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Annuity Puzzle: Evidence from a Swiss pension fund *

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Abstract

We analyze individual annuitization decisions at retirement in an environment with mandatory participation into a funded pension pillar and low average annuity price. Using administrative data from a large Swiss insurance company over the period 2011-2015, we document that, even in this favorable environment, only 42.6% of the retirees fully annuitize, against 45% taking full lump sum. We individual annuitization decisions strongly respond to financial incentives, measured by the Money Worth ratio, and the tax rates on annuity and lump sum payments. Lump-sum payments are more common among French and Italian speaking individuals. Using Share data, we show that French and Italian-speaking Swiss are more likely to leave inheritance – thus suggesting that preferences for bequest may effect annuitization decisions. Finally, we provide evidence of "passive" adverse selection, since individuals living in high mortality municipalities are less likely to annuitize and more likely to cash out their pension wealth.

Keywords: Annuity demand, Mortality risk, Culture, Passive Adverse Selection
JEL classification codes: D81, D82, G22, J26

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1 Introduction

Economists have long theorized (Yaari, 1965) that elderly individuals are better off annuitizing their pension wealth rather than withdrawing lump sums at retirement. In fact, annuities provide insurance against longevity risk, thus preserving people from the risk of outliving their assets. Yet, the empirical evidence shows otherwise. Several explanations have been put forwards to account for this annuity puzzle. Adverse selection is pervasive in most annuity markets (Finkelstein and Poterba, 2002, 2004), which are also characterized by high fees, thereby leading to the supply of expensive financial products. The presence of additional welfare programs, such as public pensions, or the incentives built in the fiscal system may also reduce the demand for annuities. But individuals' characteristics, such as preferences for bequest or personalized long term care, risk and loss aversion, may play a role too.

In this paper, we analyze the annuitization decision at retirement in a specific environment, which does not suffer from many of these shortcomings. We consider the Swiss second pension pillar, in which individuals enrolled in company pension plans have to decide, upon retirement, whether to annuitize their accumulated pension wealth, to receive the lump sum amount or to opt for a combination of these two options. Since enrolling into the second pension pillar is mandatory for Swiss workers with labor income above a minimum threshold, there is no adverse selection into the pool of individuals having to take the annuitization decision. Moreover, the coefficients used to convert the individual pension wealth into an annuity are administratively fixed at a very favorable level, so that the average price of an annuity is conveniently low.

In this favorable institutional setting, we exploit administrative data from a large Swiss insurance company (II pillar) over the period 2011-2015 to disentangle the relevance of the financial incentives in the annuitization decision from the role played by individual preferences. To measure the financial incentives, we construct the value of an annuity to an individual, measured by the Money Worth ratio, by using the insurance company information on the individuals' retirement age, pension wealth and annuity or lump sum payments, and average mortality tables. Moreover, we calculate the overall average tax rates applied to each individual in the two cases of full annuitization and of complete lump sum withdrawn. These tax rates vary according to individual characteristics, such as the amount of pension income, of the annuity or of the lump sum amount, as well as at canton and municipal levels. To assess the role played by preferences, we consider individuals' characteristics that are known to affect annuitization decisions. The existing literature on the annuity puzzle has discussed the role of

risk (and loss) aversion and preference for bequest (Benartzi et al., 2011). We try to tackle the role of family culture in annuitization decisions. In particular, we consider the language of the financial statement sent by the insurance company to the enrolled individuals and partition our sample into Latin – namely, French and Italian speaking individuals – and others, mostly German (or English) speaking.

Even in an environment that tend to favor annuities, only 42.6% of the retirees choose fully annuitization, against 45% who withdraw all their pension wealth as a lump sum. Our results show that individuals respond to financial incentives, as proxied by Money Worth Ratios and by taxes on annuity and on lump sum payments. Individual characteristics matter too. Annuitization rates are higher for women than for men, but lower for French and Italian speaking individuals than for German-speaking, who display a strong preference for lump-sum payments. We use the Survey of Health, Ageing and Retirement in Europe (SHARE) database to show that French and Italian-speaking Swiss are more likely to leave an inheritance than German-speaking Swiss. These findings provide supporting evidence to the idea that individual preferences for bequest may effect annuitization decisions.

Finally, we provide also evidence of "passive" adverse selection, according to the "unused observable test" introduced by Finkelstein and Poterba (2014). In fact, we find that some observable individual characteristics that are not used for the pricing of the annuity are correlated with the annuity demand. This is the case of the mortality rate at municipal level, with individuals from high mortality municipalities being less likely to annuitize – fully and partially.

The paper is structured as follows. Section 2 reviews the related literature and Section 3 describes the Swiss institutional framework. Section 4 presents the methodology. Section 5 discusses our empirical strategy and results. Finally, section 6 concludes.

2 Literature

Since Yaari (1965), the theoretical literature (Brown and Poterba, 1999; Davidoff et al., 2005) has suggested that, in absence of distortions or bequest motives, individuals should fully annuitize their pension wealth upon retirement. In fact, annuities allow to insure against the longevity risk, by guaranteeing a stream of income so long as an individual is alive. However, the empirical literature has provided large evidence that individuals do not fully annuitize (Benartzi et al., 2011).

Incomplete annuitization of pension wealth may be related to individual conditions. Retirees may have bequest motives and thus prefer to use the lump-sum option in order

to have disposable funds to transfer to their offsprings (Friedman and Warshawsky, 1990; Ameriks et al., 2011; Bommier and Le Grand, 2014). They may have health concerns and thus prefer to save for future out-of-pocket medical expenses, if good quality public services are not available. Hence, they may have a preferences for lump-sum and precautionary savings (Peijnenburg et al., 2015; Sinclair and Smetters, 2004; Turra and Mitchell, 2007). The existence of generous public pension benefits, which constitute a real (i.e., inflation-indexed) annuity, may also provide a disincentive for individuals to annuitize the additional pension wealth accumulated on the second pillar (Dushi and Webb, 2004).

The empirical literature has long recognized the role of individual characteristics in explaining differences in annuity decisions. Hurd and Panis (2006) find that annuitization is more common among male, older, well-educated and richer individuals, while workers with short expected longevity are more likely to take a lump-sum. Instead, Agnew et al. (2008) suggest that women are more likely to annuitize, even after controlling for different degrees of risk aversion and financial literacy. Wealth, financial literacy and education are shown to be important drivers (Cappelletti et al., 2013). Differences in the subjective discount factor also affect annuity decisions (Warner and Pleeter, 2001). To account for differences in mortality risk, marital status, risk aversion, and social security benefits, Brown (2001) uses a life-cycle model of consumption to construct a utility-based measure of annuity value. His results show a positive association between the individual annuity equivalent wealth and the annuitization rate. Individual characteristics determine the different value of the annuity option, to which individuals respond. Using the same methodology as in Brown (2001) and Swiss administrative data, Bütler and Teppa (2007) find similar results: low accumulation of retirement assets is strongly associated with taking the lump sum option.

Preference factors may play a role too. For instance, individuals may be loss-averse and thus perceive an annuity as a gamble, in which an early departure represents a loss of a large part of their pension wealth (Hu and Scott, 2007; Benartzi et al., 2011). Individuals with ambiguity aversion to uncertain survival probabilities have also be shown to annuitize less (d'Albis et al., 2019). Behavioral aspects, such as mental accounting, may matter. Individuals facing the trade-off between a lump-sum and an annuity may overweight the relevance of an immediate large lump-sum versus a long sequence of smaller sums (Benartzi et al., 2011). The annuitization of retirement savings is also strongly affected by recent stock returns and this behavioral effect is increasing with the age of the individuals (Previtero, 2014).

Another streem of the literature suggests that annuities may have low values, due

to adverse selection in private annuity markets (Friedman and Warshawsky, 1990; Brugiavini, 1993). Indeed, the empirical literature provides ample evidence of adverse selection even in more developed annuity markets such as the UK (Finkelstein and Poterba, 2002, 2004), Chile (Illanes and Padi, 2018) and Sweden (Hagen, 2015). Finkelstein and Poterba (2002) and Finkelstein and Poterba (2004) use the positive correlation test (Chiappori and Salanie, 2000) to establish the existence of adverse selection both within and across annuity products in the UK. They show that annuitants tend to live longer than the average UK population and that long-lived individuals self-select into annuity products with a longer guaranteed period and a steeper payment profile. As a result, the value of the annuities is lower for those products that are preferred by long-lived individuals. Finkelstein and Poterba (2002) draw an interesting distinction between "active" and "passive" selection. In "active selection", people exploit private information on their expected mortality, for instance from parents' mortality or from their own health, to take decisions. In "passive selection", the demand for annuities is correlated with socioeconomic factors, which, in turn, are correlated with life expectancy. A specific test for passive selection is provided by Finkelstein and Poterba (2014). By using a dataset of annuity contracts over the period 1980-98 from a UK life insurer, they show that the socioeconomic characteristics of the annuitant's ward are correlated with the annuitant's mortality risk, conditional on the age and gender of the individual, which are the only two variables used by insurers in annuity pricing. In addition, these characteristics predict the choice of annuity contract in terms of initial annual annuity payment, the tilt of the annuity payment stream over time, and the length of the annuity guarantee period.

The value of market annuities may be low also for other reasons. Administrative costs may be large (Mitchell et al., 1999) or fiscal schemes may disincentivize annuities with respect to other options, such as lump sum transfers (Bütler and Ramsden, 2016). Welfare programs may also reduce individuals' convenience to annuitize, if means-tested income support, health or long term care programs are available (Bütler et al., 2017; Laitner et al., 2018; Reichling and Smetters, 2015).

Our paper analyzes the annuity puzzle in an environment with no adverse selection, in which annuity prices are low – i.e., the Money Worth Ratio of an annuity is large. Moreover, we can control for differential taxation between annuity and lump-sum and other individual characteristics, such as gender, age and geographical location. Furthermore, we can analyze the impact of cultural factors on the annuitization decision, by exploiting the language (French, Italian, German or English) of the statement sent to the individuals enrolled in the pension plan. To the extent that this linguis-

tic cleavage captures cultural aspects (such as preferences and beliefs) of the different linguistic groups of Swiss citizens, our paper relates also to the literature on the effect of cultural factors on economic decisions. Culture is constituted of customary beliefs and values that are transmitted over time from generation to generation (Guiso et al., 2006) and that may affect individual economic decisions. The recent literature on the effects of family culture, which our linguistic cleavage may identify, is quite large (for a survey, see Alesina and Giuliano (2015). The strength of the family ties has been shown to influence individuals' living arrangements across Europe (Giuliano, 2007) and employment decisions (Algan and Cahuc, 2007, 2009). Also the design of economic institutions may depend on the predominant family culture. Alesina and Giuliano (2015) argue that strong family ties induce individuals to be less mobile and thus to prefer a more regulated labor market, while countries with weak familiy ties are associated with more flexible labor markets, since workers are less reluctant to provide geographic mobility. Galasso and Profeta (2018) suggest that the design of the pension system, in particular its degree of generosity, depends on the pre-existing family organization, as proxied by the inheritance rules. Finally, Eugster et al. (2011) and Gentili et al. (2017) analyze the role of culture respectively in the demand for social insurance and in Long Term Care arrangements. They focus on Switzerland and exploit the within-state variation in cultural groups. Their results suggest that residents of French, Italian and Romansh-speaking municipalities develop a higher demand for social insurance, use home-based care services more intensely and enter nursing homes at older ages and in worse condition than their German-speaking neighbors.

3 The Swiss Pension System

The Swiss pension system is based on two pillars. The first pillar consists of the state-run basic PAYG old age system. This scheme is mandatory for all employees, self-employed, and unemployed individuals over the age of 20. This unfunded system is financed by payroll taxes, which amount to 9.8% of the individual's labor market income and provides inflation-indexed pension benefits upon retirement. The normal retirement age is currently 65 for men and 64 for women.

The second pillar consists of funded company pension plans. They are compulsory for these employees, whose income exceeds a minimum threshold of CHF 21,330 a year (in 2019). Employees, whose income is below the threshold, and self-employed persons may choose to self-insure. Overall, approximately 96% of working men and 83% of working women are covered (Bütler, 2016). The contribution rate, which is

equally shared between employers and employees, changes with the age of the insured individual and amounts on average to 17% of the labor income. For this second pillar, the minimum age to be entitled to a benefit varies across pension plans. Many plans allow early retirement, by offering an option for early withdrawal from employment with actuarially fair reductions.

First pillar pension benefits can only be collected as real annuities. Instead, the second pillar occupational pension wealth can be withdrawn either as a monthly (nominal) annuity, as a lump sum payment, or as a combination of the two components. The annuity is calculated using a conversion rate, which varies according to the gender and age of the recipient. The minimum conversion rate is decided by law. Since 2004 it has gradually been reduced from 7.2 to 6.8 (for men and women who have reached the normal state retirement age). The minimum conversion rate applies only on the mandatory part of the occupational pension savings, which refers to the portion of the annual salary between CHF 24,885 and CHF 85,320. Pension funds may decide to use a lower conversion rate for the over-mandatory part. Figure 1 shows the evolution of the minimum conversion rate by gender over the time span of our analysis.

Both annuities and lump sum payments are subject to income taxes. Three layers of taxation apply: national, cantonal and municipal level. Annuities are simply added to other sources of labor income, such as first-pillar pensions, to determine the tax base, on which the national, cantonal and municipal tax rates are applied every year. Lump sum payments are instead subject to a one-time special tax, which is kept separate from other sources of labor income. Also in this case, three tax rates are applied to the taxable lump sum payment to determine the total special tax on the lump sum payment.

The Swiss welfare system includes other programs that can be of relevance to individuals taking their financial decisions at retirement. Elderly, disabled individuals and survivors, who are unable to cover basic costs of living with benefits from the two pension pillars and from other sources of income, are eligible to means-tested benefits from a supplementary benefit scheme, which secures a monthly income of CHF 3,000 for singles and CHF 4,500 for couples (Bütler et al., 2015). This income level is coupled with a guaranteed health insurance, provided by the canton, covering for health expenses. Cantons are also in charge of providing long term care (LTC) services, through medical nursing homes, nursing departments of old-age and disability home.[1] According to the federal law on LTC provision, about 65% of the cost of health care provided by

[1]While German speaking regions have so far relied more heavily on nursing homes, French and Italian speaking areas have developed more home care services (Gentili et al., 2017).

nursing homes or by home-based health care services is covered by compulsory health insurance. Individuals are reliable for up to 20% of the costs, with a ceiling of approximately 8,000 CHF per year, while the remaining part of the bill is covered by cantons and municipalities. They have instead to cover the non-medical costs of LTC, such as residential costs and help at home for activities of daily living (ADL) and instrumental activities of daily living (IADL). These costs are financed through individuals' out-of-pocket expenditures, which may vary according to their income or wealth, or by supplementary LTC insurances. Individuals with insufficient own resources to cover for these basic costs have additional contributions available from the AVS-AI pillar of the social security administration and from the canton.

4 Data and descriptive evidence

4.1 Data

In our analysis, we use administrative data from a large Swiss insurance company on almost 13,000 contracts for the period 2011-2015. The dataset contains information on the financial choice at retirement (annuity only, lump-sum payment only or a combination of the two options) and related amounts, on the date of retirement, age at retirement, gender, postal code and language used in the financial statements sent by the company for almost 13,000 individuals. For each individual, we can estimate the total pension wealth from the lump-sum amount or from the annuity (or from the combination). In the case of an annuity, we use the conversion rates that are applied to convert the pension wealth into annuities.[2] We then construct three outcome variables: (i) Annuity is a dummy variable equal to 1 if the individual chooses to annuitize fully and 0 otherwise; (ii) Annuity Rate is the share of the individual's pension wealth obtained as an annuity; and (iii) Capital is a dummy variable equal to 1 if the individual chooses to collect all the pension wealth as a lump sum payment and 0 otherwise.

We use the postal code of the individual's place of residence to construct individuals' specific tax rates on the annuity and on the lump sum, since these tax rates vary by municipalities and cantons. We collect information on tax schemes from the tax administrations at the national level, for the 26 Swiss cantons and for around 1700 municipalities in the sample. For each individual, we calculate the tax rate that would be applied in one of the two polar options of annuity and of lump sum, depending on

[2]We have information on the conversion rates used for both the mandatory part and the over-mandatory part of the pension wealth.

his/her municipality of residence and income level. In the case of fully annuitization, we calculate the taxable income by summing the annuity and an estimate of the first pillar pension, since the tax rate applied to the annuity depends on this overall taxable income.[3] The tax rate varies by cantons (and municipalities) and determines the progressivity of the tax schedule. Using the federal and canton tax rates and the municipal multiplier to the canton taxes, which determines the municipal taxes, we can calculate the overall average tax rate imposed every year on the annuity. In the case of full lump sum withdrawal, special federal, cantonal and municipal taxes are levied on a one-time basis. We apply the respective tax rates, which again vary at canton and municipal level, to obtain the overall average tax rate on the lump sum payment. In all these calculations, we assume individuals to be married.[4]

We also collect age and gender specific mortality data for the Swiss population as a whole and at municipal-level. While the data at the national level comes from the mortality tables provided by the Swiss Federal statistical office, we construct municipal specific mortality rates using vital statistics death data and census population data. We attribute the mortality rates to the different individuals, according to their gender and age, and, for the data at municipal level, also their postal code, and use them also to calculate the individual value of the annuity (see section 4.2).

Finally, we collect the following municipal variables from the Swiss Federal Statistical Office: mortality rates for the age group 60-79, average taxable income, share of individuals with upper secondary education, and share of foreigners.

4.2 The Money Worth Ratio

To analyse whether people are responsive to financial incentives, and, particularly to the price of the annuity, we calculate the Money Worth Ratio (MWR). This is equal to the expected present discounted value of all annuity payments divided by the initial

[3] In line with Butler and Ruesch (2008), we assume that the the first pillar pension is equal to 32/17, 52/46 or 122/40 of the benefit payment of the annuity, respectively, if the annuity is less than CHF 52000, between CHF 52000 and CHF 122000, larger than CHF 122000.

[4] Among people retiring at the Normal Retirement Age, the marriage rate is 70%. Married individuals are jointly taxed, with their incomes being combined to determine the tax bracket. Married (or in a registered partnership) women are entitled to widow's first pillar pension equal to 80% of their spouse's old-age pension. Men are entitled to receive a widower's pension, if they care after children from the marriage aged 18 or younger. Rules for the occupational pension funds vary across funds. However, the general rules is that a surviving spouse (male or female) of a insured person is entitled to a second pillar pension, if they have dependent children, or are at least 45 years old and the marriage lasted at least 5 years.

premium:

$$MWR_{x,s} = \frac{A}{PW} \sum_{t=j}^{w} \frac{{}_jp_{x,s}}{(1+i)^(j-t)} \tag{1}$$

where A is the annual annuity payment, w is the ultimate age in the mortality table, ${}_jp_{x,s}$ is the probability that a individual aged x of sex s is still alive at time j, i is the interest rate used to discount future payments, and PW is the accumulated pension wealth. The price of an annuity is typically defined as the complement to one of the Money Worth Ratio (MWR). For each individual, the accumulated pension wealth can be estimated from insurance company data by considering the lump sum payments and/or the annuity payments, to which the conversion coefficients are applied. The surviving probabilities come from the national-level mortality tables provided by the Swiss Federal Statistical. They differ by gender. Finally, we assume a nominal interest rate of 4% to discount future payments.

We also construct an alternative measure of the individuals' MWRs, which captures the differences in life expectancy by municipalities and gender. We use data on mortality rates by municipality and gender. To smooth our these more granular mortality data, we adopt the following Gompertz function:

$$\mu_{x,m,s} = \alpha e^{b_{x,s}} \tag{2}$$

where μ is the rate of mortality at age x in the municipality m for sex s, α denotes the level of mortality at initial age, b the increase in mortality over age x for sex s. In order to estimate the parameters of the Gompertz curve, we use the method of least squared and estimate the following model:

$$log(m_{x,m}) = \alpha + \beta_{am} + n_m \tag{3}$$

where $m_{x,m}$ is age and municipality-specific mortality rates, am is equal to $\frac{age+age(n+1)}{2}$ and n_m are municipal fixed effects. We estimate the model separately for women and men.

The complements of the predicted values of our dependent variable in the model represent age and gender-specific municipal survival probabilities($h_{x,m,s}$). Specifically,

$$h_{x,m,s} = 1 - e^{log(\hat{m}_{x,m})}. \tag{4}$$

These probabilities are used to compute our alternative measure of individuals' MWRs, which reflects mortality differences across municipalities, as follows:

$$MWR_{x,s,mun} = \frac{A}{PW} \sum_{t=j}^{w} \frac{{}_jh_{x,m,s}}{(1+i)(j-t)} \tag{5}$$

where ${}_jh_{xms}$ is the probability that a individual aged x of sex s living in the municipality m, is still alive at time j. All the other variables are defined as before. Hence, this alternative measure of MWRs vary according to the individuals' municipality of residence, age at retirement, sex, annual annuity payment and pension wealth. Figure 2 shows the observed mortality rates and the modeled Gompertz hazard function.

4.3 Descriptive Evidence

Table 1 provides summary statistics for our variables of interests. The average retirement age is 64.14 years and the average pension wealth amounts to CHF 280,000. Second pillar recipients are mostly male 63%. Most of the financial statements are in German (77%), with a lower percentage in French (15%) and in Italian (7%).[5] Individuals' financial decisions at retirement were very polarized: 42% decided to fully annuitize their pension wealth and 45% to cash-in the entire amount as a lump-sum. Only 13% of the beneficiaries used a combination of both instruments.

Figure 3 displays the share of individuals, who fully annuitize, as a function of their pension wealth. Full annuitization is very uncommon among individuals in the lowest decile of pension wealth, while ranging between 40% and 50% among the other groups. This pattern may depend on several factors. The existence of means-tested supplemental benefits in Switzerland provides an incentive for people with low pension wealth to opt for a full lump sum payment, in order to avoid receiving even small annuities that may jeopardize their eligibility to social insurance scheme (Bütler et al., 2017). Moreover, pension wealth levels may be negatively correlated with subjective discount rates and mortality rates, thereby leading low wealth individuals to prefer the lump sum option (Loewenstein, 1987; Frederick et al., 2002; Bütler et al., 2017).

Table 1 reports also summary statistics for the municipal mortality rate of the 60-79 age group and for individuals' Money Worth Ratios. The average mortality risk is 1.3%.

Figure 4 plots the distribution of mortality risk for the 60-79 age group in the different municipalities for men and women. Large differences emerge, particularly for men. Municipalities at the 90th percentile of the distribution are characterized by a

[5]The Federal Statistical Office reports that in 2017 the share of the German, French and Italian speaking groups in the Swiss population were respectively 65%, 18% and 10%.

male mortality risk of 0.020, while the death rate decreases to 0.011 for those at the 10th percentile. The female mortality risk appears instead to be more compressed: the difference between these two percentiles is equal to 0.06.

The average Money Worth Ratio is well above one: 1.23 (Table 1). This large average MWR reveals that annuities are offered at a very favorable price in Switzerland. This depends on insurance companies being legally binded to use a given conversion rate of 6.8 (or more) for the mandatory part of the second pillar. This is recognized to be extremely convenient for the retirees, particularly in a time of very low interest rates (Rusconi, 2008; James and Vittas, 2001). Figure 5 displays the values of our two measures of MWR by retirement age for women (right panel) and men (left panel). For both measures, the MWR is 0.1 percentage points higher for women than for men and is increasing with retirement age until the mid-60 and then flattens out. For both sexes, the MWR calculated using the alternative measure of municipal life expectancy is larger than the MWR using the average life expectancy in Switzerland.

5 Empirical Analysis

In our empirical analysis, we address two main issues. First, we examine the role of the financial incentives and of the individual characteristics, such as gender and cultural background, in individuals' annuity decisions. Second, we test for passive adverse selection by augmenting our regressions with information on the municipal level mortality rate, which are public available, but are not used to price annuities.

Financial incentives in annuitization decisions are mostly shaped by the tax system, the annuity conversion rate and the individuals' wealth and gender. Conversion rate, gender, as well as retirement age, affect the individual MWR, which summarizes the value of the annuity. For each of our three dependent variables (Annuity, Annuity Rate and Capital), we run three OLS regressions to assess the role of financial incentives: The first is the following:

$$Y_{ist} = \beta_0 + \beta_1 Female_i + \beta_2 ConversionRate_i + \beta_3 X_i + \rho_s + year_t + \varepsilon_{ist} \tag{6}$$

where Y_{imst} indicates the type of annuitization choice made by an individual i living in municipality m in the canton s in the year t, $Female_i$ is a dummy for women, $ConversionRate_i$ indicates the conversion rate applied to translate the pension wealth into annuities[6], and X_i is a set of individual characteristics that may influence the annuitization choice including pension wealth, pension wealth squared (to capture non linear

[6]the conversion rate changes according to the age and gender of the individual and retirement year.

effects), and the average tax rates that would be applied in case of full annuitization or of full lump sum withdrawal. Finally, ρ_s and $year_t$ represent, respectively, canton and year fixed-effects, which control for differences in institutional arrangements and time-varying factors. Standard errors are clustered at municipal level.

In the second specification, we replace $Female_i$ and $ConversionRate_i$ with MWR_i, which is the Money Worth Ratio for the individual i, calculated using gender- and age-specific mortality rates, as described in section 4.2.

$$Y_{ist} = \beta_0 + \beta_1 MWR_i + \beta_2 X_i + \rho_s + year_t + \varepsilon_{ist} \tag{7}$$

In the third specification, in order to analyse the role of cultural background, we augment the previous specification by adding the language of the financial statement among the regressors. Specifically, we include $Latin_i$, which is a dummy variable for those who speak a latin language (French, Italian, Romansh).

Then, we turn to investigating the presence of passive adverse selection in the market. To do so, we include the municipal mortality rate for the age group 60-79 ($MortalityRate_m$) among our regressors, as follows:

$$Y_{imst} = \beta_0 + \beta_1 MortalityRate_m + \beta_2 MWR_i + \beta_3 M_m + \beta_4 X_i + \rho_s + year_t + \varepsilon_{imst} \tag{8}$$

The equation also includes M_m, a vector of other socioeconomic characteristics of the municipality such as average income, share of foreigner and share of people with at least upper secondary level of education.

Finally, we replicate Equation 7 using our alternative measure of the MWR, which is constructed using age-, gender-, municipality-specific mortality rates. In order to check the robustness of our results, for the two dichotomous dependent variables (Annuity, Capital), we also replicate our analyses using a probit model rather than a linear probability model.

5.1 Results: The annuitization choice

Table 2 presents the results on the role of financial incentives for annuitization decisions. Columns 1, 3 and 5 report the estimates of each factor that may affect financial incentives for our three variables of interest: Annuity, Share Annuity and Capital (Equation 6). As expected, higher conversion rates, which increase the value of the annuity, increase their uptake and reduce the choice of lump sum payments. Women annuitize more than men. This gender differ may be due to the more favorable treatment that

women receive on the annuity, given their higher longevity and even a larger conversion rate. The fiscal treatment of the annuity plays an important role, in line with results in Bütler and Ramsden (2016). Higher average tax rates on the annuity reduce full annuitization and decrease the annuity rate. Individuals' accumulated pension wealth also matters for financial decisions at retirement. As suggested also by Figure 3, lower wealth is associated with a preference for lump-sum. Columns 2, 4 and 6 present the results when financial incentives are mostly captured by the MWR, calculated using the average mortality rate (Equation 7). A higher MWR, corresponding to a lower price of an annuity, increases the probability of full or partial annuitization, and reduces the uptake of lump sum payments. An increase of 0.06 points (or one standard deviation) of the MWR increases the probability of full annuitization of about 0.12 points, corresponding to an increase of 27%, and decreases the probability of complete lump sum withdrawal of 0.082 percentage points, corresponding to a decrease of 29%. The effect on annuity rate is instead of 0.13 points, corresponding to a 26% increase. Also in this alternative specification, the tax treatment of the annuity and the accumulated pension wealth affect the annuity decision.

In Table 3, we report the results of the specification, in which we include the language of the financial statement. An interesting correlation emerges between the financial decision and the language of the financial statement. After controlling for the geographical location of the beneficiary, the coefficient on the *latin* variable – capturing financial statements in French or in Italian – is negative and highly significant in columns 1 and 2, while is positive (albeit not significant) in column 3. This implies that being a French and Italian speaking person decreases the probability of choosing an annuity by 0.06 points and increases the likelihood to cash-out pension wealth as lump sum by 0.03 points. This suggests that cultural elements may play a role in shaping financial decisions at retirement. We will return to this aspect in Section 5.3.

All the results are robust to using a probit model as shown in Tables A.1-A.2.

5.2 Results: Passive Adverse Selection

In Table 4, we investigate the role of the municipal mortality risk in explaining annuitization choices. Columns 1,3 and 5 report the results of Equation 8, which includes the mortality rate for the age group 60-79 in the municipality of residence of the individual ($DeathRate_m$), while Columns 2,4 and 6 refer to the case in which MWR and municipal mortality rate are replaced by the our second measure of the individual's MWR. Our findings suggest that the fiscal treatment of the annuities, the pension wealth, and

the MWR remain crucial determinants of the financial decision at retirement. Yet, the mortality rate at municipal level matters for the annuity choice too. One standard deviation increases in the mortality rate (0.007 points) decreases the probability of fully annuitization of 0.0095 points, corresponding to a 2.2% reduction, and increases the probability of complete lump sum withdrawal of 0.0090 points, corresponding to a 2% increase. Moreover, it decreases the annuity rate by 0.0094 points, corresponding to a 1.8% increase.

The importance of the municipal mortality risk in the annuitization choices is confirmed in columns 2,4 and 6, in which our second measure of the MWR that uses municipal specific mortality rates, enter as a regressor. The MWR is highly significant: positive in the first two columns, and negative in the last one. Specifically, one standard deviation increase in the MWR (0.077 points) increases the probability of fully annuitization of 0.0878 points, corresponding to a 20% increase, and reduces the probability of complete lump sum withdrawal of 0.098 points, corresponding to a 22% drop. Moreover, it increases the annuity rate by 0.096 points, corresponding to a 19% increase. Table A.3 shows similar results using a probit model for the two dichotomous variables.

These findings suggest that information about mortality rates at municipal level, which is not used in the pricing of the annuity, despite being publicly available, has a large effect on financial decisions. This result is in line with the literature pointing to the existence of passive adverse selection (Finkelstein and Poterba, 2014).

5.3 Culture and Individual Preferences

Our previous findings show that economic and fiscal incentives are crucial in financial decisions at retirement. Yet, the language of the financial statement matters too. French and Italian speaking individuals seem to have stronger preferences for lump sum payments compared to German speaking individuals. To address these possible differences in preferences, we consider two potential channels. First, we analyze differences in the degree of risk aversion, which could lead to different financial choices at retirement. Second, we consider differences in family ties and in within-family arrangements on issues such as bequest and personalized care to the elderly.

To investigate these differences, we use The Survey of Health, Ageing and Retirement in Europe (SHARE), a multidisciplinary and cross-national panel database containing individual information on heath, retirement, socio-economic status, social and family networks for approximately 85,000 individuals aged 50 years or more in 19

European countries, including Switzerland. We use the several waves (2004, 2007, 2011, 2013, 2015, 2017) of SHARE for Switzerland. The survey includes information on gender and on the language spoken by the individual, which allows us to distinguish Swiss residents speaking a latin language (Italian, French, Romansh) from German-speaking residents. We exploit questions in the SHARE on risk-aversion, purchase of insurance, probability of leaving an inheritance and gift giving.

We measure risk aversion using the following question: When people invest their savings they can choose between assets that give low return with little risk to lose money, for instance a bank account or a safe bond, or assets with a high return but also a higher risk of losing money, for instance stocks and shares. Which of the statements on the card comes closest to the amount of financial risk that you are willing to take when you save or make investments? a. Take substantial financial risks expecting to earn substantial returns. b. Take above average financial risks expecting to earn above average returns. c. Take average financial risks expecting to earn average returns. d. Not willing to take any financial risks. We construct a dummy variable for risk aversion that takes a value of 1 if individuals answered c or d to the previous question and 0 otherwise. Regarding the purchase of insurance, individuals are asked "Do you currently own any life insurance policies?". We construct a dummy variable equal to 1 for those who own a life insurance and 0 otherwise.

To elicit individuals' attitude towards the chances of leaving an inheritance, we use the question "What are the chances that you will leave any inheritance?" We then construct three dummy variables, equal to 1 if the individual states that the probability of leaving inheritance is respectively larger than 50%, than 70% or is equal to 100%, and 0 otherwise. Finally, to measure the gift-giving behavior, we exploit the following question: "Now please think about the last twelve months. Not counting any shared housing or shared food, have you given any financial or material gift or support to any person inside or outside this household amounting to 400 CHF or more?" We construct a dummy variable taking value 1 for a Yes answer and 0 otherwise. Table 5 provides summary statistics.[7]

Using these variables we estimate the following probit model:

$$Prob(Y_{irt} = 1) = F(\beta_0 + \beta_1 X_i + \beta_2 Latin_i + region_r + wave_t + \varepsilon_{ist}) \tag{9}$$

Y_{ist} represents our variable of interests, namely Risk Aversion, purchase of Life Insurance, the different self-assessed probability of leaving an inheritance and the gift

[7]Our sample consisting of six waves of SHARE, yet not all questions are asked in each wave. In particular, the question on the probability of leaving inheritance was only asked in the 2004 and 2007 waves.

giving dummy. X_i is a set of individual control variables, such as gender, age, civil status and education. $Latin_i$ is a dummy for latin speaking individuals, i.e. Italian, French, Romansh, which represent our variables of interest. Finally, we include wave and macro-region fixed-effects and indicate them with $wave_t$ and $region_r$, respectively.[8]

Table 6 reports the marginal effects from our Probit regression estimates. Latin-speaking individuals are less risk-averse than German-speaking respondents (column 1), which is in line with their financial choice at retirement. Moreover, Latin-speaking respondents expect to leave inheritance more than German-speaking Swiss. In fact, they are 16% more likely to respond that they will most certainly (with 75% probability) leave an inheritance (columns 4) and 19% more likely to respond that they will leave an inheritance for sure (column 5). Finally, Latin are 4.3% more likely to have engaged in gift-giving behavior in the last twelve months. Taken together, these findings point to systematic differences in risk-aversion and in within-family inheritance behavior across language groups in Switzerland. These different preferences may help to explain the observed differences in annuitization choices at retirement.

6 Concluding remarks

In this paper, we focus on the Swiss pension system, in which participation to a funded second pillar is mandatory and average annuity prices are low. We provide three main insights on the annuitization choice. First, we show that individuals strongly react to economic and fiscal incentives when making their annuitization decisions upon retirement. By exploiting differences in the conversion rate used to translate the accumulated pension wealth into annuities (due to age, gender and year of retirement) we show that individuals are more likely to opt for the annuity if the Money Worth Ratio of the annuity is high. Fiscal differences across municipalities due to different taxation of pension benefits (annuity or lump sum) matter too. Second, we provide novel evidence of the effect of family culture on the annuitization decision. The lump sum option is more popular among French and Italian speaking individuals. These groups are shown to have stronger preferences for inheritance. Finally, we provide evidence of passive adverse selection. Individuals from municipalities with higher mortality risk are more likely to cash out their pension savings. Our findings confirm that individuals take economically rational decision, but that different preferences matter too. Even in a

[8]The information on the canton is missing. The macro-regions, which are defined at the NUTS 2 level, are: Lake Geneva Region, Espace Mitterland, Northwestern Switzerland, Zurich, Eastern Switzerland, Central Switzeraland, and Ticino.

favorable environment – the Swiss second pension pillar – (passive) adverse selection may emerge in the annuity decision.

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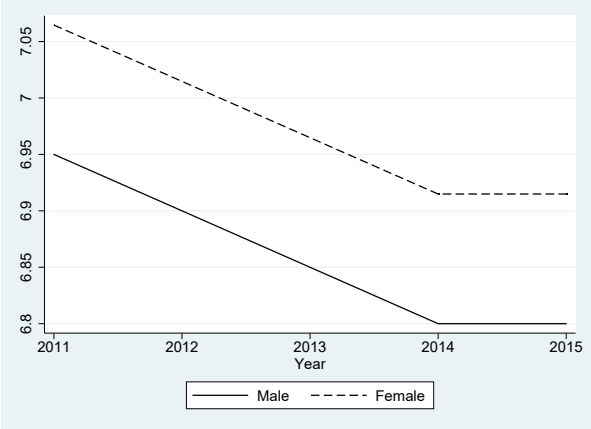
Figures and Tables

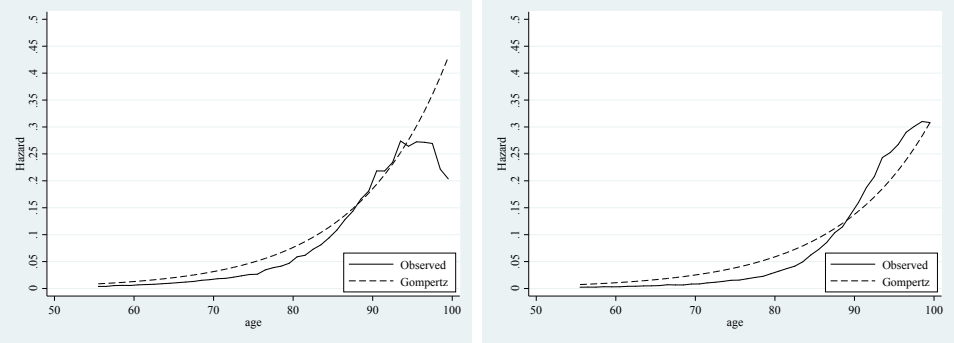
Figure 1: Conversion Rates over time by Gender



Note. The graph shows the conversion rates applied by the pension fund to translate the pension wealth (mandatory component) into annuities, for women age 64 and men age 65

Figure 2: Age-Specific Mortality and Gompertz Fit

(a) CH Men 2011-2015 (b) CH Women 2011-2015

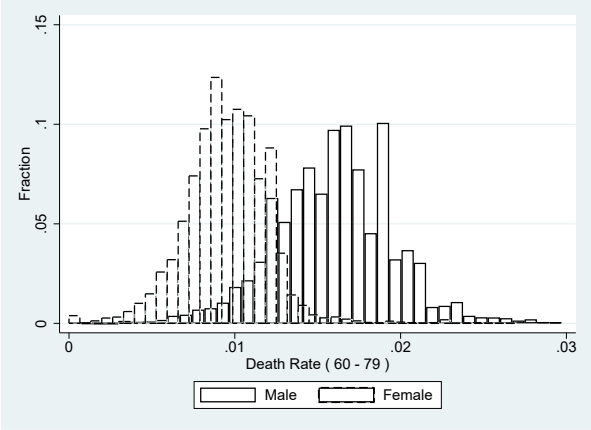


The graphs show the average observed mortality rates and the modeled Gompertz hazard rates in Switzerland for the 55-100 age group for men and women, respectively. The average is computed using municipal mortality rates and respective Gompertz estimates for the 2011-2015 time interval.

Figure 3: Full Annuitization by Pension Wealth Deciles

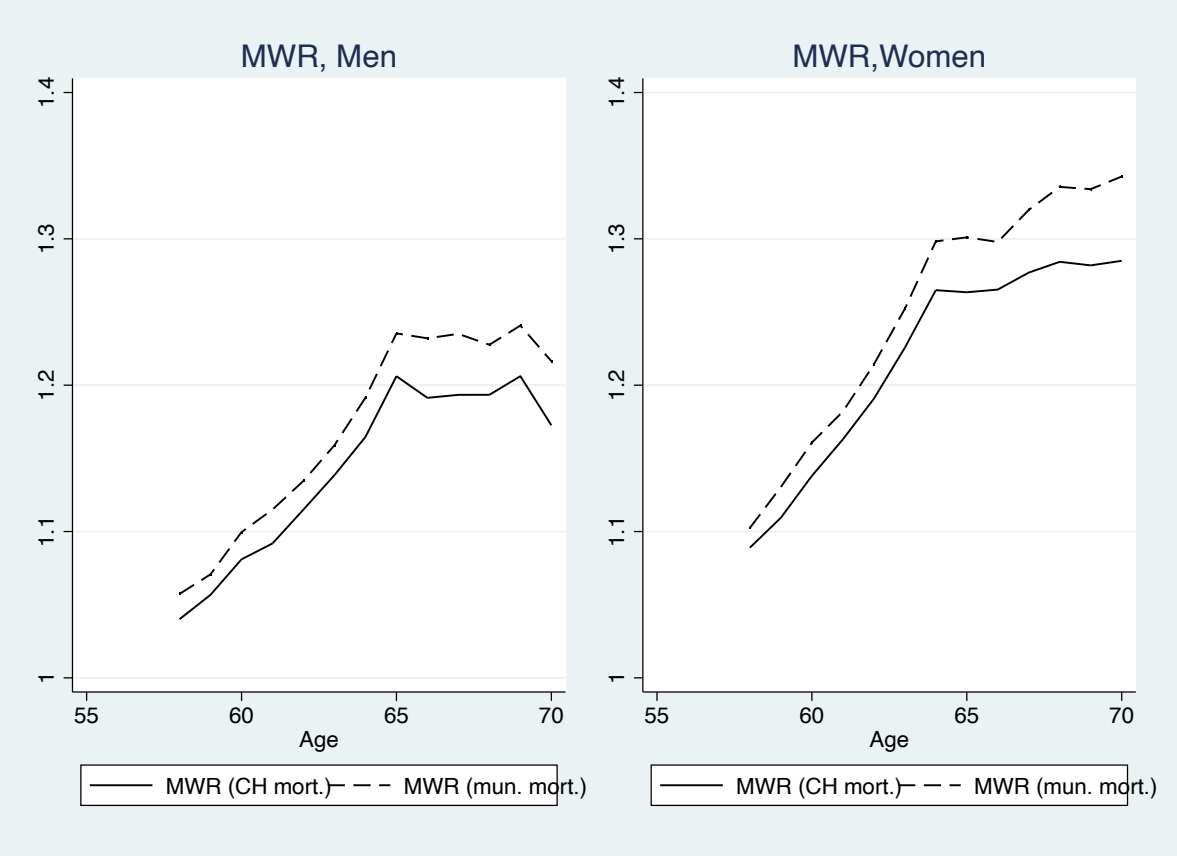
Note. The graph shows the share of individuals who fully annuitise their pension wealth in each decile of pension wealth. Data: Our sample 2011-2015.

Figure 4: Municipal Death Rates (60-79) by gender



Note. The graph shows the distribution of the female and male municipality mortality risk for the 60-79 age group, in our sample. Individuals are linked to the corresponding mortality risk using their municipality of residence and gender. Years: 2011-2015.

Figure 5: Individual MWRs by Age and Gender



Note. The graphs show the average Money Worth Ratio in our sample by age and gender of the individual. In the right figure, the MWRs vary according to the age, gender, year and individual pension wealth of the individual. In the left figure, the MWRs also differ by municipality of residence of the individual. Years: 2011-2015.

Table 1: Descriptive statistics

Variable	**mean**	**sd**	**N**
Female	0.365	0.482	12,595
German	0.770	0.421	12,595
English	0.007	0.086	12,595
French	0.151	0.358	12,595
Italian	0.072	0.259	12,595
Retirement Age	64.138	1.743	12,595
Pension Wealth	2.867	2.737	12,595
Tax Rate on Capital	0.058	0.035	12,595
Tax Rate on Annuity	0.059	0.059	12,595
Pension Wealth	2.867	2.737	12,595
Annuity	0.426	0.495	12,595
Share annuity	0.504	0.476	12,595
Capital	0.450	0.50	12,595
Death Rate 60-79	0.0133	0.0070	12,595
MWR	1.2063	0.0602	12,595
MWR mun	1.2356	0.0770	12,595
Average Income (Municipal)	76748	33533	12,587
Share Foreigners (Municipal)	0.228	0.103	12,595
Share With Upper-Secondary Education (Municipal)	0.481	0.064	12,428

Note: Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Share Annuity=(amount of pension wealth withdrawn as annuity/ total pension weath); Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF.

Table 2: The role of financial incentives

	(1) Annuity only	(2) Annuity only	(3) Share Annuity	(4) Share Annuity	(5) Capital only	(6) Capital only
Female	0.085***		0.084***		-0.083***	
	(0.011)		(0.011)		(0.011)	
Conversion Rate	0.124***		0.150***		-0.160***	
	(0.011)		(0.011)		(0.011)	
MWR		1.981***		2.198***		-2.264***
		(0.103)		(0.100)		(0.099)
Pension wealth	0.096***	0.141***	0.110***	0.159***	-0.116***	-0.165***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Pension wealth2	-0.006***	-0.007***	-0.007***	-0.008***	0.007***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Tax Rate on Lump sum	0.137	-0.269	0.343	-0.095	-0.491	-0.044
	(0.375)	(0.375)	(0.376)	(0.372)	(0.390)	(0.384)
Tax Rate on Annuity	-0.732***	-1.028***	-0.234	-0.498**	-0.054	0.191
	(0.276)	(0.257)	(0.248)	(0.229)	(0.249)	(0.231)
Observations	11,954	11,954	11,954	11,954	11,954	11,954
R-squared	0.048	0.065	0.090	0.112	0.111	0.132
Canton FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes

Note: Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Share Annuity=(amount of pension wealth withdrawn as annuity/ total pension weath); Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 3: The role of Culture

VARIABLES	(1) Annuity only	(2) Share Annuity	(3) Capital only
Latin	-0.059***	-0.043**	0.035
	(0.022)	(0.021)	(0.021)
MWR	1.967***	2.186***	-2.255***
	(0.102)	(0.099)	(0.098)
Pension wealth	0.141***	0.159***	-0.166***
	(0.010)	(0.010)	(0.010)
Pension wealth2	-0.007***	-0.008***	0.008***
	(0.000)	(0.000)	(0.000)
Tax Rate on Lump sum	-0.272	-0.088	-0.041
	(0.379)	(0.376)	(0.389)
Tax Rate on Annuity	-1.073***	-0.536**	0.233
	(0.258)	(0.230)	(0.233)
Observations	11,869	11,869	11,869
R-squared	0.065	0.112	0.131
Canton FE	yes	yes	yes
Year FE	yes	yes	yes

Note: Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Share Annuity=(amount of pension wealth withdrawn as annuity/ total pension weath); Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 4: The role of the Municipal Death Rate

VARIABLES	(1) Annuity only	(2) Annuity only	(3) Share Annuity	(4) Share Annuity	(5) Capital only	(6) Capital only
Death Rate(60-79)	-1.353**		-1.347**		1.293**	
	(0.645)		(0.621)		(0.647)	
MWR	1.948***		2.173***		-2.244***	
	(0.101)		(0.100)		(0.099)	
MWR mun		1.141***		1.248***		-1.277***
		(0.084)		(0.086)		(0.086)
Pension wealth	0.145***	0.111***	0.165***	0.125***	-0.173***	-0.130***
	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)
Pension wealth2	-0.007***	-0.006***	-0.008***	-0.007***	0.008***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tax Rate on Lump sum	-0.377	0.044	-0.267	0.253	0.146	-0.403
	(0.400)	(0.375)	(0.390)	(0.370)	(0.398)	(0.382)
Tax Rate on Annuity	-1.079***	-0.744***	-0.599***	-0.176	0.309	-0.143
	(0.253)	(0.259)	(0.227)	(0.232)	(0.231)	(0.235)
Observations	11,954	11,954	11,954	11,954	11,954	11,954
R-squared	0.067	0.055	0.115	0.098	0.134	0.118
Canton FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Municipal Controls	yes	no	yes	no	yes	no

Note: Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Share Annuity=(amount of pension wealth withdrawn as annuity/ total pension weath); Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF. Municipal controls include share of foreigners, municipal income, share of individuals with upper-secondary education. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 5: Descriptive statistics (SHARE)

Variable	**mean**	**sd**	**N**
Latin	0.2738	0.4459	1.2e+04
Age	66.9887	10.2739	1.2e+04
Married	0.7006	0.4580	1.2e+04
Female	0.5460	0.4979	1.2e+04
Education	0.9472	1.1428	1.1e+04
RiskAversion	0.9696	0.1716	1.2e+04
LifeInsurance	0.1797	0.3840	8.3e+03
PrInheritance	31.0685	38.3000	7.2e+02
GivenGift	0.3166	0.4652	1.2e+04

Note: SHARE data (Waves:1,2,4,5,6,7).

Table 6: SHARE, Probit

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RiskAver	LifeIns	PrLeavInh>50	PrLeavInh>75	PrLeavInh=100	GivenGift
Latin	-0.013**	0.023	0.101	0.162**	0.187**	0.043**
	(0.006)	(0.015)	(0.084)	(0.080)	(0.074)	(0.018)
Observations	10,845	7,907	582	582	582	10,942
Pseudo R2	0.0808	0.147	0.0423	0.0325	0.0315	0.0376
Individual Controls	yes	yes	yes	yes	yes	yes
Wave FE	yes	yes	yes	yes	yes	yes
Macroreg FE	yes	yes	yes	yes	yes	yes

Note: Individuals controls include age, civil status, gender and education. Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A.1: The role of Financial Incentives, Probit

VARIABLES	(1) Annuity only	(2) Annuity only	(3) Capital only	(4) Capital only
Female	0.090***		-0.090***	
	(0.012)		(0.012)	
Conversion Rate	0.133***		-0.172***	
	(0.012)		(0.013)	
MWR		2.248***		-2.553***
		(0.126)		(0.127)
Pension wealth	0.104***	0.157***	-0.125***	-0.183***
	(0.012)	(0.012)	(0.012)	(0.012)
Pension wealth2	-0.006***	-0.008***	0.007***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Tax Rate on Lump sum	0.239	-0.255	-0.483	0.021
	(0.397)	(0.400)	(0.477)	(0.466)
Tax Rate on Annuity	-0.833***	-1.170***	-0.040	0.265
	(0.302)	(0.281)	(0.282)	(0.266)
Observations	11,954	11,954	11,954	11,954
Canton FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Probit estimates, marginal effects. Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Share Annuity=(amount of pension wealth withdrawn as annuity/ total pension weath); Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table A.2: The role of Culture, Probit

	(1) Annuity only	(2) Capital only
Latin	-0.065***	0.042*
	(0.023)	(0.024)
MWR	2.234***	-2.544***
	(0.125)	(0.125)
Pension wealth	0.157***	-0.184***
	(0.012)	(0.012)
Pension wealth2	-0.008***	0.008***
	(0.001)	(0.001)
Tax Rate on Lump sum	-0.260	0.029
	(0.404)	(0.471)
Tax Rate on Annuity	-1.218***	0.314
	(0.282)	(0.267)
Observations	11,869	11,869
Canton FE	yes	yes
Year FE	yes	yes

Note: Probit estimates, marginal effects. Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table A.3: The role of the Municipal Mortality Risk, Probit

VARIABLES	(1) Annuity only	(2) Annuity only	Capital only	Capital only
Death Rate(60-79)	-1.365**		1.455**	
	(0.693)		(0.722)	
MWR	2.217***		-2.538***	
	(0.125)		(0.126)	
MWR mun		1.240***		-1.382***
		(0.097)		(0.098)
Pension wealth	0.162***	0.120***	-0.193***	-0.140***
	(0.012)	(0.012)	(0.013)	(0.012)
Pension wealth2	-0.008***	-0.007***	0.009***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Tax Rate on Lump sum	-0.376	0.127	0.253	-0.420
	(0.428)	(0.397)	(0.484)	(0.460)
Tax Rate on Annuity	-1.237***	-0.852***	0.412	-0.133
	(0.277)	(0.282)	(0.266)	(0.266)
Observations	11,954	11,954	11,954	11,954
Municipal Controls	yes	yes		
Canton FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Note: Probit estimates, marginal effects. Sample of years 2011-2015. Annuity : = 1 if amount of pension wealth withdrawn as annuity= total pension wealth, O otherwise; Capital : 1 if amount of pension wealth withdrawn as annuity =0, 0 otherwise. Pension Wealth is in 100000 CHF. Municipal controls include share of foreigners, municipal income, share of individuals with upper-secondary education. Robust standard errors clustered at municipal level in parentheses.*** p<0.01, ** p<0.05, * p<0.1