individuals in our sample. Specifically, Table 3 reports the estimation of the same model as in Table 1 on different populations. We conduct regressions separately for men and women (columns 1 and 2), for individuals with low or high educational attainment (columns 3 and 4), and for individuals of low or high socio-economic status (columns 5 and 6). Low socio-economic status refers to unskilled or blue-collar workers and office clerks, and high socio-economic status refers to white-collar workers and executives. Panel A reports estimations made with our preferred strategy, comparing individuals who inherit at a given age with those inheriting in the next couple of years, whereas panel B reports the estimation of the model when all other individuals are included in the control group. Columns (1) and (2) of the table first reveal that receiving an inheritance has a very similar effect on labor force exit for men and women, namely an increase of about 40% of their current probability of exit. On the other hand, columns (3) to (6) indicate that inheritance receipt has a significant effect on current exit only for individuals with low educational attainment (+81%) and for blue-collar workers (+53%). We find lower and not statistically significant effects on highly qualified individuals (+10%) and on white-collar workers (+22%). This may reflect the fact that these individuals hold more fulfilling jobs and that they wish to keep on working for as long as they can, regardless of whether they have the financial possibility to retire. It could suggest that the receipt of an inheritance does not have an effect on the labor force participation of individuals with very strong ties to their jobs.

An alternative interpretation of these results is that an individual holding a white-collar job may be more likely to be the breadwinner in his or her household, and might therefore have less leeway to exit the labor force when she wants. To test this idea, Table 4 reports the estimation of the same model as before, but where we interact the treatment variable with several indicators of household structure. First, column (1) considers whether the effect of receiving an inheritance on labor force participation varies when individuals live alone or in a couple. It reveals that receiving an inheritance has a significant effect on labor force exit for both of these groups of individuals. Specifically, individuals living alone are 60% more likely to exit the labor force after receiving an inheritance, and individuals living in a couple are about 32% more likely to do so. The estimated effect of inheritance receipt is therefore about twice as high for individuals living alone than for those living in a couple. As those individuals are by definition breadwinners

in their household, this result seems inconsistent with the idea that the absence of effect on individuals holding white-collar jobs is driven entirely by a breadwinner effect.

When individuals live in a couple, we can breakdown the results further according to whether the individual's spouse is still active, and whether the individual under consideration is the breadwinner in the household (columns 2 and 3).[20] Column (2) first shows that, for individuals living in a couple, receiving an inheritance has a strong and significant effect on labor force withdrawal only when individuals happen to inherit when their spouse is already retired, corresponding to a 46% increase in retirement rates. For individuals whose spouse is still working, we obtain much lower estimates which are not statistically significant (+10%). This result seems again inconsistent with the idea that breadwinners would have less leeway to retire earlier, as individuals whose spouse is retired are likely to be primary earners in their households.[21] Actually, the results on singles and spouses of retirees seem to suggest the opposite, namely that primary earners are more likely to exit the labor force than others after the receipt of an inheritance. An interpretation for this could be that breadwinners hold more bargaining power in the household, which gives them more freedom to retire if they want to. However, we do not find strong support for this hypothesis when looking at couples where both individuals are working. Specifically, column (3) further breaks down the results for individuals living in such households by differentiating between primary earners and other individuals. We find estimate of similar magnitudes, and not statistically significant, for both groups.

5.2 Influence of labor force status

To go one step further in this analysis, we turn to other indicators of labor market attachment. We begin by investigating whether part-time workers are more likely to exit the labor force following the receipt of an inheritance than full-time workers. We first estimate the same model as in Table 1 on the subsample of individuals for whom part-time work information is available.[22] We then estimate the same model distinguishing between inheritances received while working

[20] The data does not contain retrospective information on earnings for each spouse. In a household with two active spouses, we consider the breadwinner to be the individual with the highest diploma or the highest socio-economic status.

[21] These results are consistent with the existence of leisure complementarities between spouses (see e.g. Gustman and Steinmeier (2000)), which can generate joint retirement patterns in dual-career couples. To be sure that our results are not driven by joint retirement behaviors, we checked that the estimates are unchanged if we impose that the individual's spouse has been retired for at least a year before the receipt of the inheritance. Cross effects of inheritance receipt by an individual on her spouse's retirement are potentially less likely in France, as individuals are the sole owners of their inherited wealth, even when they are married under the most common regime of community of property.

[22] Information on part-time work was not available in the 1998 survey.

part-time and those received while working full-time. Results are reported in columns (1)-(4) of Table 5. As it turns out, the receipt of an inheritance has a very strong impact on part-time workers' probability to exit the labor force (+136%). The impact on full-time workers is also significant, but more moderate (+37%), although not statistically lower than the impact on part-time workers. In column (5) of Table 5, we also explore if inheritances may induce full-time workers to partially withdraw from the labor market through a transition to part-time employment. Specifically, we focus on the subsample of individuals who are full-time employees at age $t-1$, and we regress a dummy indicating that they switch to a part-time job between $t-1$ and t on a dummy indicating that an inheritance was received at t.[23] These estimates suggest that full-time workers are about 120% more likely to transition to part-time employment when they receive an inheritance, although this effect is not statistically significant. Overall, those results suggest that the receipt of an inheritance may have a stronger impact on individuals with a lower attachment to the labor market. This is consistent with previous works (e.g. Kaplan (1987)), which have generally found that workers who hold less fulfilling or more painful jobs are also more reactive to wealth shocks.[24] These results also confirm that the effect of inheritance receipt on labor force exit is not entirely driven by individuals with low labor market attachment. Full-time workers also have a very significant increase in retirement probabilities following the receipt of an inheritance.

Given these conclusions, the next question is whether the receipt of an inheritance triggers labor market withdrawal only for individuals facing a low cost of exit. As described in Appendix C, most workers need to wait until they turn 60 to be able to unlock their public pension, and individuals must work until they reach the necessary contribution length to retire with full benefits. For example, individuals born after 1973 must contribute to the system for 43 years in order to be able to claim full benefits. To explore this issue, Table 6 shows the results of estimating model (2) when the inheritance dummy is interacted with an indicator that the individual under consideration is older than 60 (column 1), or with an indicator that she has fulfilled the necessary contribution length (column 2). First, column (1) reveals that the effect of inheritance receipt on labor force participation is not lower when individuals happen to inherit before 60. Receiving an inheritance after 60 increases the probability of instantaneous labor market exit by about 26%

[23] We do not focus solely on inheritors because of the very limited number of transitions to part-time employment observed in the data.

[24] Other interpretations are consistent with our findings. For example, there may be a link between labor market attachment and the strength of bequest motives: individuals who happen to have a lower attachment to the labor market may also be more responsive to the receipt of an inheritance because they do not intend to leave as much wealth to their children as individuals holding more fulfilling jobs.

with respect to receiving an inheritance in the following couple of years, but it is not significant. As it happens, this figure actually almost triples, to a 63% increase, when the inheritance is received before 60. This result indicates that the impact of inheritance receipt on labor force participation is not lower when individuals cannot yet cash out their public pension. Column (2) of Table 6 then shows that this also holds true when considering pension rights rather than the possibility to unlock the pension. Specifically, individuals who happen to inherit when they have already reached their full contribution length (and have therefore earned their full benefits) are 47% more likely to exit the labor market at that point than those who receive their inheritance in the next couple of years. This effect is only slightly smaller (30%) when individuals happen to receive their inheritance when they have not yet worked enough to earn their full pension rights.

As described in Appendix C, the entitlement cost of an early labor market exit can be quite large, even with just a few missing years of contribution. When workers are too far away from earning their full benefits, receiving an inheritance might not be enough to compensate the loss of pension money associated with an early exit, even if an individual has a strong disutility for work. To test this idea, we investigate whether the effect of inheritance receipt on retirement decreases when individuals are missing more than a certain number of years of contribution. Specifically, column (3) reports the results of the estimation of the same type of model as for column (2) of Table 6, but distinguishing whether individuals are missing more or less than 2 years of contribution. As it turns out, individuals who have not yet earned their rights to full benefits but who are close to having done so are also those for whom receiving an inheritance is associated with the strongest probability to retire. When an individual happens to receive an inheritance while she is less than two years away from earning full retirement rights, her probability of exiting the labor market increases by 48%. By contrast, if she happens to receive an inheritance while being more than two years away from earning full benefits, she is not more likely to exit the labor market than a comparable individual who did not yet receive any inheritance. These results confirm that the retirement effect of inheritance is not entirely driven by individuals facing low costs of exit. They also suggest that private wealth can substitute for lower pensions, although it is unclear from this analysis what the elasticity for this substitution is.

5.3 Influence of inherited amount

As shown in Table A1, inherited amounts vary substantially in our sample, and all things equal, we would expect individuals who inherit a larger amount to be more likely to exit the labor force

following the receipt of their inheritance. In order to test whether this is the case in our data, we split inheritances received by individuals in our sample by amount tercile. Columns (1)-(3) of Table 7 report the results of separate estimations of model (2) for individuals whose inheritance belongs to each tercile.[25] Columns (4)-(6) of the same table report the results obtained when individuals receiving an inheritance in the qth tercile are compared to all other individuals in the sample rather than just with those receiving an inheritance in the qth tercile within the next two years. More precisely, in these columns, the retirement indicator is regressed on an inheritance dummy Inh_{iqt} which is 1 if individual i receives an inheritance in the qth tercile at t, and 0 if i does not inherit at t.

Columns (1)-(3) of the table show that individuals who receive an inheritance in either the bottom or top tercile have about 45% higher chances of instantaneous labor force exit than those inheriting a similar amount in the next two years. However, this effect is about 1.5 times stronger (although not statistically different), from +45% to +70%, for individuals who receive an inheritance in the middle tercile, and the same pattern appears in columns (4)-(6). These findings suggest a bell-shaped rather than increasing response to inherited amounts, where individuals receiving extreme inheritances are less impacted than those receiving average inheritances. An interpretation for this could be that individuals are more sensitive to the ratio of inherited wealth to personal wealth than to the actual amount of money they inherit. Individuals who inherit higher amounts may also hold more wealth, so that the ratio of inherited to personal wealth could be roughly similar in the bottom and top tercile (see for example Elinder et al. (2016)). Unfortunately, we cannot test this hypothesis as we do not observe personal wealth at the time of inheritance; only personal wealth at the time of the interview is known in the data.[26]

6 Inheritance, retirement, and risk aversion

The previous sections have shown that the receipt of an inheritance has a substantial effect on labor force participation, and that this holds true for a variety of socio-demographic groups. In this section, we explore and test some theoretical interpretations of this result. Previous

[25] Not all individuals report inherited amounts. We lose about 15% of individuals in this analysis.

[26] The type of inheritance is also a topic of interest. However we did not find any significant difference between the effect of (e.g.) liquid and illiquid assets in our data. An interpretation for this is that the type of assets is correlated with the amount received; real-estate makes up most of illiquid inherited assets, and is also over-represented in large inheritances. However, it is not possible to disentangle the effect of size from the effect of type of inheritance in our data as the amounts received are not reported by asset inherited: only the overall size of the inheritance in known. Restricting the sample to inheritances which only include assets of one type leads to very small samples.

studies have highlighted that, in a classical theoretical framework, inheritance receipt should have an impact on labor supply decisions only to the extent that inheritances are not anticipated. Intuitively, agents integrate the receipt of an expected inheritance in their intertemporal budget constraint, and choose their lifetime supply of labor, and in particular their date of retirement, accordingly. When an individual receives exactly the amount that she expected, her labor supply decisions should not be affected.

However, in a related contribution, Brown et al. (2010) found that this was not entirely true empirically. Specifically, some of their specifications show that individuals who receive an inheritance in line with the amount they expected are still more likely to retire earlier than expected than individuals who do not receive any inheritance. In other specifications, the point estimate associated with the effect of an expected inheritance on retirement even exceeds the one associated with an unexpected inheritance. Possible explanations for this result include the existence of liquidity constraints, and the idea that bequests constitute uncertain sources of wealth which might therefore be discounted by risk-averse agents. In this section, we build a simple theoretical model which incorporates both of these elements to understand how they may affect the way in which inheritance receipt impacts retirement decisions. Using multiple measures of risk aversion available in our data, we test that it is a key element in explaining our previous results.

6.1 A model of retirement decision with liquidity constraints, uncertain inheritance, and risk aversion

We consider a simple model in which agents live three periods: they work in period 1 and are retired in period 3, but they can choose between work and retirement in period 2. Agents earn a wage w when they work, whereas they get a public pension income λw when they are retired, with $\lambda \in (0,1)$. In addition, agents inherit an amount B at time $T \in \{2,3\}$, but they are uncertain about both T and B. Assuming that agents have rational expectations, we denote $p = P(T=2)$,[27] and for simplicity, we consider that $B \sim \mathcal{U}(b_{min}, b_{max})$. In what follows, we normalize w to 1 so that B is the amount inherited relative to individuals' wage in the first period. We also assume that agents face partial credit constraints: they cannot borrow against future inheritances, nor against any uncertain income. For example, since agents cannot commit in period 1 to working in period 2, they can only consume up to $(1+2\lambda)w$ in period 1. Agents do

[27] In this context, p represents both the actual and subjective probability of inheriting in period 2.

not leave any bequests, so that they consume in period 3 all of their remaining wealth from the previous periods. In this model, we are interested in comparing the retirement decisions made in period 2 by individuals who happen to inherit in period 2 and by those who happen to inherit in period 3. These individuals differ only by the timing of receipt of their inheritance, which relates to our empirical setting.

We consider that agents have preferences of the Epstein-Zin form, so that the intertemporal elasticity of substitution ρ and the risk aversion α are governed by different parameters.[28] Following Stock and Wise (1990), we also assume that retirement has a multiplicative effect on the enjoyment of every unit of consumption and denote k this multiplicative constant. In this context, agents solve the following problem in period 1:

$$\begin{aligned} V_1 = \max_{c_1} & \left(c_1^{1-\rho} + E_1 \left(V_2(c_1, B, T)^{1-\alpha} \right)^{\frac{1-\rho}{1-\alpha}} \right)^{\frac{1}{1-\rho}} \\ \text{s.t. } & c_1 \leq 1 + 2\lambda \end{aligned}$$

where c_1 is the first period consumption and V_2 is the second period value function. We have:

$$\begin{aligned} E_1 \left(V_2(c_1, B, T)^{1-\alpha} \right) &= E_{B,T} \left(V_2(c_1, B, T)^{1-\alpha} \right) \\ &= E_T \left(E_B \left(V_2(c_1, B, T)^{1-\alpha} | T \right) \right) \\ &= pE_B \left(V_2(c_1, B, 2)^{1-\alpha} \right) + (1-p) \left(V_2(c_1, B, 3)^{1-\alpha} \right) \end{aligned}$$

Denoting r an indicator for retirement in period 2, $k(r) = 1 + r(k-1)$ the enjoyment of each unit of consumption, and $I(r) = 2 - r + \lambda(1+r)$ agents' lifetime income, we have:

$$\begin{aligned} V_2(c_1, B, 2) = \max_{c_2, r} & \left((k(r)c_2)^{1-\rho} + \beta \left[k(I(r) + B - c_1 - c_2) \right]^{1-\rho} \right)^{\frac{1}{1-\rho}} \\ \text{s.t. } & c_2 \leq I(r) + B - c_1 \end{aligned}$$

and

$$\begin{aligned} V_2(c_1, B, 3) = \max_{c_2, r} & \left((k(r)c_2)^{1-\rho} + \beta E_2 \left(\left[k(I(r) + B - c_1 - c_2) \right]^{1-\alpha} \right)^{\frac{1-\rho}{1-\alpha}} \right)^{\frac{1}{1-\rho}} \\ \text{s.t. } & c_2 \leq I(r) - c_1 \end{aligned}$$

[28] We assume an Epstein-Zin utility function so as to be able to distinguish the theoretical effect of risk aversion from that of intertemporal elasticity of substitution, which cannot be done using more traditional functions (e.g. CRRA utility).

Appendix B presents a partial resolution of this model, as well as detailed results from its simulation for different sets of parameters. We present the main findings from these simulations in Figure 2, which plots retirement decisions in period 2 in the (α, k) space when $E(B) = 1$. In France, most individuals choose to retire at some point between 55 and 65, and retirement laws also provide strong incentives making it quasi-mandatory to retire once individuals reach 65. A way to interpret our model in the light of these features is therefore to consider that each of the three periods represents a 10-year time span. In this scenario, period 1 captures agents' choices over ages 45-54, where individuals cannot yet cash out their pension, period 2 represents choices over ages 55-64, during which individuals may chose to retire, and period 3 represents mandatory retirement over ages 65-74. An expected bequest of 1 means that individuals expect to receive the equivalent of their first period income, which in this context would mean the equivalent of ten years of earnings, representing about 240K€ on average.[29]

Figure 2 shows that three main cases can arise. For each α, individuals will always choose to retire in period 2 if their enjoyment of leisure k is high enough (area A). Conversely, individuals with a low enjoyment of leisure will choose to work in period 2 (area C). In between, for each $\alpha > 0$, there is a range of k (area B) for which individuals will only choose to retire in period 2 if they have already received their inheritance at that moment.[30] The basic intuition for this result is that when agents are risk averse, they will make retirement decisions taking into account the certainty equivalent of their inheritance if they have not yet received it. Since the certainty equivalent of the bequest is lower than its expected value, the level of leisure enjoyment necessary to prefer retirement over work is higher for individuals who have not yet inherited than for those who have, even when the latter received exactly the amount expected. In Figure 2, the measure of area (B) with respect to the joint probability distribution of (α, k) in the population is directly related to the parameter that we estimate empirically. It represents the proportion of inheritors for whom receiving an inheritance at a given point in time rather than a few years later changes retirement behaviors.

Figure 2 also shows that the range of values of k for which individuals will be sensitive to the timing of receipt of inheritance is wider as α increases. For any level α_0 of risk aversion, this entails that the measure of area (B) with respect to the joint distribution of (α, k) conditional

[29] The average monthly wage per person in France is about 2000€.

[30] More precisely, this figure is obtained by comparing second period retirement choices of an individual who inherits in period 2 of an amount exactly equal to $E(B) = 1$, and one who does not receive an inheritance in period 2. The latter individual is certain to inherit in period 3, but the amount that she will receive is still uncertain.

on $\alpha < \alpha_0$ is lower than the measure conditional on $\alpha > \alpha_0$.[31] In other words, the effect of inheritance receipt on retirement decisions should be higher for groups of individuals having higher risk aversions. In appendix B, we show that the case analyzed in Figure 2 ($E(B) = 1$) is one where the inheritance received is low enough that agents are not credit constrained in the first or second period. We also provide evidence that, when agents are credit constrained in the second period, which happens when the expected value of the bequest is high enough with respect to first period income, the effect of inheritance on retirement decisions may instead be decreasing in risk aversion. The basic intuition behind this result is that when agents are more risk averse, they will also consume less in the first period and are in turn less likely to hit their budget constraint in the second period. They may therefore be more likely to retire early than agents with a lower risk aversion. However, in the light of this model, we expect few individuals to receive inheritances big enough that they are hitting their budget constraint. As we discussed above, an expected bequest of 1, for which individuals in our model are not constrained by their borrowing capacity, can be interpreted as representing an average inherited amount of about 240,000€. In our sample, this corresponds approximately to the last decile of inheritances as shown in table A1, which suggests that at least 90% of individuals inherit amounts such that they do not hit their budget constraint.

6.2 Risk aversion and the impact of inheritance receipt on retirement

In the context of the model presented in the previous section, the impact of inheritance on labor force exit should be more important for agents who are more risk averse, if (as we expect) most agents do not inherit amounts so big that their borrowing constraints are binding. We now test whether we find support for this hypothesis in our data using multiple measures of risk aversion. In the waves of the Wealth Survey that took place in 2004 and 2010, about half of the individuals were asked questions about their attitude towards risk. Individuals had to position themselves on a scale from 0 (very careful individual) to 10 (person who likes to take risks), and were also presented with a simple lottery that we detail in Appendix D. These questions provide us with two measures of risk aversion, which we label respectively subjective risk aversion and lottery risk aversion. In addition, we use stock market participation as a third measure of risk aversion (see e.g. Black et al. (forthcoming)). We estimate an augmented version of model (2), specifically:

$$y^*_{it} = \mu_t + \alpha \text{Inh}_{it} + \beta \text{Risk}_i + \gamma \text{Inh}_{it} * \text{Risk}_i + X_{it}\delta + \text{Inh}_{it} * X_{it}\kappa + \epsilon_{it} \quad (3)$$

[31] This is assuming that the distribution of k and α are independent.

where Risk_i is an indicator for high risk aversion, $*$ denotes interactions, and X_{it} includes the same controls as in model (2). The parameter of interest in this model is γ, which captures the additional increase in labor force exit rates generated by the receipt of an inheritance for individuals with a high risk aversion. The model also includes a control for time preference and its interaction with the indicator of inheritance receipt.[32] We expect individuals who are less risk averse to have a higher preference for present, and therefore higher retirement rates at a given age all things equal. This means that preference for present may be a confounder and omitting it and its interaction may then bias our estimates downwards. More generally, model (3) includes the interaction of all the controls with the treatment, to reduce the possibilities that γ picks up the heterogeneity of the treatment effect along known observables. Before presenting the results of the estimation of this model, we must highlight the fact that our three measures of risk aversion provide information that is relative to the time of the interview. We do not observe individuals' risk aversion *before* the receipt of their inheritance. It may be of concern that individuals' risk aversion changes after receiving an inheritance, and therefore that risk aversion at the time of the survey does not accurately reflect risk aversion before the inheritance was received. However, we do not think that this is a problem for two reasons. First, the empirical evidence supporting the hypothesis that wealth shocks do affect risk aversion is mixed. For instance, Brunnermeier and Nagel (2008) show no significant effect of wealth on risk aversion. Salamanca (2016) also shows that risk aversion has a strong auto-regressive component making it essentially constant for an individual over time. Second, even if wealth shocks did affect risk aversion, we would expect risk aversion to decrease more for individuals who receive larger inheritances relative to their wealth. Since larger inheritances (relative to individuals' wealth) are also expected to have a larger effect on labor market exit, this would generate a negative correlation between risk aversion observed at the time of the survey and an individual's probability to have exited the labor market the year of receipt of the inheritance. This would amount to a downward bias in our estimated value of γ.

The results of the estimation of model (3) for our three measures of risk aversion are reported in Table 8. Columns (1)-(3) of the table show the results obtained when Inh_{it} is a dummy indicating that an inheritance is received during $[t, t+1[$ rather than during $[t+1, t+3[$, and columns (4)-(6) report the results obtained when Inh_{it} is a dummy indicating simply that an inheritance was received during $[t, t+1[$. The table shows that, for all three measures of risk

[32] In the part of the survey related to risk aversion, individuals also had to position themselves on a scale from 0 (individuals living for today) to 10 (individuals concerned by their future and planning it).

aversion, the receipt of an inheritance coincides with an increase in labor force exit rates that is higher for individuals with a high risk aversion than for others. In our preferred specification (columns (1)-(3)), this difference is significant for the measures based on lottery results and on whether individuals own stocks (columns (2) and (3)). For these two measures, highly risk averse individuals are respectively 3.4 and 4.3 times more likely to exit the labor force following the receipt of an inheritance than individuals with a low risk aversion. Columns (4)-(6) show that similar results are obtained when comparing inheritors with other individuals, although the magnitude and significance of the estimates for the subjective and shareholding measures of risk aversion are reversed.

These findings are consistent with the model presented in section 6.1 and shed new light on the retirement effects of expected inheritances found in previous works. When individuals are risk averse, they will plan their retirement according to the certainty equivalent of their inheritance, which is lower than its expected value. In this context, the receipt of an inheritance will be associated with an increase in current retirement rates even if agents make perfect predictions on the size of their inheritance.

7 Conclusion

In this paper, we use the receipt of an inheritance as a wealth shock to investigate the retirement effect of private wealth. Building on lifelong retrospective data available in the French Wealth Survey, we estimate the effect of inheritance receipt on labor market exit by comparing inheritors with other inheritors rather than with all employed individuals. This addresses the concern that inheritors might differ from other individuals in some way that is correlated to retirement decisions. We find that chances of current labor market exit are about 40% higher for individuals who inherit a given year compared to those who will inherit in the next two years, but there is substantial heterogeneity in this effect across socio-demographic groups. This effect is similar for men and women, but it is more important for individuals who are less educated, who hold blue-collar jobs, or who work part-time. We find significant effects both for individuals living alone or in a couple, but for the latter, the effects are driven by individuals whose spouse is already retired. These results suggest that the most impacted groups comprise individuals who potentially hold less rewarding jobs and who may have weaker ties to the labor market. We also show that the retirement effect of inheritance receipt is not concentrated on individuals for whom leaving the labor market is the least costly. Effects are also significant for individuals who

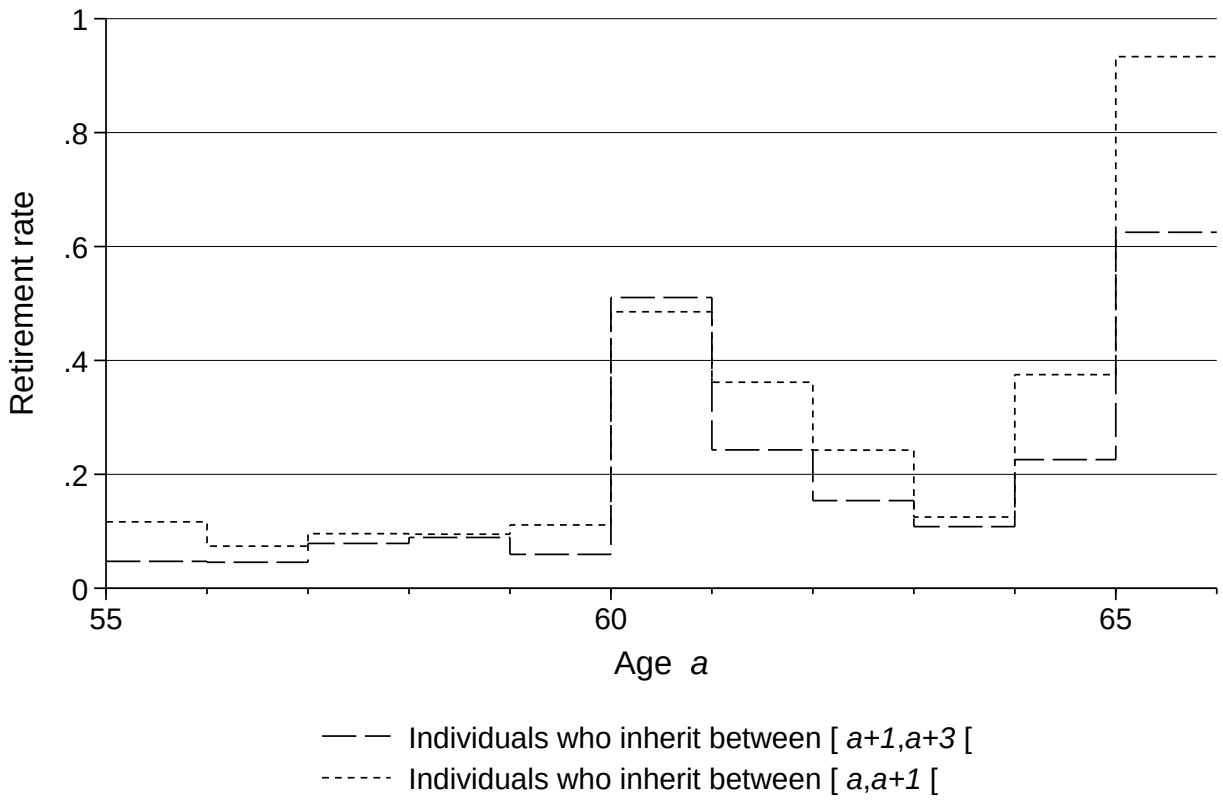
happen to inherit at a point in their life when they cannot yet cash out their public pension, or when they have not yet achieved full benefit entitlement.

We then explore and test some theoretical interpretations of our results. We build a simple model of retirement decisions in which agents receive a bequest, but are uncertain about both the date of receipt and the amount that they will inherit. Agents are risk-averse, and face potential liquidity constraints as they cannot borrow against any uncertain source of income. In this context, we provide evidence that individuals may bring forward the date of their retirement when they inherit, even if the amount received was exactly in line with their expectations. This is because risk-averse individuals plan their retirement according to the certainty equivalent of their inheritance, which is lower than its expected value. We provide evidence that this effect is stronger for individuals with a higher risk-aversion, as long as agents are not hitting their budget constraint. We find evidence consistent with this prediction in our data.

These results help shed new light on the effects of expected inheritances found in previous works. They also suggest that pension uncertainty may be an important determinant of retirement age. In a context where public pension systems in many countries are under growing demographic pressure and financial strain, pension reforms reducing benefits have been more and more frequent in the last decades. In a scenario where agents are risk-averse, this growing uncertainty may have unexpected effects on retirement age patterns. Such reforms are also likely to affect primarily workers holding less rewarding jobs and those at the fringe of the labor market.

Figures and Tables

Figure 1 – Retirement probability by age and inheritance receipt



Note: for each age $a \in [55, 65]$, the figure shows the proportion of individuals employed (or unemployed) between $[a-1, a[$ who exit the labor market between $[a, a+1[$. The short-dashed line shows this proportion computed among individuals who receive an inheritance between $[a, a+1[$, whereas the long-dashed line shows this proportion computed among individuals who receive an inheritance between $[a+1, a+3[$.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 1 – Effect of inheritance receipt on instantaneous retirement

	Inheritors only		All individuals	
	(1)	(2)	(3)	(4)
Inheritance	0.317***	0.343***	0.274***	0.367***
	(0.1028)	(0.1045)	(0.0787)	(0.0791)
	+ 37%	+ 41%	+ 32%	+ 44%
Additional controls	No	Yes	No	Yes
Observations	2788	2788	73016	73016
Individuals	1227	1227	14391	14391

Note: the table shows the results of the estimation of a complementary log-log model, where a indicator of current labor force exit is regressed on an indicator of current inheritance receipt, and a full set of age dummies (11 levels, for ages 55 to 65). Controls in columns (2) and (4) include the net wealth of the household, and dummies for public sector workers, socio-economic status (3 dummies), socio-economic status of father (3 dummies), own and spouse's diploma, active mother, marital status, year of data (2 dummies), number of children (3 dummies), number of siblings (3 dummies), and homeowner parents. In columns (1) and (2), the sample is defined by keeping, at each age a, individuals who receive an inheritance between $[a, a+3[$. In columns (3) and (4), we keep all individuals. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 2 – Effect of inheritance receipt on instantaneous retirement: some robustness checks

	2 years		Other control groups		
	(1)	(2)	(3)	(4)	(5)
			3 years	5 years	10 years
Inheritance	0.343***		0.301***	0.265***	0.275***
	(0.1045)		(0.1002)	(0.0939)	(0.0914)
	+ 41%		+ 35%	+ 30%	+ 32%
Received from parents		0.322***			
		(0.1183)			
		+ 38%			
Received from partner		0.293			
		(0.1864)			
		+ 34%			
Other		0.769**			
		(0.3005)			
		+ 116%			
Additional controls	Yes	Yes	Yes	Yes	Yes
Observations	2788	2788	3545	4912	7247
Individuals	1227	1227	1323	1530	1798

Note: the table shows the results of the estimation of a complementary log-log model, where a indicator of current labor force exit is regressed on an indicator of current inheritance receipt (columns 1, 3, 4 and 5) or an indicator that the individual is receiving the inheritance from (i) his parents, (ii) his deceased partner or (iii) other individuals (column 2). All regressions include a full set of age dummies (11 levels, for ages 55 to 65), and the same controls as in Table 1. In columns (1) and (2), the sample is defined by keeping, at each age a, individuals who receive an inheritance between $[a, a+3[$. In columns (3), (4) and (5), we keep at each age individuals who receive and inheritance respectively between $[a, a+4[$,$[a, a+6[$, and $[a, a+11[$. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 3 – Effect of inheritance receipt on instantaneous retirement for various demographic subgroups

	Sex		Education		SES	
	(1) Men	(2) Women	(3) Low	(4) High	(5) Low	(6) High
Panel A: inheritors only						
Inheritance	0.372**	0.350**	0.593***	0.097	0.428***	0.197
	(0.1446)	(0.1560)	(0.1416)	(0.1725)	(0.1326)	(0.1904)
	+ 45%	+ 42%	+ 81%	+ 10%	+ 53%	+ 22%
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1491	1297	1502	1281	1685	1103
Individuals	659	568	674	551	751	476
Panel B: all individuals						
Inheritance	0.343***	0.405***	0.515***	0.209	0.470***	0.166
	(0.1083)	(0.1159)	(0.0979)	(0.1315)	(0.0952)	(0.1417)
	+ 41%	+ 50%	+ 67%	+ 23%	+ 60%	+ 18%
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37533	35483	52637	20071	55088	17928
Individuals	7598	6793	10603	3734	11133	3258

Note: the table shows the results of the same regression as in the column (2) of Table 1 for various demographic subgroups. Specifically, columns (1) and (2) concentrate on men / women, and columns (3) and (4) respectively investigate individuals below and above the median relative diploma. Columns (5) and (6) study respectively blue collar to middle-level workers, and executives. The sample studied in Panel A is the same as that studied in columns (1) and (2) of Table 1, and the sample studied in Panel B is the same as that studied in columns (3) and (4) of Table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 4 – Effect of inheritance receipt on instantaneous retirement by household situation

	Inheritors only			All individuals		
	(1)	(2)	(3)	(4)	(5)	(6)
Single	0.472**	0.476**	0.477**	0.513***	0.514***	0.515***
	(0.2367)	(0.2362)	(0.2363)	(0.1717)	(0.1709)	(0.1708)
	+ 60%	+ 61%	+ 61%	+ 67%	+ 67%	+ 67%
Couple	0.278**			0.268***		
	(0.1360)			(0.1006)		
	+ 32%			+ 31%		
Couple with retired spouse		0.378**	0.378**		0.287**	0.287**
		(0.1736)	(0.1735)		(0.1281)	(0.1281)
		+ 46%	+ 46%		+ 33%	+ 33%
Couple with active spouse		0.096			0.170	
		(0.2106)			(0.1679)	
		+ 10%			+ 19%	
Breadwinner			0.115			0.111
			(0.2703)			(0.2201)
			+ 12%			+ 12%
Non-breadwinner			0.073			0.247
			(0.3304)			(0.2576)
			+ 8%			+ 28%
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2319	2319	2319	60122	60122	60122
Individuals	1028	1028	1028	12353	12353	12353

Note: the table shows the results of the same regression as in the column (2) of Table 1, where the inheritance indicator was interacted with a variable indicating whether the individual lives alone or in a couple (columns 1 and 4), a variable indicating whether the individual lives alone, with a retired spouse, or with an active spouse (columns 2 and 5), and a variable indicating whether the individual lives alone, in a couple with a retired spouse, or in a couple with an active spouse where he is (resp. is not) the breadwinner (column 3 and 6). Regressions also include the main effects of these variables. The sample studied in columns (1) to (3) is the same as the one studied in columns (1) and (2) of Table 1, and the sample studied in columns (4) to (6) is the same as that studied in columns (3) and (4) of Table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 5 – Part-time work and the effect of inheritance receipt

	Inheritors only		All individuals		
	(1) Transition to retirement	(2) Transition to retirement	(3) Transition to retirement	(4) Transition to retirement	(5) Transition to part-time
Inheritance	0.333***		0.358***		0.225
	(0.1160)		(0.0879)		(0.7130)
	+ 40%		+ 43%		+ 25%
Inheritance x		0.859*		0.664**	
working part-time		(0.4678)		(0.3104)	
		+ 136%		+ 94%	
Inheritance x		0.313***		0.337***	
working full-time		(0.1200)		(0.0914)	
		+ 37%		+ 40%	
Working part-time		-0.423		-0.218***	
		(0.2647)		(0.0298)	
		- 34%		- 20%	
Additional controls	Yes	Yes	Yes	Yes	Yes
Observations	2275	2275	56879	56864	30181
Individuals	997	997	11115	11113	8401

Note: columns (1) and (3) replicate columns (2) and (4) of Table 1 excluding individuals interrogated in the 1998 survey (for whom information on part-time work is not available). Columns (2) and (4) replicate columns (1) and (3), but interacting the dummy of current inheritance receipt with a dummy for current part-time employment. These regressions also include the main effect of part-time employment. Column (5) focuses on the subsample of full-time workers at age $a-1$ and shows the results of regressing a dummy indicating a transition from full-time to part-time employment at age a on a dummy indicating inheritance receipt at a. All regressions include the same controls as in Table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 2004-2010.

Table 6 – Retirement rights and the effect of inheritance receipt

	Inheritors only			All individuals		
	(1)	(2)	(3)	(4)	(5)	(6)
*Inheritance * age*						
Below 60	0.491***			0.367***		
	(0.1563)			(0.1153)		
	+ 63%			+ 44%		
60 or above	0.230			0.368***		
	(0.1402)			(0.1076)		
	+ 26%			+ 44%		
*Inheritance * contribution duration*						
Incomplete		0.261			0.310**	
		(0.1679)			(0.1321)	
		+ 30%			+ 36%	
More than 2 years missing			0.016			0.132
			(0.2476)			(0.2170)
			+ 2%			+ 14%
Less than 2 years missing			0.394**			0.403**
			(0.1973)			(0.1654)
			+ 48%			+ 50%
Complete		0.385***	0.387***		0.402***	0.402***
		(0.1330)	(0.1330)		(0.0990)	(0.0990)
		+ 47%	+ 47%		+ 49%	+ 49%
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2788	2788	2788	73016	73016	73016
Individuals	1227	1227	1227	14391	14391	14391

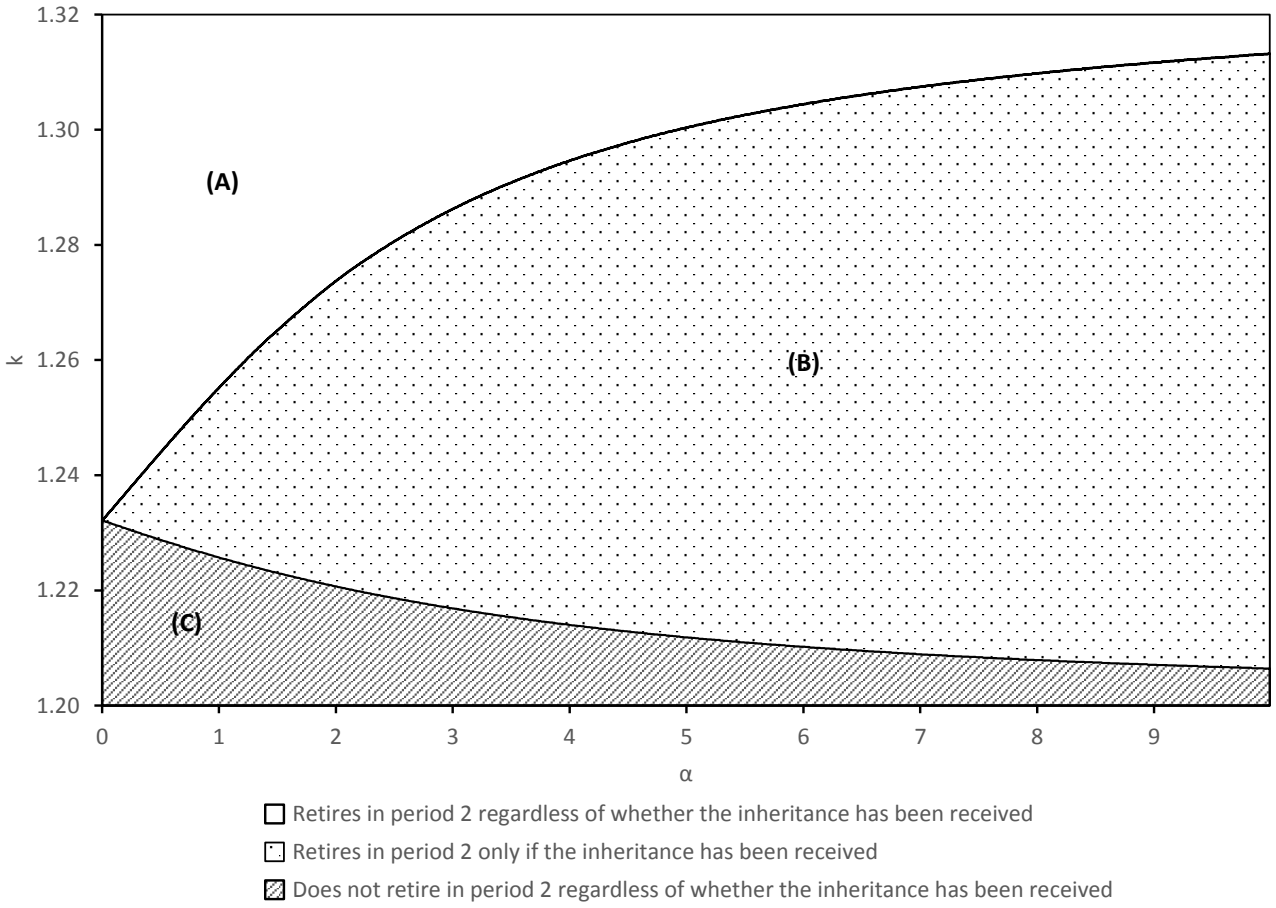
Note: columns (1) to (3) estimate the same model as in column (2) of Table 1. In column (1), the inheritance indicator is replaced by two dummies indicating current inheritance receipt while an individual is aged below / above 60. In column (2), the inheritance dummy is replaced by two indicators of current inheritance receipt while having (resp. not having) earned full retirement benefits (see appendix C for details). In column (3), the indicator for inheritance receipt while not having earned full benefits is further broken down in two separate indicators for current inheritance receipt while being more / less than two years away from full benefits. Colums (2) and (3) also include respectively 1 and 2 controls for contribution status (main effects). Columns (4) to (6) reproduce columns (1) to (3) on the full sample like in column (4) of table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Table 7 – Inherited amount and the effect of inheritance receipt

	Inheritors only			All individuals		
	(1) Bottom third	(2) Middle third	(3) Top third	(4) Bottom third	(5) Middle third	(6) Top third
Inheritance	0.381*	0.528***	0.358*	0.303**	0.374***	0.297**
	(0.2111)	(0.2005)	(0.2041)	(0.1481)	(0.1428)	(0.1504)
	+ 46%	+ 70%	+ 43%	+ 35%	+ 45%	+ 35%
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	778	795	799	72296	72293	72299
Individuals	356	354	356	14372	14375	14375

Note: columns (1)-(3) of the table show the results of the estimation of the same model as in column (2) of Table 1, estimated on the subsample of individuals who receive an inheritance in the first/second/third tercile in terms of amounts. Columns (4)-(6) show the results of regressing an indicator for current labor force exit at time t on an inheritance dummy which takes value 1 if the individual receives an inheritance in the qth tercile at t, and 0 if he does not receive any inheritance at t. Inheritance tercile are computed after converting all inherited amounts to 2010€ using the GDP deflator. Controls include all those in Table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

Figure 2 – Retirement choices in the second period when $E(B) = 1$



Note: this figure shows the retirement choices of agents in the second period of the model described in section 6.1 as a function of their risk aversion (α), their taste for leisure (k), and the realized timing of receipt of their inheritance. For each value of (α, k), it is obtained by comparing simulated retirement decisions in the second period of the model for individuals who either (i) receive their inheritance in period 2 with the amount expected, or (ii) do not receive in period 2. In this latter case, individuals are certain to inherit in period 3, but the actual amount that they will receive is still uncertain.

Table 8 – Risk aversion and the effect of inheritance receipt on retirement

	Inheritors only			All individuals		
	(1)	(2)	(3)	(4)	(5)	(6)
	Subjective scale	Lottery	Owns stocks	Subjective scale	Lottery	Owns stocks
Inheritance * risk averse	-0.111	1.250*	1.476**	1.186***	1.176**	0.469
	(0.6081)	(0.7298)	(0.6112)	(0.3797)	(0.4834)	(0.4399)
	- 10%	+ 249%	+ 337%	+ 227%	+ 224%	+ 60%
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Interacted controls	Yes	Yes	Yes	Yes	Yes	Yes
Time preference controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	583	583	583	12093	12093	12093
Individuals	255	255	255	2372	2372	2372

Note: the table shows the results of the estimation of the same model as in Table 1, where the inheritance indicator is also interacted with an indicator for high risk aversion. In column (1), risk aversion is defined using a subjective scale from 0 to 10, in column (2) it is defined using a simple lottery described in appendix D, and in column (3) low risk aversion is proxied by an indicator for whether an individual own stocks. All regressions include a control for high risk aversion, a control for high preference for present and its interaction with current inheritance receipt, as well as all the controls included in Table 1, and the interaction of all these controls with current inheritance receipt. The sample studied in columns (1) to (3) is the same as that studied in columns (1) and (2) of Table 1, and the sample studied in columns (4) to (6) is the same as that studied in columns (3) and (4) of Table 1. Standard errors clustered at the household level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 2004-2010.

References

Andersen, S. and K. M. Nielsen (2012): "Ability or Finances as Constraints on Entrepreneurship? Evidence from Survival Rates in a Natural Experiment," *The Review of Financial Studies*, 25, 3684.

Asch, B., S. J. Haider, and J. Zissimopoulos (2005): "Financial incentives and retirement: evidence from federal civil service workers," *Journal of Public Economics*, 89, 427 – 440.

Attanasio, O. P. and S. Rohwedder (2003): "Pension Wealth and Household Saving: Evidence from Pension Reforms in the United Kingdom," *American Economic Review*, 93, 1499–1521.

Black, S. E., P. J. Devereux, P. Lunbord, and K. Majlesi (forthcoming): "On The Origins of Risk-Taking in Financial Markets," *The Journal of Finance*.

Blau, D. M. and R. M. Goodstein (2016): "Commitment in the household: Evidence from the effect of inheritances on the labor supply of older married couples," *Labour Economics*, 42, 123 – 137.

Bloemen, H. G. (2011): "The Effect of Private Wealth on the Retirement Rate: An Empirical Analysis," *Economica*, 78, 637–655.

——— (2016): "Private wealth and job exit at older age: a random effects model," *Empirical Economics*, 51, 763–807.

Bo, E., E. Halvorsen, and T. Thoresen (2013): "Inheritance as a Disincentive to Work," *Statistics Norway, working paper*.

Brown, J. R., C. C. Coile, and S. J. Weisbenner (2010): "The Effect of Inheritance Receipt on Retirement," *The Review of Economics and Statistics*, 92, 425–434.

Brown, K. M. (2013): "The link between pensions and retirement timing: Lessons from California teachers," *Journal of Public Economics*, 98, 1 – 14.

Brunnermeier, M. K. and S. Nagel (2008): "Do Wealth Fluctuations Generate Time-Varying Risk Aversion? Micro-evidence on Individuals," *American Economic Review*, 98, 713–36.

Burtless, G. and R. A. Moffitt (1985): "The Joint Choice of Retirement Age and Postretirement Hours of Work," *Journal of Labor Economics*, 3, 209–236.

Chan, S. and A. H. Stevens (2004): "Do changes in pension incentives affect retirement? A longitudinal study of subjective retirement expectations," *Journal of Public Economics*, 88, 1307 – 1333.

Coile, C. and J. Gruber (2007): "Future Social Security Entitlements and the Retirement Decision," *The Review of Economics and Statistics*, 89, 234–246.

Coile, C. and P. Levine (2006): "Bulls, bears, and retirement behavior," *Industrial and Labor Relations Review*, 59, 408–429.

COR (2013): "Retraites : un état des lieux du système français," Douzième rapport annuel, Conseil d'orientation des retraites.

Coronado, J. L. and M. Perozek (2003): "Wealth effects and the consumption of leisure: retirement decisions during the stock market boom of the 1900s," Finance and Economics Discussion Series 2003-20, Board of Governors of the Federal Reserve System (U.S.).

Cox, D. and O. Stark (2008): "Bequests, Inheritances, and Family Traditions," Working paper, Center for Retirement Research at Boston College.

CPO (2009): "Le patrimoine des ménages," Rapport, Conseil des Prélèvements Obligatoires.

Davies, J. B. (1982): "The Relative Impact of Inheritance and Other Factors on Economic Inequality," *The Quarterly Journal of Economics*, 97, 471.

Elinder, M., O. Erixson, and D. Waldenström (2016): "Inheritance and Wealth Inequality: Evidence from Population Registers," IZA Discussion Papers 9839, Institute for the Study of Labor (IZA).

Garbinti, B. (2014): "L'achat de la résidence principale et la création d'entreprises sont-ils favorisés par les donations et héritages ?" *Document de travail Insee*.

Goux, D., E. Maurin, and B. Petrongolo (2014): "Worktime Regulations and Spousal Labor Supply," *American Economic Review*, 104, 252–76.

Gustman, A. and T. L. Steinmeier (2000): "Retirement in Dual-Career Families: A Structural Model," *Journal of Labor Economics*, 18, 503–45.

Hanel, B. (2010): "Financial incentives to postpone retirement and further effects on employment - Evidence from a natural experiment," *Labour Economics*, 17, 474 – 486.

Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen (1992): "The Carnegie Conjecture: Some Empirical Evidence," NBER Working Papers 4118, National Bureau of Economic Research, Inc.

Hurst, E. and A. Lusardi (2004): "Liquidity Constraints, Household Wealth, and Entrepreneurship," *Journal of Political Economy*, 112, 319–347.

Imbens, G. W., D. B. Rubin, and B. I. Sacerdote (2001): "Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players," *American Economic Review*, 91, 778–794.

Joulfaian, D. (2006): "Inheritance and Saving," NBER Working Papers 12569, National Bureau of Economic Research, Inc.

Joulfaian, D. and M. O. Wilhelm (1994): "Inheritance and Labor Supply," *Journal of Human Resources*, 29, 1205–1234.

Kaplan, H. (1987): "Lottery winners: The myth and reality," *Journal of gambling behavior*, 3, 168–178.

Krueger, A. and J.-S. Pischke (1992): "The Effect of Social Security on Labor Supply: A Cohort Analysis of the Notch Generation," *Journal of Labor Economics*, 10, 412–37.

Manoli, D. and A. Weber (2016): "Nonparametric Evidence on the Effects of Financial Incentives on Retirement Decisions," *American Economic Journal: Economic Policy*, 8, 160–82.

Mastrobuoni, G. (2009): "Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities," *Journal of Public Economics*, 93, 1224 – 1233.

Piketty, T. (2011): "On the Long-Run Evolution of Inheritance: France 1820 - 2050," *The Quarterly Journal of Economics*, 126, 1071.

Salamanca, N. (2016): "The Dynamic Properties of Economic Preferences," mimeo.

Samwick, A. A. (1998): "New evidence on pensions, social security, and the timing of retirement," *Journal of Public Economics*, 70, 207–236.

Sevak, P. (2002): "Wealth Shocks and Retirement Timing: Evidence from the Nineties," Working Papers wp027, University of Michigan, Michigan Retirement Research Center.

Stancanelli, E. and A. Van Soest (2016): "Partners' leisure time truly together upon retirement," *IZA Journal of Labor Policy*, 5, 12.

Stock, J. H. and D. A. Wise (1990): "Pensions, the Option Value of Work, and Retirement," *Econometrica*, 58, 1151–80.

A Description of the sample

Table A1 – Descriptive statistics

	Whole sample	Inheritors 55-67
SES		
Managers	22.6%	38.8%
Middle-level occupations	22.9%	23.2%
Blue-collar workers	29.2%	24.1%
Production workers	25.2%	13.9%
Education		
No education	25.1%	12.0%
Little education	32.9%	25.6%
Some education	15.9%	17.4%
Highly educated	26.0%	45.0%
Public sector workers	31.0%	36.8%
Men	52.8%	53.7%
Inherited at ages 55-67	8.5%	100.0%
Inherited amounts (2010€)		
Mean	119,000€	
Median	75,000€	
First decile	4,000€	
First tercile	35,000€	
Last tercile	128,000€	
Last decile	247,000€	
Individuals	14391	1227
Observations	73016	7809

Note: This table shows the main characteristics of individuals in our samples. Column (1) focuses on all individuals older than 55 at the time of the interview, and column (2) focuses on the subsample of these individuals who received an inheritance between ages 55 and 67. *Source:* Enquête Patrimoine, Insee, 1998-2010.

Table A2 – Effect of inheritance receipt on instantaneous retirement, without the unemployed

	Inheritors only		All individuals	
	(1)	(2)	(3)	(4)
Inheritance	0.364***	0.385***	0.275***	0.371***
	(0.1071)	(0.1093)	(0.0806)	(0.0812)
	+ 44%	+ 47%	+ 32%	+ 45%
Additional controls	No	Yes	No	Yes
Observations	2581	2581	66196	66196
Individuals	1145	1145	13503	13503

Note: the table replicates Table 1, but excluding unemployed individuals from the sample. Standard errors clustered at the individual level are reported in parentheses. Exponentiated coefficients are reported as percentages below. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.
Source: Enquête Patrimoine, Insee, 1998-2010.

B A model of retirement choice with risk averse agents

B.1 Resolution of the model

In the context of the model presented in section 6.1, agents solve the following problem in period 1:

$$V_1 = \max_{c_1} \left(c_1^{1-\rho} + E_1 \left(V_2(c_1, B, T)^{1-\alpha} \right)^{\frac{1-\rho}{1-\alpha}} \right)^{\frac{1}{1-\rho}}$$
$$\text{s.t. } c_1 \leq 1 + 2\lambda$$

where c_1 is the first period consumption and V_2 is the second period value function. We have:[33]

$$\begin{aligned} E_1 \left(V_2(c_1, B, T)^{1-\alpha} \right) &= E_{B,T} \left(V_2(c_1, B, T)^{1-\alpha} \right) \\ &= E_T \left(E_B \left(V_2(c_1, B, T)^{1-\alpha} | T \right) \right) \\ &= pE_B \left(V_2(c_1, B, 2)^{1-\alpha} \right) + (1-p) \left(V_2(c_1, B, 3)^{1-\alpha} \right) \end{aligned}$$

We solve this model by backward induction, starting in period 3. We assume that agents leave no bequest, so that third period consumption is entirely determined by previous periods' choices. Denoting r an indicator for retirement in period 2 and $I(r) = 2 - r + \lambda(1 + r)$ agents' lifetime income, we have $c_3 = I(r) + B - c_1 - c_2$. For simplicity, we also denote B the actual amount inherited (which is a draw from $\mathcal{U}(b_{min}, b_{max})$). In order to determine choices in the second period, we consider separately the case where the inheritance is received in period 2 or in period 3.

Case 1: the inheritance is received in period 2 ($T = 2$) Denoting $k(r) = 1 + r(k - 1)$ the enjoyment of each unit of consumption, agents solve the following problem when $T = 2$:

$$V_2(c_1, B, 2) = \max_{c_2, r} \left((k(r)c_2)^{1-\rho} + \beta \left[k(I(r) + B - c_1 - c_2) \right]^{1-\rho} \right)^{\frac{1}{1-\rho}}$$
$$\text{s.t. } c_2 \leq I(r) + B - c_1$$

[33] We assume that the timing of inheritance is independent of the actual amount inherited and of agents' beliefs about this amount. No new information on parents' assets is available to agents in period 2. Under this assumption, E_B denotes the expectation with respect to B taken in the first or second period indifferently.

Let $r \in \{0,1\}$. The first order conditions with respect to c_2 yield:

$$\begin{aligned}
& c_2^{*\rho} k(r)^{1-\rho} = \beta k^{1-\rho}[I(r) + B - c_1 - c_2^*]^\rho \\
\iff \quad & c_2^*[k(r)^{\frac{\rho-1}{\rho}} + \beta^{-\frac{1}{\rho}} k^{\frac{\rho-1}{\rho}}] = \beta^{-\frac{1}{\rho}} k^{\frac{\rho-1}{\rho}}[I(r) + B - c_1] \\
\iff \quad & c_2^* = \frac{\beta^{-\frac{1}{\rho}} k^{\frac{\rho-1}{\rho}}}{k(r)^{\frac{\rho-1}{\rho}} + \beta^{-\frac{1}{\rho}} k^{\frac{\rho-1}{\rho}}}[I(r) + B - c_1] \\
\iff \quad & c_2^* = \frac{k(r)^{\frac{1-\rho}{\rho}}}{\beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}} + k(r)^{\frac{1-\rho}{\rho}}}[I(r) + B - c_1]
\end{aligned}$$

Note that, since $\beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}} > 0$, this implies that $c_2^* < I(r) + B - c_1$. Hence the constraint is always satisfied. Plugin this expression into V_2, we get for $r \in \{0,1\}$:

$$\begin{aligned}
V_{2,r}(c_1, B, 2)^{(1-\rho)} &= (I(r) + B - c_1)^{1-\rho}[(\frac{k(r)^{\frac{1}{\rho}}}{\beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}} + k(r)^{\frac{1-\rho}{\rho}}})^{1-\rho} + \beta k^{1-\rho}(1 - \frac{k(r)^{\frac{1-\rho}{\rho}}}{\beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}} + k(r)^{\frac{1-\rho}{\rho}}})^{1-\rho}] \\
&= (I(r) + B - c_1)^{1-\rho}[\beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}} + k(r)^{\frac{1-\rho}{\rho}}]^\rho \\
\iff V_{2,r}(c_1, B, 2) &= (I(r) + B - c_1)[(\beta k^{1-\rho})^{\frac{1}{\rho}} + k(r)^{\frac{1-\rho}{\rho}}]^{\frac{\rho}{1-\rho}}
\end{aligned}$$

Maximizing with respect to r, we get:

$$\begin{aligned}
r = 1 \quad & \iff \quad V_{2,r=1}(c_1, B, 2) \geq V_{2,r=0}(c_1, B, 2) \\
& \iff \quad B \geq c_1 - 2 - \lambda + (1-\lambda)\frac{k(1+\beta^{\frac{1}{\rho}})^{\frac{\rho}{1-\rho}}}{k(1+\beta^{\frac{1}{\rho}})^{\frac{\rho}{1-\rho}} - \left(1 + \beta^{\frac{1}{\rho}} k^{\frac{1-\rho}{\rho}}\right)^{\frac{\rho}{1-\rho}}}
\end{aligned}$$

Which solves the model in the second period when $T = 2$.

Case 2 : the inheritance is received in period 3 ($T = 3$) In this case, B is still a random variable with distribution $\mathcal{U}(b_{min}, b_{max})$, and agents solve the following problem:

$$\begin{aligned}
V_2(c_1, B, 3) = \max_{c_2, r} & \left((k(r)c_2)^{1-\rho} + \beta E_B \left([k(I(r) + B - c_1 - c_2)]^{1-\alpha} \right)^{\frac{1-\rho}{1-\alpha}} \right)^{\frac{1}{1-\rho}} \\
\text{s.t. } & c_2 \leq I(r) - c_1
\end{aligned}$$

We have:

$$E_B[k(I(r)+B-c_1-c_2)]^{1-\alpha}) = \int_{b_{min}}^{b_{max}} \frac{k^{1-\alpha}}{b_{max}-b_{min}}(I(r)+B-c_1-c_2)^{1-\alpha}dB$$
$$= \frac{k^{1-\alpha}}{(b_{max}-b_{min})(2-\alpha)}[(I(r)+b_{max}-c_1-c_2)^{2-\alpha}$$
$$-(I(r)+b_{min}-c_1-c_2)^{2-\alpha}]$$

The program of the agent therefore rewrites:[34]

$$V_2(c_1,B,3) = \max_{c_2,r} \ [\ (k(r)c_2)^{1-\rho} + \beta(\frac{k^{1-\alpha}}{(b_{max}-b_{min})(2-\alpha)}[(I(r)+b_{max}-c_1-c_2)^{2-\alpha}$$
$$-I(r)+b_{min}-c_1-c_2)^{2-\alpha})^{\frac{1-\rho}{1-\alpha}}]^{\frac{1}{1-\rho}}$$
$$\text{s.t. } c_2 < I(r)-c_1$$

This expression cannot generally be maximized by hand. We solve the rest of the model numerically (including the determination of the choice of c_1 in the first period).

B.2 Simulations

Figures B1 an B2 present the results of the simulation of the model for different values of the parameters.[35] Our main point of interest is to analyze how the second period retirement decision r varies with the parameters of the model, but we also report the values of all the other choice variables, namely the consumptions c_1 and c_2. In the first row of figures, we report how the first period consumption c_1 varies as a function of k for each value of α and $E(B)$. The second row of figures plots the retirement decisions of individuals in period 2 as a function k. We consider separately the case when individuals happen to inherit in period 2 ($T=2$) of an amount exactly equal to $E(B)$ (red line), and when they do not receive it in period 2 (green line). In that case, they know for sure that they will inherit in period 3 ($T=3$), but are still uncertain about the amount that they will receive. The last row of figures plots the corresponding second period consumption as a function of k, separately for each value of T like in the second row of figures. We also plot the budget constraint that individuals face in the second period when $T=3$ in the

[34] The assumption that inherited amounts follow a uniform distribution makes it possible to obtain an analytical expression of the expectation inside the maximization program. This simply makes simulation faster by cutting the simulation of the expectation.

[35] We fix $\lambda = .75$, which corresponds to the usual replacement rate in the French pension system, $\beta = .95$ following Stock and Wise (1990) and $\rho = 2$.

black dashed line.[36]

Consumption patterns The first row of figures indicates that first period consumption is generally increasing with k. This is because k increases the marginal utility of an additional unit of consumption in periods where the individual is retired (period 3 and possibly 2), so that when k increases, agents choose to allocate more of their lifetime income in periods where they are not retired (period 1 and possibly 2). These plots also show that c_1 drops discontinuously at a certain value of $k = k^*(T = 3, \alpha, E(B))$, which corresponds to the value of k above which agents choose to retire in the second period when $T = 3$.[37] The interpretation for this discontinuity is that when $T = 3$, agents cannot condition their retirement decision in period 2 on the actual amount that they inherit (because they have not yet received their inheritance). Note that there is no discontinuity in c_1 at the value of k above which individuals will choose to retire in period 2 (which we denote $k^*(T = 2, \alpha, E(B))$, because when $T = 2$, agents can completely condition their decisions on the actual amount inherited, smoothing out any uncertainty relative to inherited amounts.[38] The third row of figures shows that second period consumption follows a similar pattern as c_1. For both $T = 2$ (red line) and $T = 3$ (green line), it is increasing in k as long as $k < k^*(T, \alpha, E(B))$, and as long as it does not hit the budget constraint (which is the case in figure B1), and then drops discontinuously for $k = k^*(T, \alpha, E(B))$.

Retirement patterns Our main point of interest is then to understand how second period retirement decisions when $T = 2$ (in the case where $B = E(B)$) and $T = 3$ change relatively to one another for different values of the risk aversion parameter α, and of the expected bequest $E(B)$. To do so, we focus on figures B1c, B1d, B2c, and B2d. In each figure, the size of the gap between the red and green lines (i.e. $k^*(T = 3, \alpha, E(B)) - k^*(T = 2, \alpha, E(B))$) is directly related to the effect that we measure in our empirical setting.[39] Receiving an inheritance in period 2 rather than in period 3 triggers retirement for individuals whose leisure enjoyment k is between $k^*(T = 3, \alpha, E(B))$ and $k^*(T = 2, \alpha, E(B))$. In the setting of this model, where individuals differ only by their preference for leisure k, the size of the effect of inheritance receipt on retirement β

[36] The budget constraint is never binding in the second period when $T = 2$, as shown above, and therefore we do not plot it.

[37] Note that the second row of figures shows that second period retirement decisions are monotonous in k. It is intuitive that individuals choose to retire when k is large enough, as k defines how much more individuals enjoy each unit of consumption when they are retired than when they are not. For both $T = 2$ and $T = 3$, agents choose to retire when k is above a certain threshold that we denote $k^*(T, \alpha, E(B))$.

[38] When $\alpha = 0$ and $E(B) = 1$, figure B1c shows that retirement decisions coincide when $T = 2$ and when $T = 3$. Only in that case is c_1 discontinuous in $k^*(T = 2, \alpha, E(B)$.

[39] When $\alpha = 0$ and $E(B) = 1$, we explain below that this gap is zero and is therefore not visible in figure B1c.

as measured by our empirical strategy is therefore:

$$\beta = \frac{\int_{k^*(T=2,\alpha,E(B))}^{k^*(T=3,\alpha,E(B))} \mathrm{d}P(k)}{\int_{\mathcal{K}} \mathrm{d}P(k)}$$

where $k \in \mathcal{K}$ and $P(k)$ is the probability measure of k over $\mathcal{K}$.

In figure B1c, the green and red lines coincide, indicating that agents are indifferent to the timing of receipt of their inheritance regarding their retirement decision. Two factors contribute to this result: (i) agents are risk-neutral ($\alpha = 0$), and (ii) liquidity constraints in the second period are not binding, as indicated by the fact that the green and black lines in Figure B1e do not coincide. When either of these two conditions fail, this result breaks down.

To understand the impact of risk aversion, figure B1d studies a case where $E(B)$ is low enough that agents' liquidity constraints are not binding in the second period (as show in figure B1f), but where agents are risk averse (to illustrate this case, we first choose $\alpha = 1.5$). These figures show that in that scenario, the value of k above which agents choose to retire in the second period also depends on the timing of receipt of the inheritance T, and namely that the value of this cutoff is higher when $T = 3$ than when $T = 2$. More precisely, comparing figures B1c and B1d, we find that $k^*(T = 3, \alpha = 1.5, E(B) = 1) > k^*(T = 3, \alpha = 0, E(B) = 1)$, whereas $k^*(T = 2, \alpha = 1.5, E(B) = 1) < k^*(T = 2, \alpha = 0, E(B) = 1)$. Figures B1e and B1f also indicate that second-period consumption is lower when $T = 3$ than when $T = 2$, whether the individual is retired or not. The intuition here is that, when $T = 3$, agents still face some uncertainty on the amount that they will inherit. As agents are risk averse, they then choose their second period consumption and retirement decision according to the certainty equivalent of their remaining lifetime income, which is lower than its expected value, entailing a lower consumption and more cautious retirement decisions than when they are not risk averse. On the other hand, when $T = 2$, agents face no more uncertainty. However, because there was uncertainty during the first period, they consumed less with respect to the case where $\alpha = 0$. As a result, they are left with additional wealth in the second and third periods relatively to the $\alpha = 0$ benchmark, which enables them to retire earlier than if they had not been risk averse.

The comparison of figures B1c and B1d suggests that the effect of the timing of inheritance receipt on individuals' retirement decisions is increasing in the risk aversion α. To go one step further, Figure 2 plots the value of k^* directly as a function of α, separately for $T = 2$ and $T = 3$. This defines three areas, (A), (B) and (C), corresponding respectively to the cases $k > k^*(T = 3, \alpha, E(B))$, $k^*(T = 2, \alpha, E(B)) < k < k^*(T = 3, \alpha, E(B))$, and $k < k^*(T = 2, \alpha, E(B))$.

This figure confirms that, when liquidity constraints are not binding, $k^*(T=2,\alpha,E(B))$ is a decreasing function of α, whereas $k^*(T=3,\alpha,E(B))$ is increasing in α. As a result, the effect of receiving an inheritance in period 2 rather than in period 3 on second period retirement decisions is increasing in risk aversion.

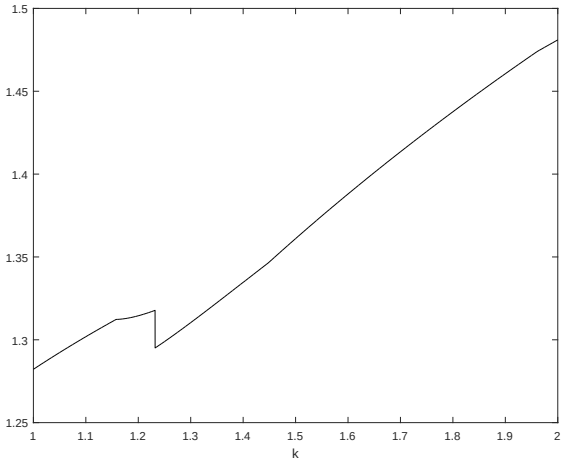
To go one step further, we also investigate how risk aversion impacts the effect of inheritance receipt on retirement when credit constraints are binding. Credit constraints may be binding when $E(B)$ is high enough, because in that case individuals are likely to want to consume more than they are able to when they have not yet received their inheritance (in particular, in period 2 when $T=3$). To this end, figure B2 considers a case where $E(B)=4$. In that case, figures B2e and B2f indicate that when $T=3$, credit constraints are binding for individuals in the second period (the green and black line coincide). In turn, figure B2c shows that retirement decisions in that case depend on T. More precisely, comparing figures B2c and B1c shows that $k^*(T=3,\alpha=0,E(B)=4) > k^*(T=3,\alpha=0,E(B)=1)$, whereas $k^*(T=2,\alpha=0,E(B)=4) < k^*(T=2,\alpha=0,E(B)=1)$. That k^* increases for $T=3$ even though $E(B)$ is higher may seem counterintuitive. The basic intuition behind this result is that when $E(B)$ increases, agents will increase their first period consumption even if they perfectly anticipate that they may become liquidity constrained in period 2 if they happen to inherit only in period 3. The reason for this is that there is always a strictly positive probability that individuals do inherit in period 2. When agents inherit in period 3 instead, they may find themselves worse off in period 2 than if they had anticipated no inheritance at all, since they over-consumed in period 1 with respect to this benchmark. They will therefore tend to push back the date of their retirement, hence an increase in the value of k^*. As it turns out, in this case, agents with a higher risk aversion may find themselves better off in period 2 when $T=3$ than those with a low risk aversion, because by being cautious in period 1, they can avoid hitting their liquidity constraint too hard. This is exactly what happens in figure B2d, which shows that $k^*(T=3,\alpha=1.5,E(B)=4) < k^*(T=3,\alpha=0,E(B)=4)$, while $k^*(T=2,\alpha=0,E(B)=4)$ is very close to $k^*(T=2,\alpha=1.5,E(B)=4)$.

Unlike in figure B1, the comparison of figures B2c and B2d actually suggests that the effect of the timing of inheritance receipt on individuals' retirement decisions is decreasing in the risk aversion when agents are at risk of hitting their credit constraint in the second period. To go one step further, figure B3 reproduces figure 2 by plotting the value of k^* directly as a function of α, separately for $T=2$ and $T=3$ in the case $E(B)=4$. This defines three areas, (A), (B) and (C), corresponding respectively to the cases $k > k^*(T=3,\alpha,E(B)=4)$,

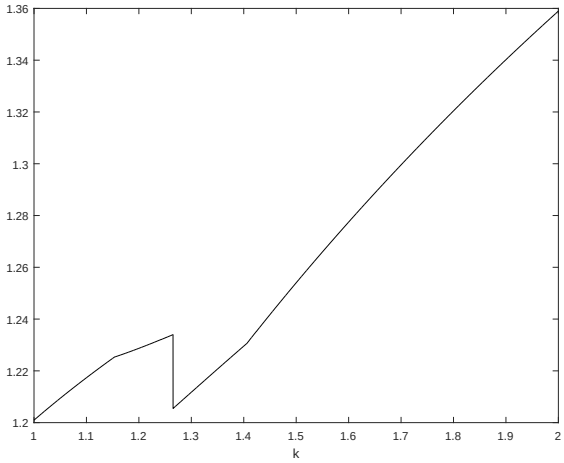
$k^*(T = 2, \alpha, E(B) = 4) < k < k^*(T = 3, \alpha, E(B) = 4)$, and $k < k^*(T = 2, \alpha, E(B) = 4)$. This figure confirms that, when liquidity constraints are binding, both $k^*(T = 2, \alpha, E(B))$ and $k^*(T = 3, \alpha, E(B))$ are decreasing functions of α. As a result, the effect of receiving an inheritance in period 2 rather than in period 3 on second period retirement decisions is decreasing in risk aversion in that case.

Figure B1 – First and second period consumptions and retirement decisions as a function of k for $E(B) = 1$

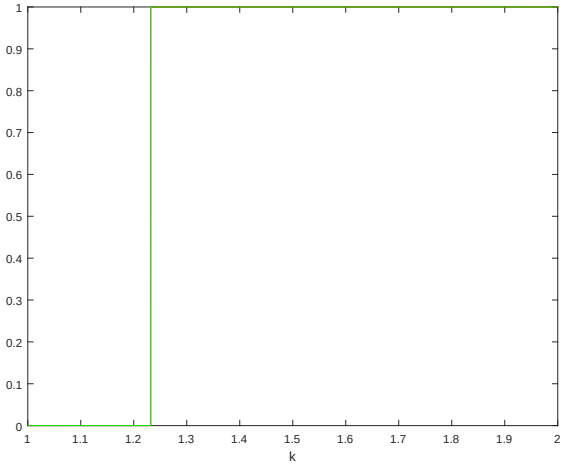
(a) First period consumption for $\alpha = 0$



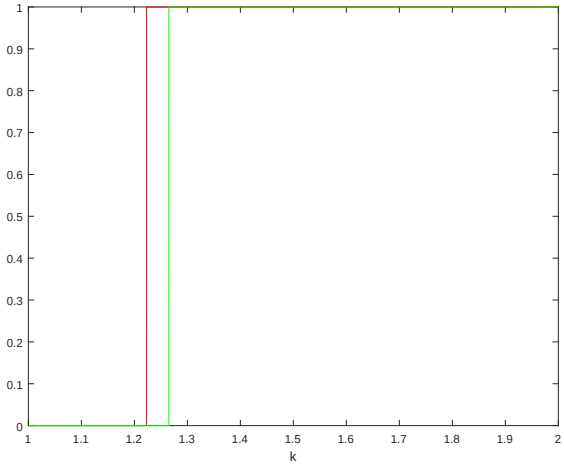
(b) First period consumption for $\alpha = 1.5$



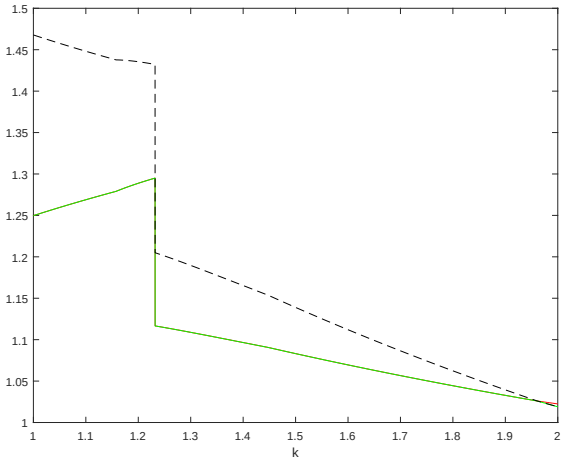
(c) Second period retirement choices for $\alpha = 0$



(d) Second period retirement choices for $\alpha = 1.5$



(e) Second period consumption for $\alpha = 0$



(f) Second period consumption for $\alpha = 1.5$

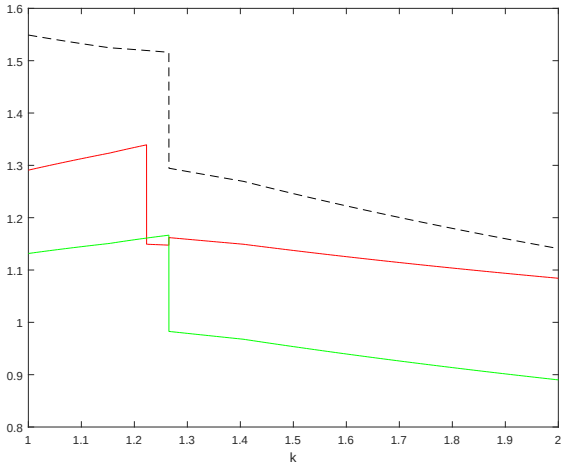
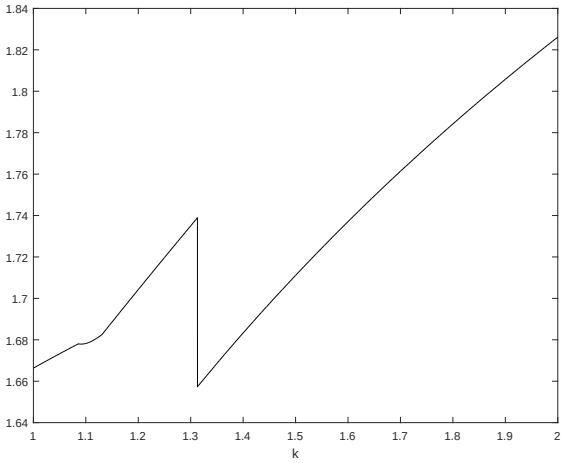
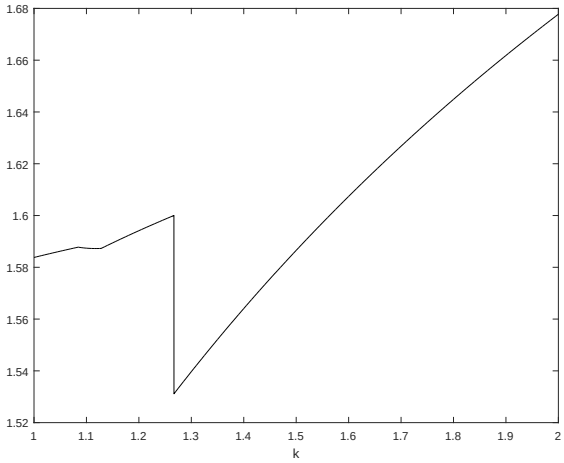


Figure B2 – First and second period consumptions and retirement decisions as a function of k for $E(B) = 4$

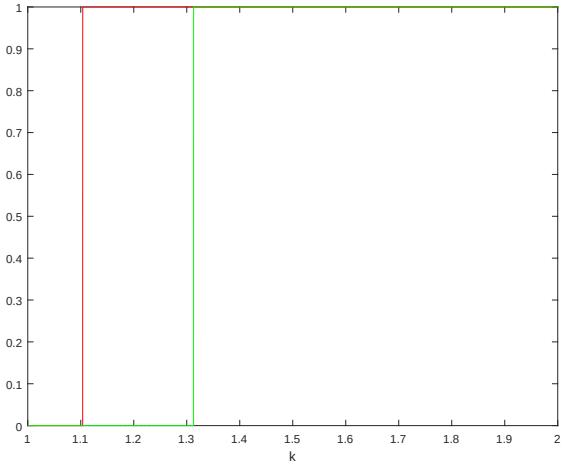
(a) First period consumption for $\alpha = 0$



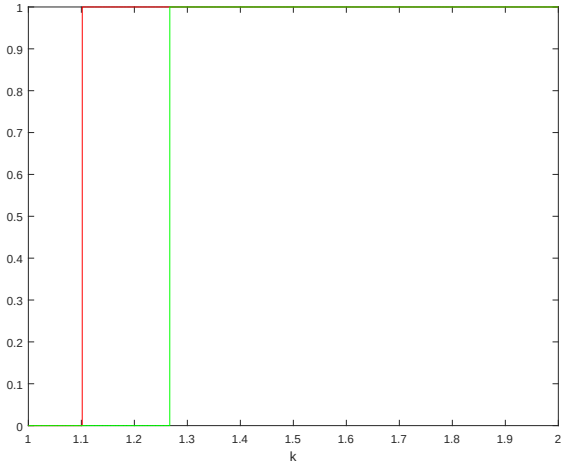
(b) First period consumption for $\alpha = 1.5$



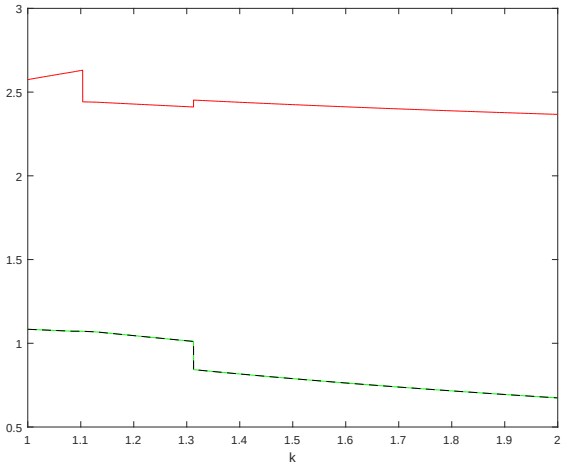
(c) Second period retirement choices for $\alpha = 0$



(d) Second period retirement choices for $\alpha = 1.5$



(e) Second period consumption for $\alpha = 0$



(f) Second period consumption for $\alpha = 1.5$

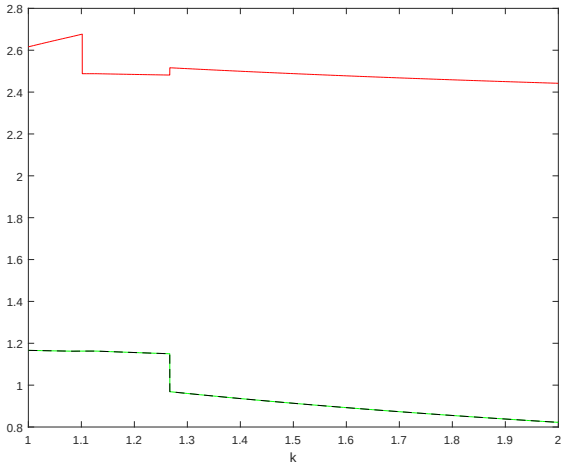
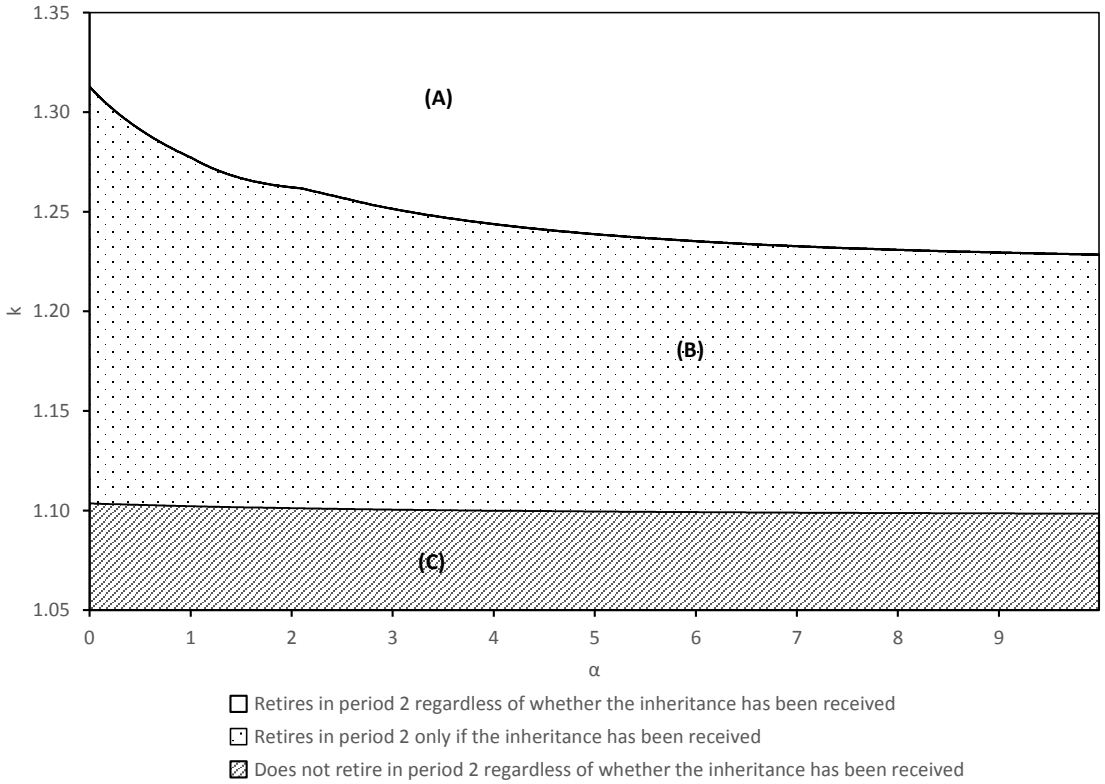


Figure B3 – Retirement decisions in the second period for $E(B) = 4$



Note: this figure shows the retirement choices of agents in the second period of the model described in section 6.1 as a function of their risk aversion (α), their taste for leisure (k), and the realized timing of receipt of their inheritance. For each value of (α, k), it is obtained by comparing simulated retirement decisions in the second period of the model for individuals who either (i) receive their inheritance in period 2 with the amount expected, or (ii) do not receive in period 2. In this latter case, individuals are certain to inherit in period 3, but the actual amount that they will receive is still uncertain.

C Retirement in France

We describe here the main features of the French retirement system which we build on in the paper. In France, contributing to a public pension fund is mandatory, and in turn public pensions constitute most of the pension income of retired individuals.[40] For our period of analysis, the legal retirement age, that is the age at which it becomes possible for one to cash out her pension, is set at 60. The monthly pension for retired workers is then computed on the basis of both past wages and years contributed to the system. Specifically, it obeys the following formula:

$$p = \bar{w} \times \tau \times \lambda$$
$$\tau = min(1, \frac{n}{n_0})$$
$$\lambda = \lambda_0 + d(n, n_0, a, a_0)$$

where $\bar{w}$ represents the base wage, τ represents the *pro rata* coefficient, and λ is the replacement rate that encompasses possible discounts or premiums. n is the number of years contributed to the system, and n_0 is fixed by the law.[41] λ_0 is the base replacement rate applicable to the individual, which is usually 50% (75% for public sector employees). d is a discount or premium term that depends on how the number of contributed years n compares to the legally set threshold n_0, and also on how the age a of the individual compares to the legally fixed age threshold a_0. It is increasing in n, positive if $n \geq n_0$ and negative if $n \leq n_0$, but cannot be negative if $a \geq a_0$ (in other words, discounts do not apply after a_0, but potential premiums still apply). For example the current law specifies that $d(n, n_0) = 0.025 * (n - n_0)$ with $|d| \leq 0.25$, that is a 2.5% discount per year missing limited to 25% off, or a 2.5% premium per additional year limited to a 25% increase. This makes discounts and premiums far from negligible, since retiring 5 years earlier than the legal threshold n_0 cuts one's pension by at least a quarter. Of particular interest is the legal number of contribution years n_0, and in particular whether the number of contributed years n of an individual is above or below that threshold. When $n \geq n_0$, $\tau = 1$ so the pension gains of working one additional year only work through λ. On the other hand when $n \leq n_0$, the pension gains of working one additional year can be substantial because the additional year increases both

[40] In addition, private sector employees must contribute to complementary pension funds, which rules are different from that of main public funds. However they follow the same patterns of premiums and discounts as public pensions, so that the conclusions of this paragraph still apply.

[41] The number of years contributed is technically different from the number of years worked. For example dispositions exist which enable women who stopped working to raise children to have a part of this time lapse counted as contribution years even though they were not working nor paying retirement contributions. Using all available information, we do our best to account for these special cases in the data.

τ and λ. Overall, an individual has more to lose if she retires before having completed the legal number of contribution years n_0.[42] In the data, we are able to reconstitute the number of years an individual has contributed to the pension system using retrospective calendars. The calendars contain information on periods of activity, as well as on periods of unemployment and military service, both of which are taken into account when computing the total number of contribution years.

[42] This all the more significant as the premium was only progressively introduced in 2003, and therefore only concerns a small part of our sample. Most of the time, there is very little incentive to work past the legal number of contribution years, whereas there are considerable incentives to work up to having contributed n_0 years.

D Measures of risk aversion

In the Wealth Survey waves of 2004 and 2010, a fraction of the respondents were asked questions relative to their perception of risk. In particular, they were successively made to choose between to of the following contracts, ordered from safer to riskier:

- Contract A: yields w with certainty
- Contract B: yields $2w$ with a 50% chance, and $\frac{4}{5}w$ with a 50% chance
- Contract C: yields $2w$ with a 50% chance, and $\frac{2}{3}w$ with a 50% chance
- Contract D: yields $2w$ with a 50% chance, and $\frac{1}{2}w$ with a 50% chance

First, respondents were asked to choose between A and C. If they chose A, then they were asked to choose between A and B; otherwise, they were asked to choose between A and D. This experiment allows us to classify individuals among four levels of risk aversion, from most risk averse to least risk averse:

- A $\succ$ B: 70% of individuals
- B $\succ$ A $\succ$ C: 16% of individuals
- C $\succ$ A $\succ$ D: 9% of individuals
- D $\succ$ A: 5% of individuals

Individuals with a high risk aversion are those from the first category, and individuals with a low risk aversion are those from any of the other three categories.

Acknowledgements

For helpful comments and discussions, we would like to thank Didier Blanchet, David Blau, Carole Bonnet, Yves Dubois, Xavier d'Haultfœuille, Tullio Jappelli, Céline Le Bourdais, Anthony Marino, Thomas Piketty, Muriel Roger, Daniel Waldenström, an anonymous referee, and seminar participants at Insee, Crest, the European Central Bank, the 28th EALE annual conference (Ghent 2016), and the 30th ESPE annual conference (Berlin 2016). This paper presents the authors' views and should not be interpreted as reflecting those of their institutions.

Bertrand Garbinti
Banque de France, CREST, Paris, France; email: bertrand.garbinti@banque-france.fr

Simon Georges-Kot
National Institute of Statistics and Economic Studies, CREST, Paris, France; email: simon.georges-kot@insee.fr

© European Central Bank, 2019

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

All rights reserved. Any reproduction, publication and reprint in the form of a different publication, whether printed or produced electronically, in whole or in part, is permitted only with the explicit written authorisation of the ECB or the authors.

This paper can be downloaded without charge from www.ecb.europa.eu, from the Social Science Research Network electronic library or from RePEc: Research Papers in Economics. Information on all of the papers published in the ECB Working Paper Series can be found on the ECB's website.

PDF ISBN 978-92-899-3484-8 ISSN 1725-2806 doi:10.2866/213835 QB-AR-19-003-EN-N