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ARTICLE

How taxes impact the choice between an annuity and the lump sum at retirement

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Abstract

We analyze how taxes affect the choice between a life-long annuity and a one-off lump sum payment, the so-called annuitization decision. Using administrative data from a large Swiss pension fund, we impute taxes for the lump sum and the life-long annuity option. We show that taxes can explain a significant part of the variation in annuity rates. Exploiting kinks in the tax schedule of the one-off lump sum, we further find evidence for tax optimization strategies. Our findings suggest that individuals react strongly to tax incentives when making retirement choices.

Key words: Annuity puzzle; occupational pension; taxation

JEL codes: D81; D91; H24; J26

1. Introduction

Understanding the determinants and consequences of individual retirement choices is paramount in an aging society. The choice between a life-time annuity and a lump sum has become a major policy issue in many countries for several reasons: first, annuities are one of the best ways to insure against poverty risk in old age. Second, through its feedback to social insurances, the choice between an annuity and a lump sum impacts public expenditures and, hence, society as a whole. Third, at the brink of retirement, this is a vital and difficult choice since it involves a substantial sum of money, is largely irreversible, and has long-lasting consequences.

The annuity price is an obvious factor in the cash-out decision at retirement. However, it remains unclear how this price impacts the decision, mainly because of a shortage of exogenous variation in annuity prices. Behavioral anomalies are another reason why it is difficult to trace out the impact of price variations.

In this paper, we look at a hitherto neglected factor of an annuity's value: differential taxation of the lump sum and the annuity. In particular, we use two forms of exogenous variation in taxation: geographic variation between Swiss cantons and tax bracket cut-offs within geographical regions. Taxes are particularly interesting as they can induce price variation, albeit in a much less transparent way than other factors. Our analysis is based on the highly decentralized tax system in Switzerland in which there is not only sizeable variation in tax schedules between cantons and municipalities, but also in the tax treatment of retirement wealth depending on whether its drawn down as a lump sum or as an annuity. Thus, Switzerland provides an excellent setting to study the effects of differential taxation within a relatively homogeneous region. So far research has mainly concentrated on the effects of the decentralized tax system on income sorting, such as Brülhart and Parchet (2014), Schaltegger *et al.* (2011), Liebig and Sousa-Poza (2006), Schmidheiny (2006), and Feld (2000).

Taxes have been shown to affect the value of an annuity. Analyzing tax treatments of life insurance and annuity products, Charupat and Milevsky (2001) show that under the Canadian tax rules, acquiring an immediate life annuity and then swapping it back by purchasing life insurance, will provide a higher after-tax rate of return than that of a generic bank deposit; this tax arbitrage opportunity arises because the taxable portion of annuity income is too low and remains constant at that level throughout annuitants' lives. Hagen (2015) calculates the value of an annuity both gross and net of taxes and finds that the present value of a 5-year payout (an option similar to cashing out one's pension wealth) could fall by more than 20% relative to the life annuity when taxes are accounted for. The negative tax effect on the present value of the fixed-term payout is particularly large for high-income individuals with large capital stocks.

There is evidence that people do respond to large, salient changes in an annuity's value. Taking advantage of a large policy change in Switzerland, Bütler *et al.* (2013) demonstrate that an 8% reduction in the rate at which retirement capital is translated into a life-long annuity – equivalent to a net present value loss of around USD 18,500 for the average retiree – was accompanied by a decline in the annuitization rate by 16.8 percentage points. However, small changes in prices may be insufficient to trigger a change in pay-out behavior if framing and peer effects are strong. Indeed, Chalmers and Reuter (2012), who study payout decisions in the Oregon Public Employees Retirement System, find no evidence that retirees respond to small changes in annuity prices.

Many studies look at the impact of taxes on retirement savings and labor supply. For example, using data from the Health and Retirement Study, Cunningham and Engelhardt (2002) demonstrate that savings from the 401(k) pension plan in the USA, which subsidizes savings through an income tax deferral and through investment accrual at the pre-tax interest rate, respond to tax deductibility of individual retirement account contributions.

Brown (2001) and others have used variations in the economic and regulatory environment, such as interest rates and conversion rates, to overcome the problem of a lack of exogenous variation in annuity prices. In this paper, we study the impact of taxation on individual annuitization choices using administrative records from a large Swiss insurance company. The dataset includes 14,620 individual cash-out decisions made between 2007 and 2015. Our tax imputation model shows substantial differences between taxation of the lump sum and taxation of the annuity. As all individuals face the same insurance contract and the same regulatory environment, our setting is an ideal laboratory to analyze how individuals react to differential taxes and take advantage of taxation to optimize their after-tax wealth or income.

Our empirical estimates show that taxes are an important determinant of individual annuitization choices: an increase in the tax rate on the lump sum is on average associated with a significant increase in the choice to annuitize. At the same time, an increase in the tax rate on the annuity leads to a significant decrease in the decision to annuitize. Wealthier individuals react more to tax incentives and thus variations in annuity pricing.

The progressive nature of the annual income tax and the one-off taxation when the capital is cashed out leaves another avenue of optimization than just choosing a polar option: a carefully chosen mix between the two options can reduce the tax burden for the retiree. We use jumps in the marginal tax rate on the lump sum to identify this effect. That is, we investigate behavioral responses around tax thresholds in the Swiss cantons. In a similar vein, Schmidheiny and Slotwinski (2015) provide evidence for strategic bunching of individuals around tax thresholds in Switzerland.[1]

Using a regression discontinuity design, we find evidence for tax optimization strategies by individuals at the brink of retirement: they sort into more favorable tax brackets by annuitizing part of their pension wealth and taking the rest as a lump sum. This tax optimizing behavior is only observed among the wealthy for whom such strategies pay off financially.

[1]They investigate behavioral responses of foreigners around the threshold where the special tax regime which only applies to foreigners, the so-called source tax, changes to the ordinary tax regime which applies to all individuals in Switzerland. They find that foreigners from high-tax municipalities push their income just below the threshold of CHF 120,000 where the tax regime changes, while foreigners from low-tax municipalities shift their income above the threshold.

Our results suggest that individuals react to tax incentives with regard to retirement choices. This has important policy implications. In addition to mandates and nudges, a more preferential tax treatment of annuities relative to lump sum payments could induce individuals to annuitize a larger share of their pension wealth. Pech (2004) has shown that such a strategy can indeed stimulate annuity demand if a cut in the supply of public goods to finance the tax incentives does not influence the private consumption choice. As a consequence, the prevalence of low incomes in old age as well as means-tested social assistance to those who run out of assets would be reduced. Furthermore, taxation of annuities could be used for redistributive purposes, as has been shown for example by Brunner and Pech (2008).

The paper proceeds as follows: Section 2 presents key features of the Swiss pension system and the Swiss tax scheme. Section 3 describes our tax imputation model. Section 4 discusses the data and descriptive statistics and Section 5 outlines the identification strategies. Section 6 presents the results. Section 7 summarizes and concludes.

2. Institutional background

Switzerland's pension system is built on three pillars. Thereby, the first and the second pillars constitute the core and account for the bulk of retirement income, whereas the third pillar is a voluntary, tax favored private pension savings scheme. The first pillar is a pay-as-you-go universal system which aims to provide a subsistence level of income to all retirees. The benefits depend on the amount of income earned during one's work life as well as the number of years contributed to the work force. The minimum is CHF 1,175 per month and the maximum CHF 2,350 per month (as of 2015).[2] The statutory retirement age is 65 for men and 64 for women.

The second pillar, which is the focus of our analysis, is a fully funded occupational pension scheme, mandatory for all employees whose annual income exceeds a pre-defined threshold (CHF 24,675 in 2015). Its goal is to maintain pre-retirement living standards. An employer can choose from different organizational structures for his occupational pension plan. These range from setting up a completely autonomous pension fund to outsourcing the scheme entirely to an insurance company. The latter is relatively common – particularly for small- and medium-sized enterprises (SMEs). Occupational pension plans are notionally set as defined contributions, but carry extensive guarantees.

The three pillars are complemented by means-tested supplemental benefits in case total income is not enough to cover basic needs. Means-tested benefits create an incentive to cash out second-pillar pension wealth because they guarantee a minimum income at retirement and thus act as an implicit insurance against financial consequences of longevity.[3]

At retirement, workers have the option to withdraw the accumulated second-pillar retirement capital as a monthly life-long annuity, a lump sum, or a mix of the two options.[4] Annuities are strictly proportional to accumulated retirement assets: second-pillar pension wealth W is translated into a yearly nominal annuity A using the conversion rate γ, hence $A = \gamma W$. The conversion rate varies with retirement age and gender (see Table A2 in the Appendix). The law stipulates a minimum conversion rate for the mandatory part, which is currently 6.8%.[5] The annuity also entails benefits for dependent children and survivor benefits under certain conditions.

[2]This is roughly the same amount in USD.

[3]Bütler *et al.* (2017) demonstrate that means-tested benefits are indeed associated with a decrease in demand for annuities, especially for individuals at the lower end of the wealth distribution.

[4]Individuals that receive disability insurance are not allowed to withdraw a mix of the two options, they are excluded from the analysis.

[5]Our dataset includes both mandatory and super-mandatory contributions. The amount of insured income above the lower threshold (CHF 24,675 in 2015) and below the upper threshold (CHF 84,600 in 2015) is called the mandatory component, and income above the upper threshold is called the super-mandatory component. All pension providers are required by law to insure the mandatory share. They are free to offer insurance for the super-mandatory share; however most (including the pension fund providing these data) do so because the second pillar is considered an integral part in attracting well-educated workers in Switzerland's tight labor market.

The accumulation and decumulation phases of occupational pensions are organized by the same provider. While it is possible to cash out the accumulated balances to buy an annuity in the unregulated market, such a strategy would never be optimal as the conversion rates (γ) in unregulated markets are well below conversion rates in the highly regulated second pillar.

If the annuity is chosen, the resulting annual income stream from pension wealth, A, is taxed like ordinary income in addition to any other income, in particular, income from the first pillar. The lump sum, on the other hand, is subject to a special, one-off tax applied to the full amount of pension wealth cashed out, disregarding any income or any other form of wealth.[6] If the annuity and the lump sum choice are combined, both taxes are applied separately to the amount withdrawn as either option.

Like ordinary income and wealth, annuities and lump sums are taxed at three levels in Switzerland: at the federal, at the cantonal, and at the municipality levels.[7]

3. Calculating taxes on annuity and lump sum

We impute taxes since we do not observe the amount of tax paid by individuals after retirement in our data. To this end, we first impute the total tax liability for any amount of pension wealth and annuity income. Second, we apply the tax imputation model to our data.

Using information on tax schedules from the tax administrations of all 26 Swiss cantons, we first compute the basic tax which is defined by the cantons and determines progressivity of the tax schedule. Our computation for the basic tax includes tax deductions and accounts for the fact that the basic tax differs according to marital status. While there are large differences in tax progressivity across cantons, there are none between municipalities within each canton.

We then calculate the total canton and municipality tax load by multiplying the basic tax with the cantonal and municipality tax multipliers.[8] Contrary to tax progressivity, there are differences in tax multipliers between municipalities within one canton (but they do not differ by marital status). As there is mandatory tax filing each year for the majority of individuals,[9] individuals are usually well aware of the tax loads in their own municipality.[10]

We use our imputation model on hypothetical datasets with observations from each municipality and different levels of pension wealth. Figures 1–4 illustrate substantial differences in taxes for both the annuity and the lump sum for both a moderate and a high pension wealth: the total tax liability on the lump sum of CHF 200,000 (CHF 600,000) ranges from about CHF 4,000 to over CHF 17,000 (CHF 18,000 to over CHF 63,000) and the total tax liability on the corresponding annuities (an annual income of about CHF 13,600 and CHF 40,800, respectively) ranges from CHF 0 to over CHF 2,000 (CHF 0 to over CHF 10,000). The main driver of these differences in tax loads are differences between cantons, not differences between municipalities within the same canton. While some municipalities have high (or low) taxes on both the annuity and the lump sum, others levy a high tax on the lump sum but only a moderate tax on the annuity, and vice versa.

To allow for a precise comparison of the tax burdens for the two pay-out options, we would have to compute the present values of tax load on the remaining lifetime for the annuity. We refrain from

[6]The only exception is third pillar pension wealth if the latter is cashed out at the same time. It is never optimal to withdraw money from the second and third pillars in the same year. This fact is actively advertised by banks or other third pillar providers when retirees plan to withdraw third pillar savings. Moreover, third pillar wealth is much lower than second pillar wealth for most retirees.

[7]We do not impute the federal tax. The federal tax is the same across cantons and for the majority of individuals, the federal tax constitutes far less than 20% of their total tax. The bulk of the income tax load goes to the municipality and to the canton in roughly equal shares.

[8]Most cantons provide the information for calculating the basic tax online. Those cantons which do not provide the information online were contacted by email or telephone, after which the information was willingly provided.

[9]An exception is individuals with non-permanent residency in Switzerland of which there are none in our dataset.

[10]The number of municipalities in Switzerland has been decreasing in recent years due to municipality mergers. For our analysis we keep track of all changes over time.

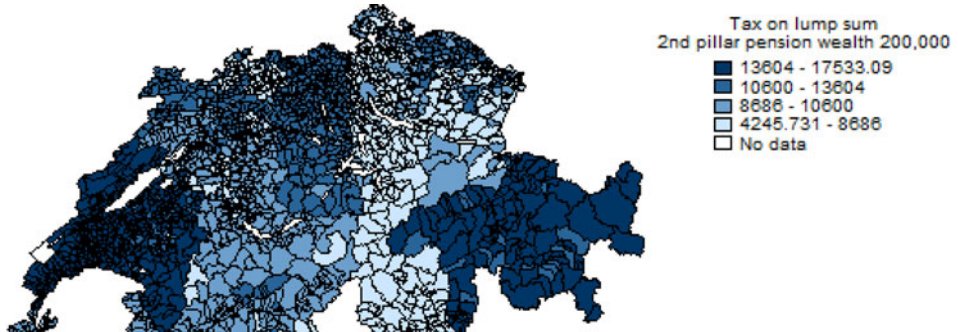

Figure 1. Tax load on lump sum of CHF 200,000 (married individuals).

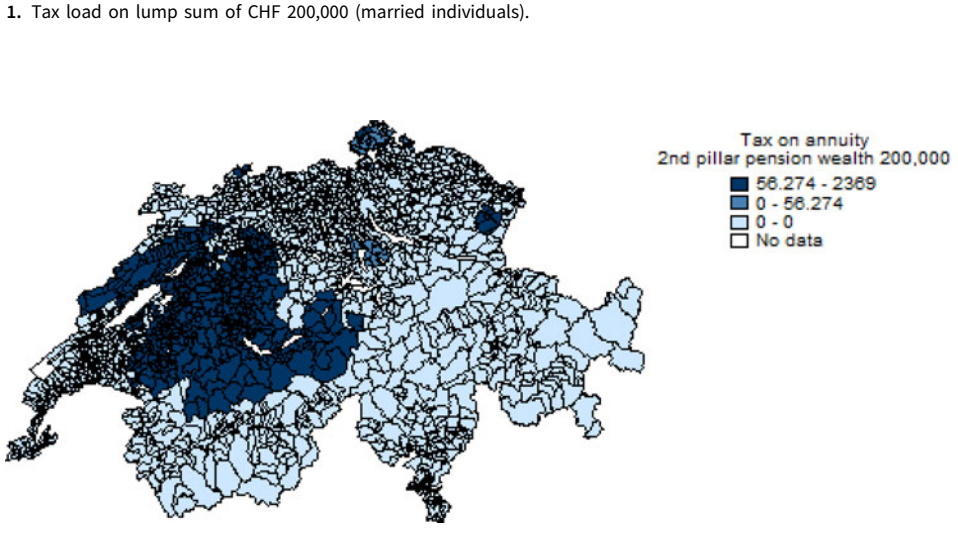

Figure 2. Tax load on annuity with pension wealth of CHF 200,000 converted to annual income of 13,600 (married individuals).

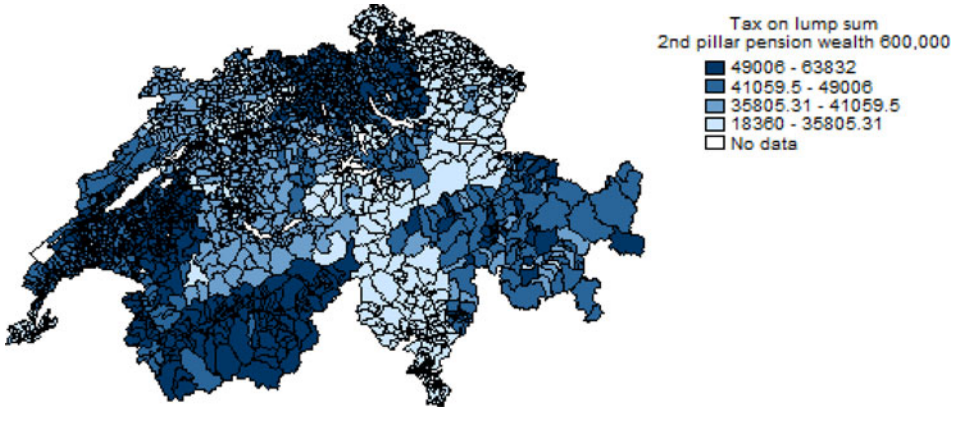

Figure 3. Tax load on lump sum of CHF 600,000 for married individuals.

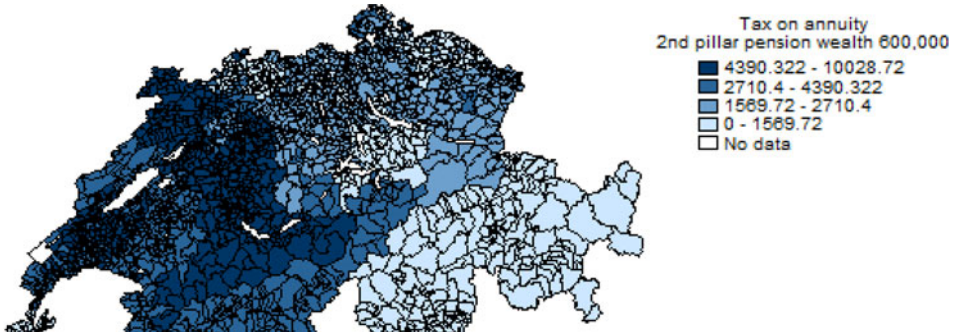

Figure 4. Tax load on annuity with pension wealth of CHF 600,000 converted to annual income of 40,800 (married individuals).

doing so as the tax load is roughly proportional to the period tax expense. Some factors for differences in the present value of future tax loads of the annuity, such as marital status and gender, are taken care of by covariates.

Taxes may change slightly over time as municipalities can adjust the municipality tax multiplier to increase or decrease their tax revenues. Cantonal taxes change in a more sluggish fashion since more parties and negotiations are involved. Five of the 26 cantons changed the basic tax calculation for the lump sum during the time period under consideration (Bern, Uri, Glarus, Appenzell Ausserrhoden, and Graubünden); however, these changes did not translate into large differences in tax liabilities. While we take into account these changes in our tax calculation model, we do not exploit changes over time explicitly.

Several cantons[11] introduced tax-related policy changes at a cantonal level in the time period under consideration, following one or more cantonal ballots. However, none of these changes were targeted at retirees.[12]

Applying our tax imputation model to the data, we can impute the tax on the lump sum from gross pension wealth directly. However, to calculate the tax on the annuity, we first need to calculate the annual income stream after retirement by applying applicable conversion rates to pension wealth (see Table A2 in the Appendix) and add income from the first pillar.[13] Note that to estimate the effects of taxation on the choice between annuity and lump sum (see Section 5), we calculate both taxes for all individuals in our dataset, irrespective of their choice.

4. Data and descriptive statistics

We use administrative records from a large Swiss insurance company which provides pension plans to SMEs in the private sector. Ninety nine percent of Swiss companies are SMEs and they provide about two-thirds of work places in Switzerland (BFS, 2012). Most importantly, the data contain information on retirement choice, i.e., taking the annuity or the lump sum, or a combination of the two. From this information, the outcome variable, the *annuity rate* is created: the *annuity rate* is the amount of pension wealth withdrawn as annuity divided by total pension wealth.

[11]Basel Land, Lucerne, Bern, Zug, Schaffhausen, Aargau, and Solothurn

[12]The nature of the changes varies, although most of them addressed families through the implementation of, e.g., deductions from income for children or decreases in tax rates for families with children.

[13]We approximate income from the first pillar by assigning 86% of the maximal first-pillar income to all individuals in our dataset. This is because both men and women receive on average 86% of their maximal first-pillar income (BSV, 2014) as each year without contribution (the so-called 'tax gap') leads to a reduction of 1/44 in one's first-pillar income. The maximum first-pillar income differs by year, something we take into account.

Table 1. Descriptive statistics

Variables	*N*	Mean	s.d.	Min	Max
Covariates					
Share female	12,186	0.36	0.48	0	1
Married	12,186	0.70	0.46	0	1
Age	12,186	64.33	1.63	58	70.97
Pension wealth	12,186	295,359	335,693	100	6,824,000
Income	12,186	77,660	58,175	0	1,085,000
WEF	12,186	7,749	46,608	0	1,500,000
Annuity after retirement[a]	6,003	20,079.41	22,285.71	0	289,200
Dependent variables and variables of interest					
Annuity rate	12,186	0.45	0.48	0	1
Choice of combination	12,186	0.21	0.41	0	1
Fraction annuitized[b]	1,619	0.69	0.25	0.02	1
Tax on annuity	12,186	1,213	3,573	0	89,470
Tax on lump sum	12,186	20,294	37,072	0	638,382
Tax rate annuity	12,186	0.03	0.04	0	0.28
Tax rate lump sum	12,186	0.05	0.02	0	0.31
Ratio[c]	12,009	0.03	0.05	0	0.7
Choice					
Average wealth by type of choice (annuity, lump sum, or combination)					
Lump sum	4,382	304,099	268,761	2,700	4,142,800
Annuity	6,177	241,697	344,936	100	6,823,800
Combination	1,627	476,487	399,115	4,500	4,257,300

[a]*Annuity after retirement:* only for individuals who receive an annuity.
[b]*Fraction annuitized:* only for individuals who annuitize part of their pension wealth.
[c]*Ratio:* only for individuals with *tax on lump sum* > 0.

The dataset further contains the following individual characteristics: date of retirement (*date*), age at retirement (*age*), gender (*sharefemale*), marital status (*married*), total second-pillar pension wealth at time of retirement (*wealth*), income in the year before retirement (*income*),[14] whether the individual receives a disability insurance (*disability*), and whether individuals have ever withdrawn some money from their second pillar to finance the purchase of a house (*WEF*, from the German 'Wohneigentumsförderung'). We further know in which sector (defined by so-called NOGA codes) the individual worked prior to retirement (*NOGA*). We exclude individuals who receive full disability insurance because their choice to take the lump sum is severely restricted (descriptive statistics for the full sample are given in the Appendix in Table A1). Table 1 provides summary statistics for the observations which are used for the analysis.

Our data are a fairly representative sample of the Swiss retirement age population and correspond closely to other papers which have used data from Swiss pension funds: the average annuity rate is almost equivalent to the rate of 0.443 in Bütler *et al.* (2013). Average age at retirement is only slightly higher than that in Bütler *et al.* (2013) and Bütler and Teppa (2007) where the average age is 63.9 years and 61.75 years, respectively, and remains stable over time (see Figure B1 in the Appendix). A lower share of women in this dataset corresponds roughly to the national average of second-pillar recipients, which is 0.41 (BFS, 2013).[15]

For every individual, we first calculate the (gross) present value of an annuity, i.e., the present value of an annual income stream of 1 after retirement, without taking into consideration taxation. The present value (*PV*) captures changes in the yield curve which represent investment opportunities if the lump sum is taken.[16]

[14]Income refers to an individual's earnings in the year before retirement from the employer linked to the pension provider.

[15]The number of people entering retirement increases over time but is unrelated to specific retirement dates, although there seems to be a cyclical component (see Figure B3 in the Appendix).

[16]We calculate the present value annuity factor at the statutory retirement age of 65 for a male beneficiary until the end of his life. The age of 65 is chosen because it corresponds to the statutory retirement age for men, and we chose men rather than women because there are more men in the sample. Our present value annuity factor is slightly downward biased as

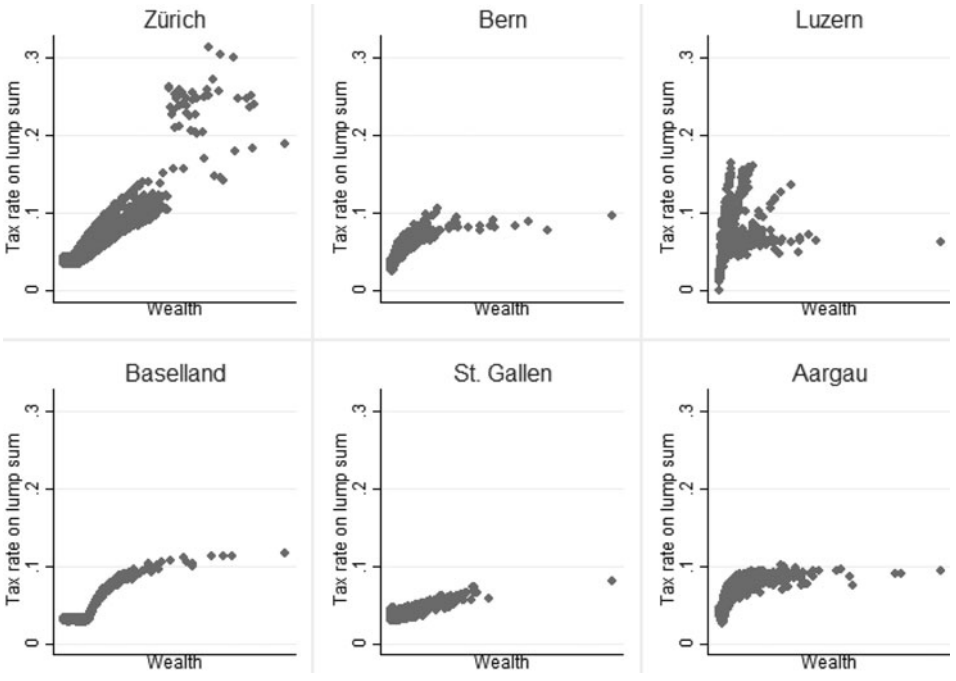

Figure 5. Tax rate on lump sum across wealth (married and single individual).

Figure 5 shows the (average) tax rate on the lump sum across the wealth distribution. The average tax rates are defined as the percentage of post-retirement wealth spent on taxes. It shows that the tax rate on the lump sum is higher for Zürich than for other cantons and increasing at different rates across cantons. Taxes differ by marital status and date of retirement for individuals with the same amount of pension wealth and also (to a much lesser degree) over time. Both become apparent in Figure 5 by the cloudiness of the figure: for the same level of wealth, tax rates differ between individuals within the same canton due to marital status and date of retirement.

5. Methodology

5.1 Ordinary least squares (OLS) regressions

In a first step, we explore the relationship between taxation and annuitization choice using OLS regressions. To this end, we run regressions of the annuity rate on three different tax measures: the (average) tax rate on the annuity, the (average) tax rate on the lump sum, and the ratio of the tax on the annuity to the tax on the lump sum.

The OLS regressions can be written as follows:

$$Y_i = \beta_0 + \beta_1 \times Z_i + \beta_2 \times X_i + \eta_i \tag{1}$$

individuals covered by the second pillar have, on average, a higher life expectancy than the overall population. We use nominal yields on Swiss treasury bonds with maturities of 1, 2, 3, 4, 5, 6, 7, 8, 10, 20, and 30 years to calculate the expected nominal short rate in each future period. Life expectancy is calculated using data from mortality tables created by the Swiss Federal Statistics Office (BFS). We have also calculated the money's worth ratio (MWR), a measure of the value of an annuity compared to the cash-out option, both with and without taxes. The MWR has been used in a number of papers, e.g., Mitchell *et al.* (1999), Brown (2001), Finkelstein and Poterba (2004), Chalmers and Reuter (2012), and Hagen (2015). It is expressed as the ratio of the present value of an annuity to the value of the lump sum. The net MWR explicitly takes into account taxes, comparing the net-of-tax income stream after retirement to the net-of-tax lump sum.

where Y_i is the annuity rate defined as follows:

$$Y_i = \frac{\text{Amount of pension wealth withdrawn as annuity}}{\text{Total pension wealth}} \quad (2)$$

Here, Z_i refers to our tax variables and X_i are control variables. The tax rate on the annuity and the tax rate on the lump sum are included in the same regression because they represent a trade-off between the two choices.[17] The regressions on the tax ratio are run separately to avoid collinearity. We control for the most important confounders, that is, we control for age, age squared, gender, marital status, the present value of the annuity, and the sector in which the individual has worked prior to retirement as all these factors have been shown to affect annuity choices (for the relationship between age, gender, marital status, and an annuity's value see, e.g., Bütler and Teppa (2007), and for the relationship between work sector and annuity choice see Bütler and Ramsden (2015)).

We further control for pension wealth (which includes second-pillar contributions from all previous jobs) as the tax rate is a function of accumulated pension wealth, and wealth squared to capture non-linearities in wealth with regard to annuity demand. Time dummies are included in most regressions because we observe an increase in the annuity rate over time (see Bütler and Ramsden, 2015, for a discussion). We do not include canton fixed effects because this would eliminate an important source of variation in relative tax loads of the two drawdown options.[18]

Variation in the tax rate can be considered exogenous as the tax rate does not affect second-pillar savings (although it might affect private savings). Individuals can optimize their tax load by choosing the most beneficial draw-down option (annuity, lump sum, or mix of the two), or by relocating to another canton with a more favorable tax rates. While the first decision is nearly free, moving to another canton takes a huge financial and non-financial hit. Indeed, based on recent research it can be assumed that the willingness to migrate is low among the elderly, in particular for lower and mid wealth individuals.[19] There is thus little concern that our results suffer from endogeneity bias due to individuals changing residence prior to retirement to take advantage of favorable tax conditions after making a choice between the annuity and the lump sum. Nevertheless, we use several strategies to address potential endogeneity issues such as selection effects into low-tax municipalities.

First, we exclude high-wealth individuals from the dataset as those are the ones which are likely to migrate to take advantage of lower taxes.[20] This is primarily important for the regressions on the lump sum tax rate: since the tax on the annuity is the same as the tax on income, people who move for income tax reasons would have done so long before retirement. Moreover, excluding wealthy retirees circumvents the problem of a potentially different annuity demand for the very rich. Second, we control for income from last year of employment and withdrawal of pension wealth to finance owner-occupied housing (*WEF*): income before retirement might be an important determinant of residence, which in turn influences tax rates. Withdrawing pension wealth prior to retirement to finance the purchase of a house might directly affect the tax rate that individuals face at retirement. It reduces the amount of pension wealth in the second pillar, while owning a house makes moving more costly. Third, we control for cantonal debt per capita which proxies for tax expectations: individuals that live in a canton with high debt might expect tax rates to increase in the future, consequently choosing the

[17]Running separate regressions for the two variables leads to almost identical results.

[18]Including canton fixed effects leads to very similar results, hence variation within a canton seems to be enough to drive the effects that we observe when not adding canton fixed effects.

[19]Brülhart and Parchet (2014) found that cuts in bequest taxes had almost no impact on migration patterns of elderly taxpayers nor on the basic tax represented by these individuals in terms of federal income taxes. Schmidheiny (2006) and Schaltegger *et al.* (2011) find evidence of income sorting within a canton as a reaction to tax differences between municipalities, while Liebig and Sousa-Poza (2006) do not find large effects of income taxation on individual migration choices. Feld (2000) and Schmidheiny (2006) confirm a limited impact of taxation on within-country migration for the full population.

[20]This leads to the exclusion of 394 individuals from a total of 10,027 individuals.

lump sum over the annuity. We do not include this variable in all regressions as it is not available for 2014 and 2015, thus leading to a loss in observations.

The distribution of the outcome variable has two mass points at zero and one – since many individuals choose either only the lump sum or only the annuity. The resulting loss in efficiency can be taken care of by computing heteroskedasticity-robust standard errors. Results of a Breusch–Pagan test for heteroskedasticity support the use of heteroskedasticity-robust standard errors. We also re-estimate the regressions on the three different tax indicators with a Tobit estimation. The doubly censored Tobit model estimates both the likelihood and the intensity of annuitization by means of maximum likelihood methods and improves the estimates from the OLS regression which will be downward-biased for the slope coefficient and upward-biased for the intercept (Wooldridge, 2020).

5.2 Regression discontinuity design

Another way to assess whether individuals adjust their annuitization decision in light of taxes is to analyze whether there is strategic bunching at kinks in the tax-schedule within geographic entities. A mix between an annuity and a lump sum reduces the tax burden due to progressivity of both taxes. The relative gain over a polar option might be ample in cantons with large jumps in the marginal tax rate on the lump sum. In this case individuals can optimally choose the right combination of annuity and lump sum to end up in a more favorable lump sum tax bracket. For example, individuals in the canton of Basel Land with a pension wealth of CHF 410,000 pay around CHF 900 more in tax than individuals with a pension wealth of 400,000 if they choose the lump sum.[21] Individuals with a pension wealth of CHF 500,000 in the same canton may pay up to CHF 10,000 more in tax if they choose the lump sum, depending on the municipality of residence.

In all cantons, such a strategy pays off especially for individuals with high pension wealth. Figure B2 in the Appendix shows that for the three options, wealth is highest on average for individuals choosing the combination.

To gain insight into whether individuals strategically place themselves in a lower tax bracket, we exploit the fact that tax schemes of the lump sum create kinks in the marginal tax rate as a function of wealth, illustrated in Figure 6. We investigate the likelihood for choosing a combination of annuity and lump sum for wealth just above these kinks. For six cantons (Aargau, Basel Land, Basel Stadt, Bern, Fribourg, and Zürich, depicted in Figure 6), we have enough observations to allow an analysis of strategic bunching. However, Basel Stadt and Fribourg lack high lump sum thresholds at which marginal tax rates increase (the highest thresholds being at pension wealth 190,000 in Fribourg and 100,000 in Basel Stadt), and the canton of Zürich is characterized by small jumps in the lump sum MTR schedule (see Figure 6). Nevertheless, we estimate treatment effects for these three cantons as well.[22]

We implement a regression discontinuity design where treatment – choosing a combination of annuity and lump sum – is a deterministic function of wealth and is defined as:

$$T_i = \begin{cases} 1 & \text{if } w_i \geqslant w_0 \\ 0 & \text{if } w_i < w_0 \end{cases} \tag{3}$$

[21]The exact amount depends on the municipality of residence.

[22]We cannot estimate effects for the other 19 cantons for the following reasons: (i) there are not enough observations per canton (SZ, OW, SH, AR, AI, VD, NE, GE, JU), (ii) there are too many thresholds, i.e., jumps in the marginal tax rate and consequently not enough observations in each tax bracket (SG, ZG, TI, LU, SO), (iii) the cantons have a flat tax rate or very complex tax system, i.e., there are no jumps in the marginal tax rate (UR, NW, GL, GR, TG, VS). While it seems attractive at first to pool together all observations to redefine wealth (of each individual) in terms of distance to nearest threshold, this approach turns out to be unfeasible: (i) there is large heterogeneity across cantons, thus tax incentives differ hugely even for otherwise identical individuals; (ii) cantons with narrow thresholds and low-wealth households would be over-represented in this RDD due to the bandwidth selection. However, those are precisely the observations where we would not expect to see an effect anyway. Table A3 in the Appendix gives an overview on the number of observations in the sample and compares them to population statistics from the Swiss statistics office BFS.

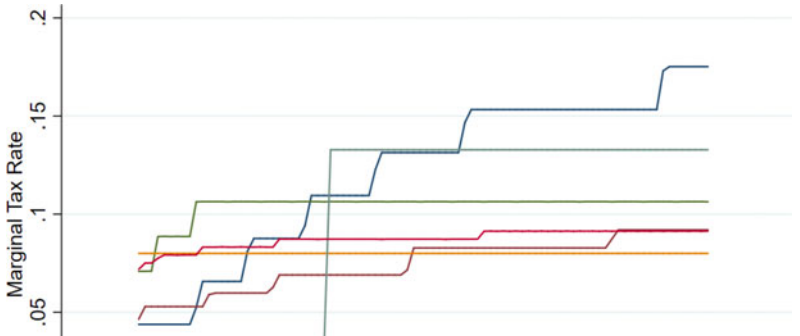

Figure 6. Marginal tax rate of lump sum across wealth.

where T_i denotes treatment, w_i denotes wealth, and w_0 the wealth thresholds. The outcome variable Y_i is a binary indicator which equals 1 if an individual annuitizes part of his or her pension wealth, but not all of it, and zero otherwise. Hence, it excludes individuals who choose the full annuity. The treatment effect is estimated using a flexible parametric model within a narrow bandwidth (in terms of wealth), hence the regression formulation is:

$$Y_i = \alpha_0 + \alpha_1 T_i + \alpha_2 W_i + \alpha_3 W_i T_i + \varepsilon_i \tag{4}$$

The parameter α_1 measures the average causal effect of being in a higher tax bracket on choosing the combination of annuity and lump sum at the assignment threshold W_0. We include interaction variables $W_i T_i$ between the assignment variable and the treatment dummy to control for the fact that the treatment may impact not only the intercept, but also the slope of the regression line.

Covariates are included as a robustness check. We do not include higher-order polynomials in the baseline estimation which would be justified when using observations far away from the cut-off for which different treatment effects are expected. Within a reasonably narrow wealth range, there is no reason to expect non-linearity between mean counterfactual outcomes and the running variable (see Jacob *et al.*, 2012 for a discussion). Nevertheless, we perform a series of robustness checks including polynomial terms along with covariates and interaction terms. A summary of these robustness checks for the two highest tax thresholds for the canton of Bern can be found in the Appendix in Tables A10 and A11.

To provide unbiased impact estimates, the cut-point must be determined independently of the rating variable, i.e., the accumulated pension wealth must be exogenous. This is the case in our setting as it is nearly impossible for individuals in Swiss pension funds to manipulate their pension wealth: pension wealth is accumulated over the whole work life and it depends on individual decisions with regard to one's occupation (e.g., working part-time or full-time, or being employed or self-employed), the amount earned, marriage and divorce decisions, and above all the regulatory environment of the pension fund chosen by the employer. Graphical evidence for no sorting around the relevant thresholds for the cantons Aargau, Basel Land, and Bern is given in the Appendix in Figures B4–B6.

Table 2. OLS regression of annuity rate on tax rate on lump sum and tax rate on annuity

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax rate lump sum	0.99*** (0.22)	0.85*** (0.25)	0.99*** (0.22)	0.36 (0.24)	0.43 (0.27)	0.37 (0.24)
Tax rate annuity	−0.69*** (0.15)	−0.65*** (0.17)	−0.71*** (0.15)	−0.61*** (0.15)	−0.60*** (0.18)	−0.63*** (0.15)
Wealth	0.05*** (0.00)	0.05*** (0.00)	0.05*** (0.00)	0.22*** (0.01)	0.21*** (0.01)	0.22*** (0.01)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.04*** (0.01)	−0.05*** (0.01)	−0.04*** (0.01)	−0.06*** (0.01)	−0.06*** (0.01)	−0.06*** (0.01)
Sex	0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.07*** (0.01)	0.06*** (0.01)	0.07*** (0.01)
Married	−0.05*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)	−0.03*** (0.01)	−0.03*** (0.01)	−0.03*** (0.01)
Age	0.74*** (0.09)	0.64*** (0.11)	0.76*** (0.09)	0.72*** (0.10)	0.64*** (0.12)	0.74*** (0.10)
Age squared	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.00*** (0.00)	−0.01*** (0.00)
PV	0.03*** (0.00)	0.01** (0.00)	−0.01 (0.01)	0.03*** (0.00)	0.01* (0.00)	−0.01 (0.01)
WEF	−0.07*** (0.01)	−0.07*** (0.01)	−0.07*** (0.01)	−0.08*** (0.01)	−0.08*** (0.02)	−0.08*** (0.01)
Debt PC		0.33* (0.18)			0.26 (0.17)	
Constant	−23.91*** (2.93)	−20.52*** (3.52)	−23.98*** (2.93)	−23.69*** (3.14)	−20.71*** (3.81)	−23.75*** (3.13)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Observations	12,186	8,814	12,186	11,573	8,389	11,573
R^2	0.060	0.064	0.065	0.119	0.116	0.122

Table 3. OLS regression of annuity rate on the ratio of tax on annuity to tax on lump sum

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Ratio	−0.26** (0.12)	−0.27** (0.12)	−0.21 (0.14)	−0.55*** (0.12)	−0.56*** (0.12)	−0.53*** (0.14)
Wealth	0.05*** (0.00)	0.05*** (0.00)	0.05*** (0.00)	0.23*** (0.01)	0.23*** (0.01)	0.22*** (0.01)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.05*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)	−0.07*** (0.01)	−0.07*** (0.01)	−0.07*** (0.01)
Sex	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.06*** (0.01)
Married	−0.05*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)	−0.03*** (0.01)	−0.03*** (0.01)	−0.03*** (0.01)
Age	0.75*** (0.09)	0.77*** (0.09)	0.66*** (0.11)	0.73*** (0.10)	0.75*** (0.10)	0.65*** (0.12)
Age squared	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)
PV	0.03*** (0.00)	−0.01 (0.01)	0.01** (0.00)	0.03*** (0.00)	−0.01 (0.01)	0.01* (0.00)
WEF	−0.06*** (0.01)	−0.06*** (0.01)	−0.06*** (0.01)	−0.08*** (0.01)	−0.07*** (0.01)	−0.08*** (0.02)
Debt CP			0.35** (0.17)			0.24 (0.17)
Constant	−24.18*** (2.94)	−24.23*** (2.94)	−21.11*** (3.53)	−23.75*** (3.16)	−23.82*** (3.15)	−21.11*** (3.84)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	No	Yes	No	No	Yes	No
Observations	12,009	12,009	8,650	11,396	11,396	8,225
R^2	0.056	0.060	0.060	0.116	0.120	0.113

6. Results

6.1 Results from OLS regressions

Results from OLS regressions of the annuity rate on the different tax indicators (tax rate on lump sum, tax rate on annuity, and ratio of tax on annuity to tax on lump sum) are displayed in Tables 2 and 3. Columns I show results for OLS regressions of the annuity rate on the tax indicators plus a set of control variables (wealth, wealth squared, income prior to retirement, withdrawal of pension wealth prior to retirement, the present value of an annuity, age, age squared, gender, marital status, and sector in which an individual has worked prior to retirement). We then include year dummies (column II) and debt per capita, our proxy for tax expectations (column III).

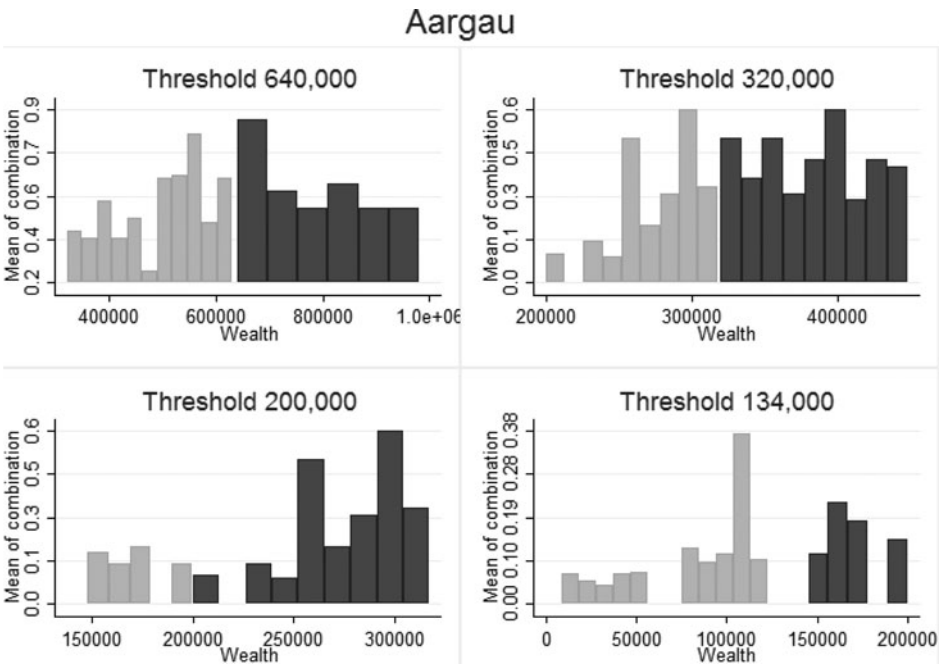

Figure 7. Mean of 'mixed option' across wealth, canton of Aargau, married individuals.

Columns IV–VI in Tables 2 and 3 are specified in the same way but the richest 5% of the sample (in terms of pension wealth) are excluded to test for selection effects and differences in annuitization behavior among the rich (see Section 5.1).

Table 2 summarizes the OLS regressions of the annuity rate on the lump sum tax rate and the annuity tax rate. The coefficient on *tax rate LS* in columns I–III is highly significant and implies that if the tax rate on the lump sum increases by 1 percentage point, the annuity rate increases by 0.85–0.99 percentage points, depending on the specification. This is a sizeable effect. Results become insignificant when we exclude the richest 5% of the sample. This confirms our hypothesis that the effect is driven by wealthier individuals (see Section 5.1).

Coefficients on *tax rate annuity* are negative and highly significant across all specifications for the full sample – even when excluding 5% of the richest individuals in our sample. Together with the results of the previous section, this implies that taxation of the lump sum affects the annuitization decision only for individuals with high wealth, while taxation of the annuity affects individual annuitization decisions across the wealth distribution. The coefficients on *tax rate annuity* imply that an increase in the tax rate on the annuity by 1 percentage point leads to a 0.6 percentage point decrease in the annuity rate, on average. The OLS regressions on *ratio* (Table 3) provide very similar results: the coefficients are negative and significant for the full sample and when excluding the richest 5% of the sample. The coefficient on *ratio* implies that a higher tax on the annuity – compared to the tax on the lump sum – is associated with a lower propensity to annuitize, on average.

Tables A4 and A5 in the Appendix summarize the results from the Tobit regressions on the different tax indicators, showing that the results do not change qualitatively to our OLS estimates.[23]

[23]The coefficients from this model cannot be directly interpreted: Tobit regressions require computation of partial effects to make them comparable to OLS coefficients (Wooldridge, 2020).

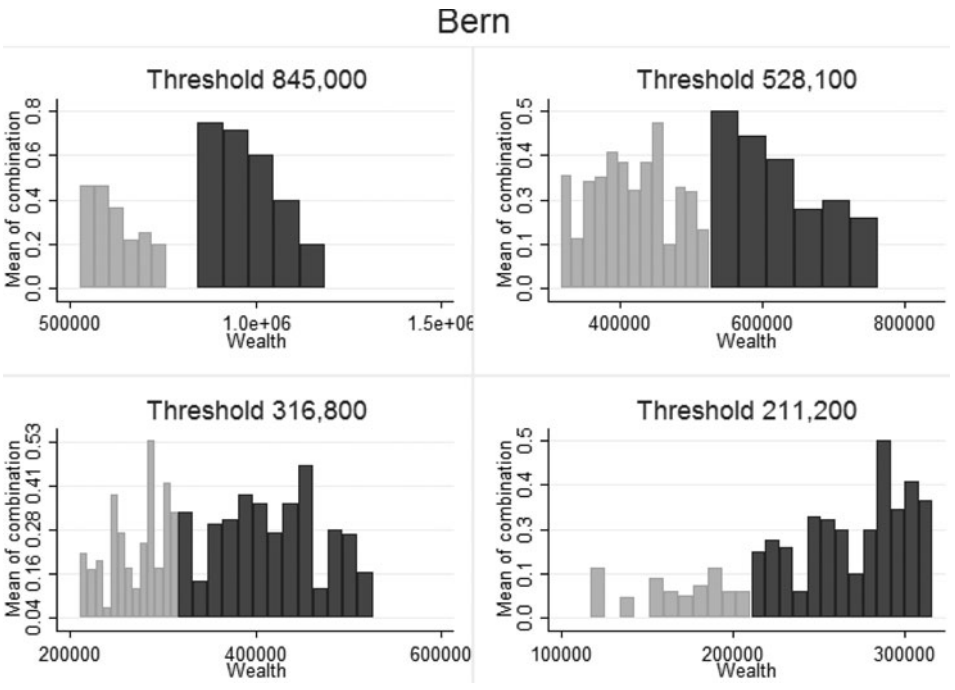

Figure 8. Mean of 'mixed option' across wealth, canton of Bern, married individuals.

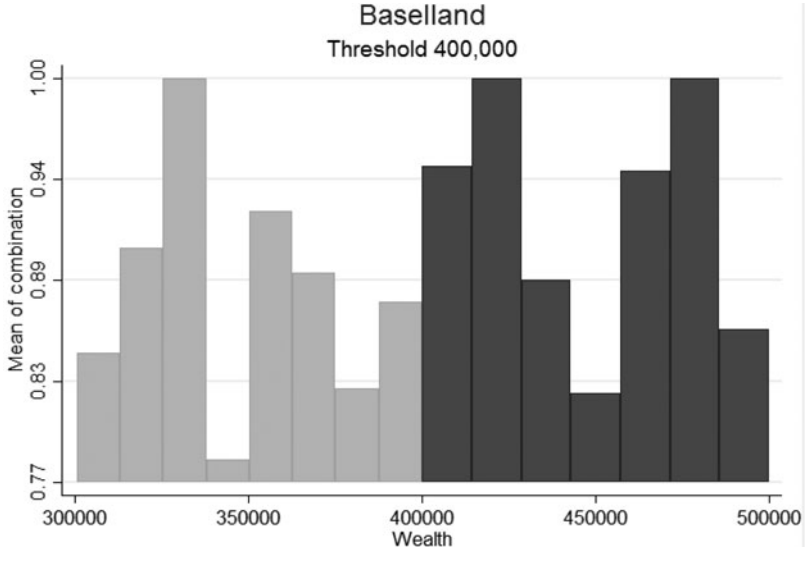

Figure 9. Mean of 'mixed option' across wealth, canton of Basel Land, married and single individuals.

We also estimate a linear probability model and a probit model for the effect of the tax rate on choosing either the full annuity or the full lump sum; hence we exclude the mixed option. This gives an idea how the tax rates affect the two polar options alone. This does not qualitatively change the results (see Tables A6 and A7 in the Appendix).

Table 4. RDD treatment effects for canton Aargau, married

Threshold	640,000		320,000		200,000		134,000		…
Bandwidth	320,000	270,000	120,000	110,000	90,000	80,000	26,000	21,000	…
T_i	1.002**	1.228**	0.936**	1.123**	−1.026	−1.792*	−1.679	0.191	…
	−0.45	−0.517	−0.465	(0.679)	(1.001)	−0.535	−1.465	−2.213	…
Wealth	8.11×10^{-7}*	1.04×10^{-6}*	4.24×10^{-6}***	-5.21×10^{-7}	-3.59×10^{-6}	4.81×10^{-6}**	-1.45×10^{-5}	7.79×10^{-7}	…
	-4.85×10^{-7}	-6.10×10^{-7}	-1.59×10^{-6}	(3.40×10^{-6})	(5.19×10^{-6})	-1.86×10^{-6}	-1.17×10^{-5}	-1.75×10^{-5}	…
Wealth × T_i	-1.45×10^{-6}**	-1.81×10^{-6}**	-3.42×10^{-6}**	4.73×10^{-6}	8.67×10^{-6}	-4.07×10^{-6}**	1.41×10^{-5}	-1.09×10^{-6}	…
	-6.53×10^{-7}	-7.78×10^{-7}	-1.66×10^{-6}	(3.66×10^{-6})	(5.42×10^{-6})	-1.91×10^{-6}	-1.20×10^{-5}	-1.79×10^{-5}	…
Const.	0.113	−0.0053	−0.823**	0.213	0.769	−0.981**	1.867	−0.0177	…
	−0.22	−0.293	−0.415	(0.580)	(0.918)	−0.491	−1.379	(2.131)	…
Obs.	190	158	233	139	120	225	68	54	…
R^2	0.03	0.038	0.082	0.094	0.105	0.073	0.026	0.004	…
Cov.	No	No	No	No	No	No	No	No	…

Outcome variable is choice of combination.

Table 5. RDD treatment effects for canton Bern, married

Threshold	845,000		526,000		316,000		…
Bandwidth	265,000	225,000	146,000	116,000	76,000	56,000	
T_i	0.562*** (0.171)	0.778*** (0.239)	0.354** (0.163)	0.409** (0.189)	−0.131 (0.0935)	−0.189* (0.112)	…
Const.	0.826*** (0.203)	1.195*** (0.424)	1.123*** (0.347)	1.362** (0.535)	−0.0175 (0.196)	−0.348 (0.359)	…
Obs.	86	66	163	124	295	207	…
R^2	0.116	0.160	0.032	0.037	0.010	0.017	…
Wealth	Yes	Yes	Yes	Yes	Yes	Yes	…
Wealth × T_i	Yes	Yes	Yes	Yes	Yes	Yes	…
Cov.	No	No	No	No	No	No	…

Outcome variable is choice of combination.

6.2 Results from regression discontinuity design

Figures 7–9 provide graphical evidence for strategic bunching for the three cantons with the highest number of observations in our dataset (Aargau, Bern, and Basel Land). They show that at the high tax thresholds in the cantons of Aargau and Bern and at the only tax threshold in the canton of Basel Land, the likelihood for choosing a combination is higher for individuals with wealth just above the threshold. This suggests that individuals with wealth just above these thresholds, where the marginal tax rate increases, annuitize part of their pension wealth (but not all of it) more often, on average.[24]

Results for the regression discontinuity design (RDD) estimations for the three cantons support the graphical evidence. Treatment effects for the canton of Aargau are positive and significant for the two highest tax thresholds (thresholds 640,000 and 320,000) and insignificant for all other thresholds (Table 4). The same holds true for the canton of Bern where treatment effects are positive and significant at thresholds 845,000 and 526,000 and insignificant thereafter (Table 5). In the canton of Basel Land, the treatment effect is positive and significant at the only tax threshold of 400,000 (Table 6).

Bandwidths for all cantons are selected on an ad-hoc basis and tested with the cross-validation procedure, a means of calculating the optimal bandwidth (see Jacob *et al.*, 2012, for an overview). Bandwidths from the cross-validation procedure are very similar to the bandwidths selected ad-hoc. For the canton of Basel Land, specifications with different bandwidths (in terms of wealth) ranging from 200,000 to 350,000 are shown (Table 6), revealing that the results are robust to a number of bandwidth choices.

Since the outcome variable is binary, the treatment effects for, e.g., Bern imply that being above the cut-off increases the probability of choosing the mixed option by over 40%. Effects are smaller for the canton of Basel Land, where the treatment effect implies an increase in the probability of choosing the mixed option by about 20%.[25]

Treatment effects for the cantons Basel Stadt and Fribourg are positive and significant in almost all specifications at the higher tax thresholds – 100,000 (Basel Stadt) and 190,000 (Fribourg). This provides additional evidence that individuals at the higher end of the wealth distribution choose a combination of annuity and lump sum to optimize taxation (see Tables A8 and A9 in the Appendix). Results for the lower tax thresholds are not significant, confirming the findings from the other cantons that only individuals at the higher end of the wealth distribution choose a mix of annuity and lump sum to optimize taxation. Results from the regression discontinuity desing (RDD) estimation for the canton of Zürich are never significant, which is to be expected with small jumps in the MTR lump sum schedule.

To sum up, results from the regression discontinuity estimations provide evidence that individuals at the higher end of the wealth distribution choose a combination of annuity and lump sum to

[24]Figures exclude individuals who choose a full annuity; gaps are due to insufficient observations.

[25]Treatment effects for the canton of Aargau lack a clear economic interpretation as they are larger than 1, a common problem associated with linear probability models.

Table 6. RDD treatment effects for canton Basel Land, married and single

Threshold	400,000			
Bandwidths	350,000	300,000	250,000	200,000
T_i	0.224*** (0.0470)	0.176*** (0.0518)	0.150** (0.0583)	0.149** (0.0640)
Const.	0.136*** (0.0228)	0.153*** (0.0259)	0.184*** (0.0304)	0.200*** (0.0348)
Obs.	365	305	254	213
R^2	0.059	0.037	0.025	0.025
Wealth	Yes	Yes	Yes	Yes
Wealth × T_i	Yes	Yes	Yes	Yes
Cov.	No	No	No	No

Outcome variable is choice of combination.

optimize taxation, whereas individuals with moderate or average wealth do not strategically place themselves in a lower tax bracket by choosing a combination of annuity and lump sum. This makes sense for two reasons: (i) the thresholds where there are jumps in the marginal tax rate are much closer together for lower wealth levels, thus positioning oneself in a lower tax bracket is often not worthwhile for individuals with low pension wealth; and (ii) high-wealth individuals can gain much more financially from annuitizing part of their pension wealth than low-wealth individuals.

7. Conclusion

In this paper, we have shown that taxes affect the annuitization decision. Research on annuitization decisions has strongly focused on behavioral factors. This is not surprising given that truly exogenous variations in annuity prices are hard to find. We exploit differences in taxation that result from the place of residence of individuals within the same pension provider.[26] We find sizeable and robust effects of differential taxes on lump sum and annuities on cash-out decisions despite the complexity and limited salience of such differences in tax loads.

The freedom to allocate pension wealth between an annuity and a lump sum opens up the possibility to minimize the tax burden by annuitizing an optimal fraction of pension wealth. Exploiting kinks in the tax schedule for the lump sum, a regression discontinuity provides clear evidence for strategic bunching: individuals with wealth just above the threshold where the marginal tax rate on the lump sum increases choose a combination of annuity and lump sum to end up in the lower marginal tax rate bracket. These tax optimization strategies are implemented only by relatively wealthy individuals for whom such behavior pays off financially, and who might be better informed than less wealthy individuals.

If individuals do react to tax incentives with regard to retirement choices, taxes might serve as an alternative or a supplementary measure to mandates and nudges to reduce poverty among the elderly. A more preferential tax treatment of annuities relative to the one of lump sum payments could induce more individuals to annuitize a (larger) share of their pension wealth, thereby reducing the danger that they outlive their assets and need social assistance in old age.

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[26]Place of residence refers to the location where the individual lived at time of retirement.

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Appendix A: Tables

Table A1. Descriptive statistics for the full sample, including individuals who receive full disability insurance

Variables	*N*	Mean	s.d.	Min	Max
Sex	14,620	0.343	0.475	0	1
Married	14,620	0.694	0.461	0	1
Age at retirement	14,620	64.32	1.578	58.00	70.97
Pension wealth	14,620	279,214	315,341	0	6,824,000
Income	14,620	65,681	59,970	0	1,085,000
Disability	14,620	13.82	32.58	0	100
PV	14,620	15.98	1.317	13.27	18.16
Outcome variable					
Annuity rate	14,620	0.516	0.481	0	1.000

Table A2. Minimum applicable conversion rates, 2007–15

Year	Men (age 65) (%)	Women (age 64) (%)
2007	7.10	7.15
2008	7.05	7.10
2009	7.05	7.00
2010	7.00	6.95
2011	6.95	6.90
2012	6.90	6.85
2013	6.85	6.80
2014	6.80	6.80
2015	6.80	6.80

Table A3. Number of observations per canton in dataset and in Switzerland

	Sample		Population statistics	
Canton	Number of obs.	Share	Number of obs.	Share
ZH	2,376	0.195	226,831	0.168
BE	1,740	0.143	187,588	0.139
LU	710	0.058	61,255	0.045
UR	35	0.003	6,415	0.005
SZ	464	0.038	22,663	0.017
OW	51	0.004	5,597	0.004
NW	78	0.006	6,836	0.005
GL	37	0.003	6,960	0.005
ZG	311	0.026	17,335	0.013
FR	282	0.023	39,918	0.03
SO	453	0.037	45,866	0.034
BS	314	0.026	38,679	0.029
BL	815	0.067	54,245	0.04
SH	101	0.008	15,121	0.011
AR	109	0.009	9,627	0.007
AI	66	0.005	2,679	0.002
SG	734	0.06	78,639	0.058
GR	456	0.037	35,077	0.026
AG	1,189	0.098	96,646	0.071
TG	488	0.04	39,287	0.029
TI	326	0.027	69,804	0.052
VD	314	0.026	113,529	0.084
VS	242	0.02	54,557	0.04
NE	139	0.011	31,338	0.023
GE	269	0.022	73,230	0.054
JU	87	0.007	13,037	0.01
Total	12,186	1	1,352,759	1

Table A4. Tobit regression of annuity rate on tax rate of lump sum and tax rate on annuity

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax rate LS	5.84*** (1.57)	5.88*** (1.57)	4.92*** (1.85)	2.56 (1.93)	2.61 (1.93)	3.01 (2.31)
Tax rate annuity	−5.36*** (1.03)	−5.53*** (1.03)	−5.38*** (1.27)	−4.90*** (1.13)	−5.07*** (1.13)	−5.13*** (1.40)
Wealth	0.47*** (0.03)	0.47*** (0.03)	0.48*** (0.04)	1.77*** (0.08)	1.77*** (0.08)	1.78*** (0.09)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.36*** (0.08)	−0.36*** (0.08)	−0.36*** (0.09)	−0.47*** (0.10)	−0.48*** (0.10)	−0.47*** (0.13)
Sex	0.17** (0.08)	0.17** (0.08)	0.12 (0.10)	0.55*** (0.09)	0.55*** (0.09)	0.51*** (0.11)
Married	−0.38*** (0.07)	−0.38*** (0.07)	−0.40*** (0.09)	−0.21*** (0.08)	−0.22*** (0.08)	−0.24** (0.09)
Age	5.31*** (0.71)	5.48*** (0.71)	5.02*** (0.90)	5.81*** (0.80)	5.98*** (0.80)	5.76*** (1.03)
Age squared	−0.04*** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)	−0.05*** (0.01)	−0.04*** (0.01)
PV	0.21*** (0.03)	−0.13 (0.11)	−0.16 (0.12)	0.19*** (0.03)	−0.10 (0.11)	−0.12 (0.13)
WEF	−0.59*** (0.09)	−0.59*** (0.09)	−0.70*** (0.12)	−0.65*** (0.12)	−0.65*** (0.12)	−0.81*** (0.16)
Debt PC			2.30* (1.35)			2.15 (1.47)
Constant	−174.54*** (22.73)	−175.20*** (22.76)	−160.37*** (28.65)	−193.34*** (25.56)	−194.31*** (25.59)	−187.73*** (32.97)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Observations	12,186	12,186	8,814	11,573	11,573	8,389
Pseudo-R^2	0.0350	0.0373	0.0415	0.0640	0.0660	0.0678

Table A5. Tobit regression of annuity rate on the ratio of tax on annuity to tax on lump sum

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Ratio	−2.71*** (0.85)	−2.81*** (0.85)	−2.42** (1.02)	−4.35*** (0.95)	−4.47*** (0.95)	−4.46*** (1.16)
Wealth	0.46*** (0.03)	0.47*** (0.03)	0.46*** (0.03)	1.77*** (0.08)	1.77*** (0.08)	1.78*** (0.09)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.36*** (0.08)	−0.37*** (0.08)	−0.37*** (0.09)	−0.48*** (0.10)	−0.49*** (0.10)	−0.49*** (0.13)
Sex	0.16* (0.08)	0.16* (0.08)	0.11 (0.10)	0.53*** (0.09)	0.53*** (0.09)	0.49*** (0.11)
Married	−0.37*** (0.07)	−0.37*** (0.07)	−0.38*** (0.08)	−0.23*** (0.08)	−0.23*** (0.08)	−0.25*** (0.09)
Age at retirement	5.32*** (0.71)	5.49*** (0.71)	5.09*** (0.89)	5.80*** (0.80)	5.96*** (0.80)	5.83*** (1.03)
Age squared	−0.04*** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)	−0.04*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)
PV	0.21*** (0.03)	−0.13 (0.11)	−0.15 (0.12)	0.18*** (0.03)	−0.10 (0.11)	−0.11 (0.13)
WEF	−0.57*** (0.09)	−0.57*** (0.09)	−0.68*** (0.12)	−0.64*** (0.12)	−0.64*** (0.12)	−0.79*** (0.16)
Debt PC			2.62** (1.30)			2.13 (1.40)
Constant	−174.54*** (22.68)	−175.10*** (22.71)	−162.37*** (28.59)	−192.55*** (25.50)	−193.48*** (25.53)	−189.73*** (32.92)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	No	Yes	No	No	Yes	No
Observations	12,009	12,009	8,650	11,396	11,396	8,225
Pseudo-R^2	0.0327	0.0348	0.0391	0.0621	0.0641	0.0655

Table A6. Effect of taxation on choosing a polar option: linear probability model for binary outcome annuity or lump sum on the tax rate on annuity and tax rate on lump sum

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax rate LS	1.09*** (0.26)	0.90*** (0.29)	1.09*** (0.26)	0.29 (0.27)	0.31 (0.31)	0.29 (0.27)
Tax rate annuity	−0.84*** (0.17)	−0.81*** (0.20)	−0.86*** (0.17)	−0.73*** (0.17)	−0.71*** (0.20)	−0.75*** (0.17)
Wealth	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.23*** (0.01)	0.21*** (0.01)	0.22*** (0.01)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.05*** (0.01)	−0.04*** (0.01)	−0.05*** (0.01)	−0.07*** (0.01)	−0.06*** (0.01)	−0.06*** (0.01)
Sex	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.07*** (0.01)	0.06*** (0.01)	0.07*** (0.01)
Married	−0.05*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)	−0.03*** (0.01)	−0.03** (0.01)	−0.03*** (0.01)
Age	0.76*** (0.10)	0.65*** (0.12)	0.78*** (0.10)	0.76*** (0.10)	0.67*** (0.12)	0.78*** (0.10)
Age squared	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)
PV	0.03*** (0.00)	0.01* (0.00)	−0.02 (0.02)	0.03*** (0.00)	0.01 (0.00)	−0.01 (0.02)
WEF	−0.07*** (0.01)	−0.07*** (0.01)	−0.07*** (0.01)	−0.08*** (0.02)	−0.08*** (0.02)	−0.08*** (0.02)
Debt PC		0.34* (0.19)			0.24 (0.18)	
Constant	−24.40*** (3.12)	−20.78*** (3.76)	−24.41*** (3.12)	−24.71*** (3.30)	−21.75*** (3.98)	−24.76*** (3.29)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Observations	10,032	7,690	10,032	9,638	7,407	9,638
R^2	0.060	0.062	0.064	0.114	0.110	0.118

Table A7. Effect of taxation on choosing a polar option: probit model for binary outcome annuity or lump sum on the tax rate on annuity and tax rate on lump sum

	Full sample			Excluding richest 5%		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax rate LS	1.48** (0.70)	1.58** (0.80)	1.52** (0.70)	0.91 (0.77)	0.99 (0.88)	0.94 (0.77)
Tax rate annuity	−2.49*** (0.46)	−2.43*** (0.53)	−2.58*** (0.46)	−2.01*** (0.46)	−1.93*** (0.54)	−2.06*** (0.46)
Wealth	0.25*** (0.03)	0.25*** (0.02)	0.25*** (0.03)	0.64*** (0.03)	0.62*** (0.03)	0.64*** (0.03)
Wealth squared	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)	−0.00*** (0.00)
Income	−0.15*** (0.04)	−0.15*** (0.04)	−0.16*** (0.04)	−0.18*** (0.04)	−0.17*** (0.05)	−0.18*** (0.04)
Sex	0.11*** (0.03)	0.08** (0.04)	0.11*** (0.03)	0.20*** (0.04)	0.18*** (0.04)	0.20*** (0.04)
Married	−0.12*** (0.03)	−0.14*** (0.03)	−0.12*** (0.03)	−0.08** (0.03)	−0.08** (0.03)	−0.08*** (0.03)
Age	2.03*** (0.30)	1.98*** (0.36)	2.11*** (0.30)	2.17*** (0.32)	1.97*** (0.40)	2.24*** (0.32)
Age squared	−0.02*** (0.00)	−0.02*** (0.00)	−0.02*** (0.00)	−0.02*** (0.00)	−0.02*** (0.00)	−0.02*** (0.00)
PV	0.07*** (0.01)	0.02 (0.01)	−0.04 (0.04)	0.07*** (0.01)	0.02 (0.01)	−0.03 (0.05)
WEF	−0.24*** (0.04)	−0.29*** (0.05)	−0.24*** (0.04)	−0.27*** (0.05)	−0.32*** (0.06)	−0.27*** (0.05)
Debt PC		0.75 (0.51)			0.69 (0.52)	
Constant	−66.93*** (9.47)	−64.69*** (11.65)	−67.93*** (9.52)	−72.31*** (10.25)	−65.36*** (12.65)	−73.05*** (10.30)
NOGA dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Observations	10,027	7,686	10,027	9,633	7,403	9,633
Pseudo-R^2	0.0566	0.0653	0.0601	0.0899	0.0917	0.0932

Table A8. RDD treatment effects for the canton of Fribourg, married individuals

Thresholds	190,000				130,000	
Bandwidths	60,000		50,000		50,000	
T_i	0.272** (0.133)	0.605 (1.242)	0.410** (0.192)	5.120** (2.249)	−0.0753 (0.185)	0.828 (0.812)
Constant	0.117 (0.121)	−47.75 (29.80)	0.218 (0.210)	−59.75* (31.08)	−0.214 (0.276)	16.60 (87.89)
Observations	113	113	74	74	38	38
R^2	0.045	0.116	0.069	0.233	0.046	0.242
Wealth	Yes	Yes	Yes	Yes	Yes	Yes
Wealth × T_i	No	Yes	No	Yes	No	Yes
Cov.	No	Yes	No	Yes	No	Yes

Outcome variable is choice of combination.

Table A9. RDD treatment effects for the canton of Basel-Stadt, married individuals

Thresholds	100,000		50,000	
Bandwidths	50,000		25,000	
T_i	0.344** (0.143)	0.163 (0.575)	5.284** (1.991)	5.019* (2.480)
Constant	0.00354 (0.130)	−54.01*** (20.38)	−5.284** (1.975)	−12.97 (29.92)
Observations	126	126	91	91
R^2	0.045	0.141	0.398	0.421
Wealth	Yes	Yes	Yes	Yes
Wealth × T_i	No	Yes	Yes	Yes
Cov.	No	Yes	No	Yes

Outcome variable is choice of combination.

Table A10. Robustness checks (I): RDD treatment effects for canton Bern, married individuals, threshold 845,000

Bandwidths	319,000			265,000			225,000			145,000		
T_i	0.200* (0.112)	0.355** (0.153)	0.317** (0.152)	0.567*** (0.164)	0.910*** (0.244)	0.951*** (0.237)	0.775*** (0.234)	0.877*** (0.277)	0.930*** (0.278)	0.931* (0.452)	0.843** (0.391)	0.863* (0.418)
Const.	−63.47** (25.01)	0.627*** (0.176)	−62.53** (24.99)	−71.75*** (25.97)	2.391*** (0.842)	−74.99*** (25.40)	−56.56* (28.97)	2.367 (1.838)	−60.65** (29.22)	−23.49 (91.22)	19.14* (9.265)	35.48 (88.45)
Wealth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wealth × T_i	No	No	No	No	No	No	No	No	No	No	No	No
Wealth squared	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Cov.	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Obs.	109	109	109	87	87	87	67	67	67	26	26	26
R^2	0.116	0.056	0.127	0.214	0.156	0.260	0.227	0.170	0.240	0.336	0.410	0.465

Outcome variable is choice of combination.

Table A11. Robustness checks (II): RDD treatment effects for canton Bern, married individuals, threshold 526,000

Bandwidths	210,000			146,000			116,000			76,000		
T_i	1.371***	0.249*	0.261**	0.431***	0.398**	0.432***	0.495***	0.454**	0.495***	0.655***	0.665***	0.651***
	(0.513)	(0.127)	(0.126)	(0.156)	(0.159)	(0.157)	(0.182)	(0.183)	(0.183)	(0.228)	(0.225)	(0.229)
Const.	−39.65**	−0.529	−42.48**	−46.92**	1.358	−46.84**	−38.56	1.593	−39.23	−31.07	5.544 (6.834)	−31.55
	(18.97)	(0.462)	(19.05)	(21.55)	(1.236)	(21.64)	(24.69)	(2.292)	(24.95)	(35.82)		(36.03)
Wealth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$T_i \times$ Wealth	Yes	No	No	No	No	No	No	No	No	No	No	No
Wealth squared	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Cov.	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Obs.	258	258	258	166	166	166	126	126	126	72	72	72
R^2	0.091	0.036	0.093	0.111	0.041	0.111	0.125	0.048	0.126	0.188	0.116	0.191

Outcome variable is choice of combination.

Appendix B: Figures

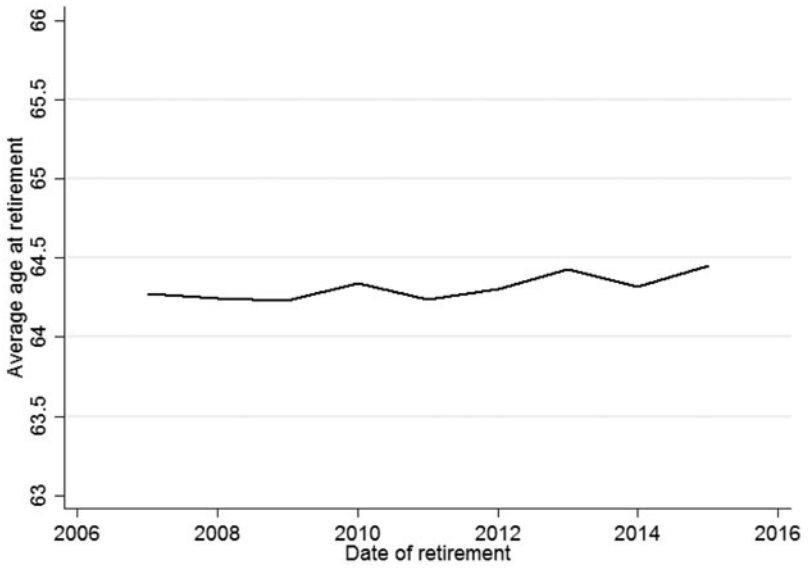

Figure B1. Average age at retirement across years, 2007–15; full sample excluding individuals that receive disability insurance.

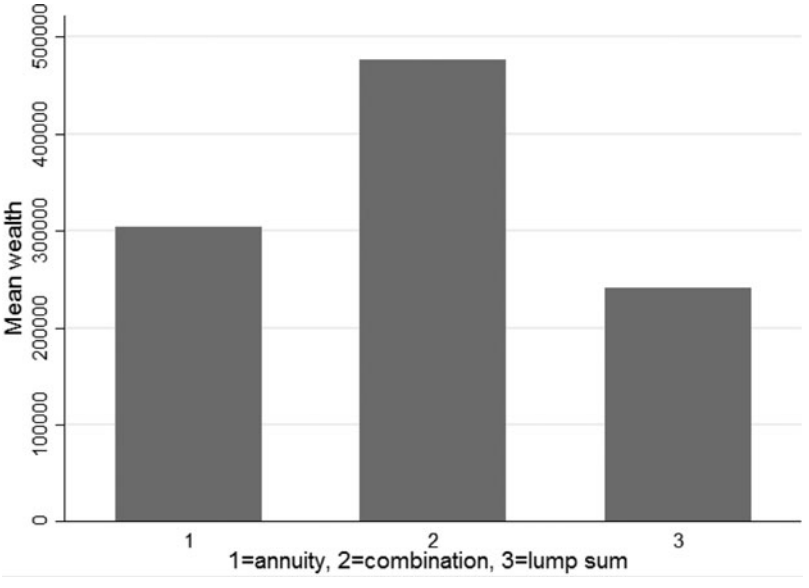

Figure B2. Average wealth across choice (full annuity, combination annuity and lump sum, full lump sum); full sample excluding individuals that receive disability insurance.

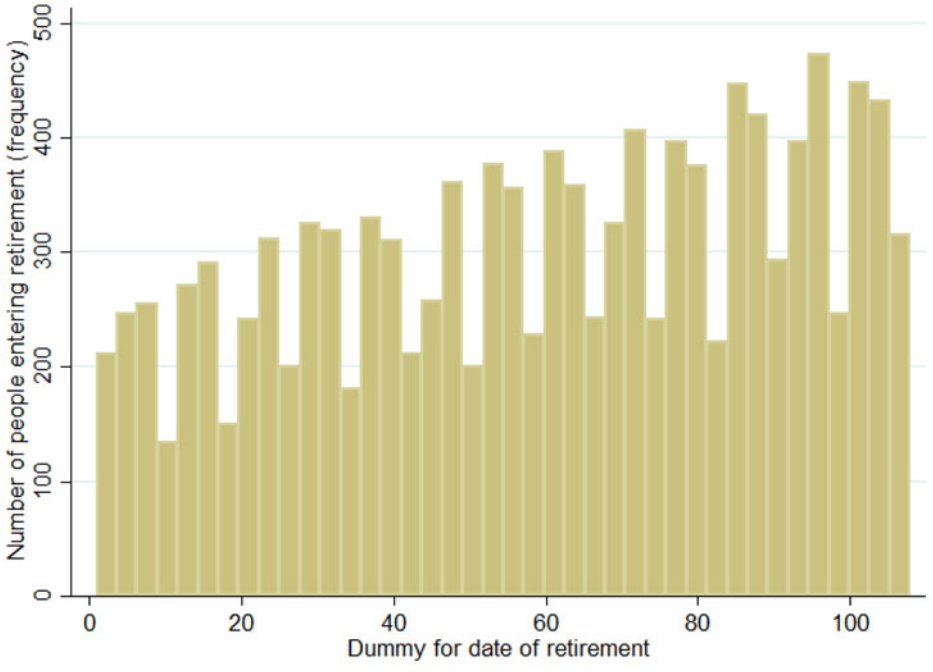

Figure B3. Histogram of the number of people entering retirement, 2007–15; full sample.

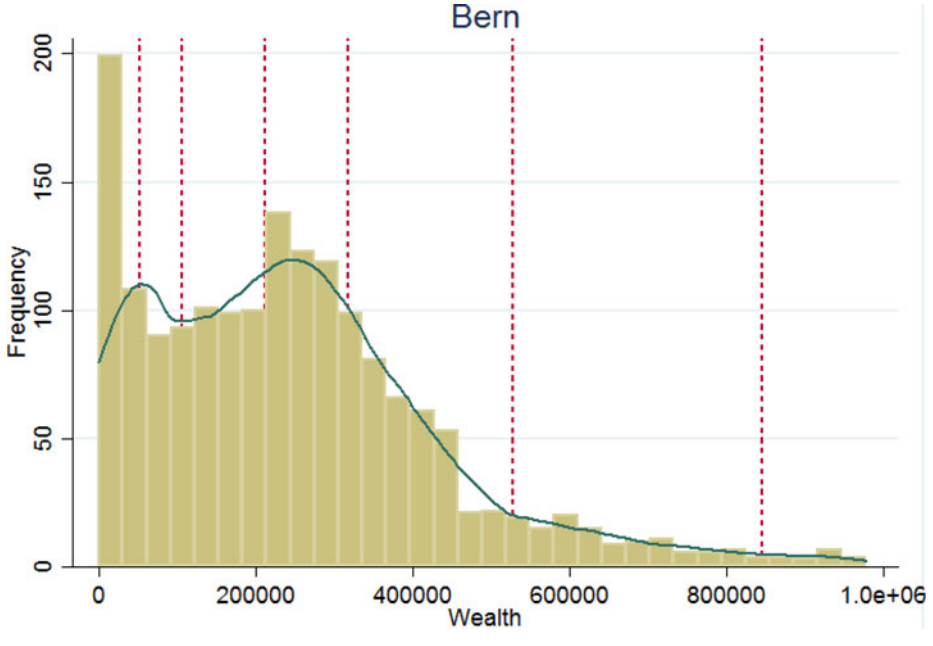

Figure B4. Wealth frequency density and wealth kernel density for wealth 0 to 1,000,000, married individuals, canton Bern. Red dotted lines indicate tax thresholds where marginal tax rates increase.

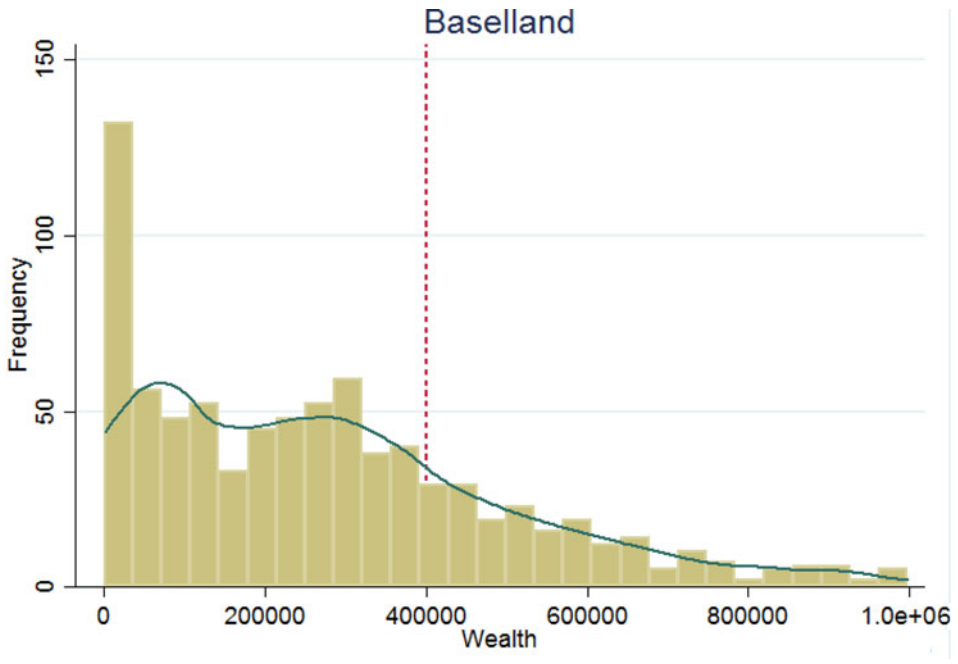

Figure B5. Wealth frequency density and wealth kernel density for wealth 0 to 1,000,000, married and single individuals, canton Basel Land. Red dotted line indicates tax threshold where marginal tax rates increases.

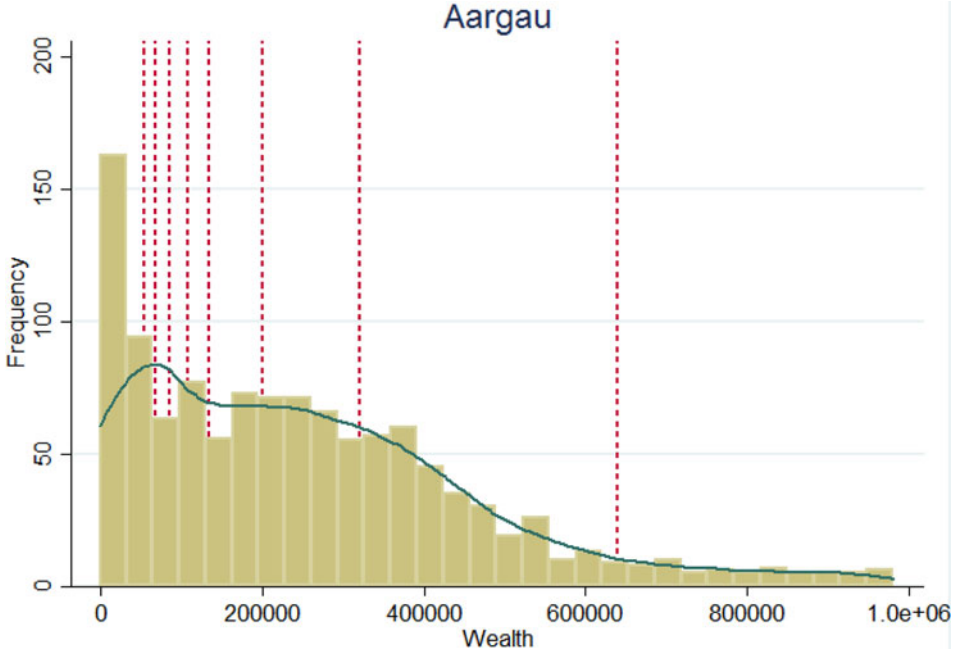

Figure B6. Wealth frequency density and wealth kernel density for wealth 0 to 1,000,000, married individuals, canton Aargau. Red dotted lines indicate tax thresholds where marginal tax rates increase.

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