Saving Responses to Mandatory Pension Plans*

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January 2025

Abstract

To boost retirement savings, half of OECD countries mandate workers to contribute a portion of their earnings to pension accounts. I study saving responses to such mandates drawing on detailed administrative tax data from Switzerland. Leveraging a discontinuity in mandatory pension contributions at an earnings threshold, I present three main findings. First, the mandate has no effect on total savings, with an estimated crowd-out rate of 93%. Second, decomposing the saving response by asset type, I find that workers fully offset mandatory pension contributions by reducing private savings, primarily in financial assets. Third, I provide suggestive evidence that the mandate does increase total savings among workers who face liquidity constraints.

JEL classification: D14, E21, H2, H3, J26

Keywords: retirement, pension, savings, mandatory, response, crowding-out

*I thank Maximilian von Ehrlich, Florian Scheuer, and Josef Zweimüller for guidance and support, and I am grateful to Arun Advani, Pavel Brendler, Camilla Skovbo Christensen, Helen Hughson, Andreas Peichl, Arthur Seibold, David Seim, Stefan Staubli, Wouter van der Wielen, and participants at EEA-ESEM, IIPF Annual Congress, Swiss Workshop on Local Public Finance and Regional Economics, University of Zurich Labor Lunch, Workshop of the Swiss Network on Public Economics, and ZEW Public Finance Conference for helpful comments. I also thank the tax administration of the canton of Bern, in particular Hans Frauchiger, for providing access to de-identified administrative microdata for the purpose of this research, and Jonas Meier for helping with requesting and processing the data. This paper supersedes an earlier version entitled "Behavioral Responses to a Pension Savings Mandate: Quasi-experimental Evidence from Swiss Tax Data".

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1 Introduction

Population aging makes it increasingly difficult for pension systems to provide sufficient financial support to retirees (Poterba, 2014). In response, governments around the world have introduced policies to raise retirement savings, including mandating contributions to pension accounts. By 2022, 19 of the 38 OECD countries have implemented some form of mandatory pension plans (OECD, 2023). Typically, these mandates require workers to regularly contribute a portion of their earnings to a pension plan. Contributions are withheld at source by the employer and directly transferred to an illiquid pension account, making it straightforward to build up retirement savings, at the cost of reducing take-home pay.

Do pension plan mandates succeed in boosting savings? Ex ante, this is unclear. Individuals may respond to being forced to contribute to a retirement account by reducing other types of savings or taking on more debt. As a consequence, mandatory contributions may affect the portfolio composition, diverting savings to less liquid pension accounts, but not change overall savings levels. Analyzing saving responses across the entire portfolio is key to understanding how mandatory pension plans affect wealth accumulation and financial preparedness for retirement.

However, there is little prior evidence due to identification and data challenges. To disentangle saving responses from unobserved heterogeneity in saving preferences, a source of exogenous variation in mandate coverage is needed. But researchers cannot conduct experiments that coerce individuals randomly assigned to treatment to contribute to retirement accounts. Furthermore, assessing portfolio responses is difficult because it requires access to microdata covering savings in all types of assets. These are hard to obtain at scale as information about wealth is typically not included in administrative datasets.

This paper estimates the effects of mandatory pension plans on comprehensive and detailed measures of individual-level savings, combining administrative tax data with identifying variation from the occupational pension plan mandate in Switzerland. In a first step, I estimate the pass-through of mandatory retirement contributions to total savings. Then, I characterize the saving response throughout the portfolio. The rich information on savings and wealth allows me to decompose the response into voluntary pension savings and private savings by asset type such as financial wealth, business wealth, property wealth, other wealth, and debt. Finally, I examine how liquidity constraints shape workers' saving responses.

Switzerland is a particularly suitable laboratory for studying saving responses to mandatory pension plans as the institutional context and rich administrative data enable me to overcome the obstacles highlighted above. I approximate the ideal experiment exploiting the fact that the pension plan mandate only applies to work-

ers with earnings above a threshold, providing compelling identifying variation in mandatory retirement contributions among otherwise very similar workers. With exogenous variation in hand, I draw on comprehensive and detailed income tax and wealth tax records to construct granular measures of savings at the asset-type level. The universal coverage of the administrative data ensures representativeness and provides ample statistical power to precisely estimate effects. Measurement error and misreporting, common concerns with survey data, are limited because the tax authority verifies the tax records for administrative purposes. The institutional setting in Switzerland is similar to many other high- and middle-income countries. The pension system consists of three pillars in the form of a pay-as-you-go scheme, employer-based pension plans, and preferentially taxed private pension accounts. This raises the likelihood that the findings of this paper extrapolate to other contexts.

The Swiss pension plan mandate requires employees whose annual earnings exceed a relatively low threshold of around CHF 20,000 (corresponding roughly to the 30^{th} percentile of the earnings distribution) to contribute to an employer-sponsored pension account.[1] Individuals subject to the mandate cannot opt out. Contributions are calculated by applying a legally defined age-specific contribution rate to qualifying earnings which equal gross earnings minus a deduction. For workers whose earnings are marginally above the mandate threshold, the contribution rate is applied to a fixed minimum. This causes a discontinuity in mandatory pension savings at the cutoff, meaning that otherwise similar workers are required to contribute substantially different amounts to employer-based pension accounts. Because being enrolled in an occupational pension plan raises the cap on contributions to preferentially taxed private pension accounts, there is also a discontinuity in the cap on private pension savings at the threshold.

I combine the sharp policy variation with high-quality administrative tax data on income, wealth, and savings from the second-largest Swiss canton, Bern, spanning years 2005 to 2017. The data cover the entire adult population and provide detailed information on individual-level voluntary retirement savings, wealth, and debt, enabling me to construct savings measures by asset type. They also allow me to link partners to include household-level variables in the analysis. These data are quite exceptional as Switzerland is one of only three OECD countries that still levy a comprehensive wealth tax (OECD, 2018*c*).

To estimate the saving response to mandatory pension plans, I leverage the variation in mandate coverage provided by the earnings threshold within a regression discontinuity framework. As workers with earnings just below and just above the threshold are very similar in all dimensions, except that only those above are sub-

[1]For most of the sample period 2005–2017, the Swiss franc (CHF) was trading roughly at parity with the US dollar. Hence, I do not report separate figures in US dollar.

ject to the mandate, this allows me to identify the causal effect. I estimate that the mandate causes a discontinuity in mandatory retirement savings of CHF 406, corresponding to around 2% of workers' earnings. This provides substantial variation to estimate the effects on other types of savings.

I present three sets of findings on the saving responses to mandatory pension plans. *First*, I find that the mandate has no effect on total savings. The point estimate is CHF 29 and implies a crowd-out rate of 93%. Based on the 95% confidence interval, I can reject increases in total savings by more than CHF 250. This implies that workers undo the impact of mandatory retirement contributions on overall savings by reducing other savings by a similar amount.

Second, I decompose the overall effect to identify the types of savings that drive the crowding-out response. This allows me to examine portfolio reallocation effects of the mandate. I split up total savings into private savings, which include any type of savings not explicitly earmarked for retirement, and voluntary pension savings. I estimate separate effects for these two savings categories and then disaggregate them further to determine the saving response for each asset type. In sum, I find that workers fully offset the mandatory retirement contributions by reducing private savings, especially in financial wealth. This implies that the mandate reallocates savings from more liquid financial assets to less liquid pension accounts.

More specifically, I estimate that the mandate lowers overall private savings by CHF 375. This drop is of similar magnitude as the mandatory pension contributions. Breaking down private savings into asset types, I find that the overall decline is mainly driven by savings in financial assets which include bank accounts, stocks, bonds, and other investments. I estimate a statistically significant decrease in financial savings by CHF 260. While most of the point estimates for the other asset types are negative, I do not find significant effects on business wealth, property wealth, other types of wealth, or debt. For savings in property, I estimate a drop by CHF 69 but the confidence interval is relatively wide because property investments are lumpy. The precision of the effect estimates for business wealth, other wealth, and debt allows me to rule out even small changes. It seems intuitive that workers respond to the mandate mainly by lowering savings in financial assets as they are more liquid than other types of wealth.

While the mandate decreases private savings, I find a highly significant increase in voluntary pension savings by CHF 112. These consist of private pension savings and voluntary lump-sum buy-ins into occupational pension plans which I can both observe in the tax data because they can be deducted from taxable income. The positive effect is surprising but it is confounded by the increase in the contribution cap on preferentially taxed private pension savings at the threshold. I separate out the impact of the changing cap from the effect of mandatory retirement contributions

by estimating the effect across the distribution of private pension savings. I find evidence that the increase in private pension savings is entirely driven by the change in the contribution cap. Holding the cap fixed across the threshold, I estimate a precise null effect on private pension savings. In line with this result, I also find a precisely estimated null effect on occupational pension buy-ins.

Third, I show how liquidity constraints shape saving responses to the mandate. To investigate the role of liquidity, I allow for heterogeneous effects across workers with different levels of baseline financial assets and household income. Reassuringly, I obtain highly consistent results using these two proxies for liquidity constraints. I find suggestive evidence that workers who are subject to liquidity constraints are not able to reduce their private savings enough to fully offset the mandatory retirement contributions. Consequently, the mandate increases their total savings by around CHF 200, representing 1% of earnings, although this estimate is not statistically significantly different from zero. Workers with high levels of financial wealth or household income respond to the mandate (and the associated increase in the cap on private pension contributions) by lowering private savings disproportionately to offset the mandated pension contributions and channel more of their savings into tax-advantaged private pension accounts, while keeping overall savings constant.

This paper contributes to three strands of the literature on saving responses to pension policies. First, it adds to the thin evidence base on mandatory pension plans. While there are vast literatures on other types of pension policies such as financial incentives and automatic enrollment (see, e.g., Choi, 2015; OECD, 2018*a*), we lack systematic evidence on the impact of pension plan mandates on saving behavior. The few existing papers find that mandated pension contributions lead to modest crowding-out of other savings (Card and Ransom, 2011; Arnberg and Barslund, 2014; Chetty et al., 2014; Friedberg, Leive and Cai, 2024). Seminal work by Chetty et al. (2014) finds close to full pass-through of mandatory retirement contributions to total savings using a regression discontinuity approach similar to this paper. But the identifying variation in mandated savings is only around $50 – almost an order of magnitude smaller than in the Swiss setting – and the threshold is at roughly $5,000, so the marginal workers affected by the mandate have very low earnings. Card and Ransom (2011) and Friedberg, Leive and Cai (2024) study the effect of mandatory pension contributions on voluntary retirement savings among faculty members at U.S. universities. Card and Ransom (2011) find crowd-out rates of 60–80% for mandatory employee contributions but only half of that for employer contributions. Friedberg, Leive and Cai (2024) estimate a considerably lower overall crowd-out rate of 30%. But they observe full crowding-out among low-earners with low savings and high-earners with high savings. As is typical in research drawing on data from pension plan providers, neither of the two papers is able to assess the response of savings

outside pension accounts sponsored by the employer.

I contribute to this literature by analyzing saving responses to mandatory pension contributions across the entire portfolio. In contrast to Chetty et al. (2014), I estimate close to full crowding-out. This suggests that a large share of workers subject to the Swiss pension plan mandate are "active savers" who undo its effect on total savings. One potential explanation is that the mandated retirement contributions in the Swiss context are much larger, which may help workers overcome fixed adjustment costs. At the same time, I find that mandatory retirement contributions do not affect voluntary pension savings which is consistent with previous findings of limited crowding-out of pension savings. Further, I show that liquidity constraints affect how individuals respond to mandatory pension savings, potentially explaining some of the variation in results across different contexts. I also contribute to this literature by providing novel evidence of portfolio reallocation responses, finding that mandatory pension contributions are funded by a reduction in financial savings.

Second, my findings are related to the literature on automatic saving policies, such as automatic enrollment and defaults, which aim to nudge workers into enrolling in pension plans and raising retirement savings. The key difference between mandatory pension plans and automatic saving policies is that mandates do not allow individuals to opt out, which constrains the set of available behavioral responses. The evidence consistently shows that automatic saving policies substantially increase contributions to pension accounts in the short run (Madrian and Shea, 2001; Choi et al., 2004; Thaler and Benartzi, 2004; Beshears et al., 2009; Benartzi and Thaler, 2013; Chetty et al., 2014; Blumenstock, Callen and Ghani, 2018; Cribb and Emmerson, 2020; Chalmers et al., 2022; Bucher-Koenen, Wallossek and Winter, 2024). But recent research documents that these positive effects are attenuated in the medium to long term because workers offset the increase in savings through a range of response margins (Derby, Mackie and Mortenson, 2023; Falk and Karamcheva, 2023; Choi et al., 2024; Choukhmane, 2024). These responses include, e.g., contributing at lower rates, participating at lower rates at subsequent employers without automatic enrollment, and withdrawing funds from pension accounts upon job separation. These findings highlight the potential advantages of mandatory pension plans over nudges, as mandates do not allow workers to opt out or decrease contribution rates below the statutory minimum (as well as limiting withdrawals).

Whereas the early literature focused on the effects of auto-enrollment on retirement savings, recent work examines the effects on debt and assets outside pension accounts. Using detailed data from a UK bank, Choukhmane and Palmer (2024) find that a substantial share of increased retirement contributions is funded by reduced deposit balances and increased debt. This is consistent with Beshears et al. (2024) who show that employees of small UK businesses partly finance automatic savings

with higher unsecured debt. By contrast, Beshears et al. (2022) do not find an effect on debt or credit scores of civilian employees of the U.S. Army.

I show that even strict mandate policies may not succeed in boosting overall savings as workers respond by reducing private savings outside retirement accounts. But mandatory pension plans can still improve financial preparedness for retirement by reallocating savings from liquid private accounts to illiquid pension accounts which are more likely to be untouched until retirement and converted into annuities. I also add to the emerging evidence on how savings outside pension accounts respond by analyzing the effect on private savings across different asset types.

Third, this paper relates to the longstanding literature on the savings effects of public pension systems. The evidence suggests that private savings respond significantly to changes in public pension contributions and benefit eligibility, but the degree of substitution varies across settings and reforms (Feldstein, 1974; Attanasio and Brugiavini, 2003; Attanasio and Rohwedder, 2003; Bottazzi, Jappelli and Padula, 2006; Aguila, 2011; Lachowska and Myck, 2018; Lindeboom and Montizaan, 2020; Etgeton, Fischer and Ye, 2023; García-Miralles and Leganza, 2024). Mandatory pension plans and mandatory public pensions differ because plans typically feature a stronger link between contributions and benefits. Pension plan contributions are often paid into fully funded personalized accounts, whereas public pension benefits do not usually increase one-to-one with contributions. In addition, there is greater uncertainty about how current contributions to pay-as-you-go systems translate into future benefits because that depends on demographic and economic trends.

I find that mandatory contributions to pension plans, which transparently increase individual pension wealth, are completely offset by reductions in private savings. This stands in contrast to some of the evidence on public pensions which can potentially be explained by the strong and salient tax-benefit linkage of mandatory pension plans (Bozio, Breda and Grenet, 2023). While the literature on public pensions typically relies on survey data, I use high-quality administrative data to estimate saving responses throughout the portfolio, similar to García-Miralles and Leganza (2024) who study the effect of delayed pension benefit eligibility on private savings.

The remainder of this paper is organized as follows. In Section 2, I discuss the relevant parts of the Swiss pension system. Section 3 describes the administrative tax data and data preparation. Section 4 explains the regression discontinuity approach that exploits the discontinuity in mandate coverage at the earnings threshold. Section 5 presents the main results on the saving responses to mandatory pension plans. Section 6 explores the role of liquidity constraints. Section 7 concludes.

2 Institutional Background

The Swiss old-age provision system consists of three pillars: (i) a standard pay-as-you-go system, (ii) a fully funded occupational pension system, which includes the mandatory pension plans studied in this paper, and (iii) voluntary private pension accounts. The structure is similar to pension systems in many other countries that consist of a government-backed defined-benefit plan, employer-sponsored defined-contribution plans, and preferentially taxed private pension accounts (e.g., in Denmark or the U.S., see Chetty et al., 2014).[2] This section introduces the relevant institutional context, focusing on the rules of the occupational pension system and voluntary private pension accounts from 2005 to 2017, the years used in the main analysis. There have been no major changes to the pension system during this period.[3] Appendix B describes the Swiss old-age provision system in more detail.

2.1 Occupational Pension System

The occupational pension system requires most workers to contribute to an employer-sponsored pension account. Employees must be enrolled in a pension plan by their employer if their annual gross earnings in the main job exceed a legally defined threshold. The pension savings mandate applies to women between 25 and 64 years and men between 25 and 65 years of age. The mandate is binding: employees meeting these conditions cannot opt out. Consequently, coverage is quite comprehensive. In 2017, 4.2 million individuals were enrolled in an occupational pension fund, representing around 83% of the Swiss labor force (Federal Statistical Office, 2019). Total contributions equalled CHF 54 billion, equivalent to 8% of GDP. These numbers demonstrate that occupational pension plans are one of the most important savings instruments in Switzerland.

The earnings threshold determining mandate coverage has increased gradually from CHF 19,350 in 2005 to CHF 21,150 in 2017.[4] Some occupational pension plans may enroll employees with earnings below the statutory cutoff on a voluntary basis. However, comparing information reported directly by occupational pension funds to administrative data collected by the social insurance system, Ecoplan (2010) concludes that there are only small discrepancies between the number of employees enrolled in occupational pension plans and the equivalent counts inferred from earn-

[2]Simplifying, the corresponding three pillars in the U.S. are Social Security, 401(k) plans, and IRAs.

[3]The occupational pension system was reformed between 2004 and 2006, but the relevant changes were implemented by 2005. Appendix Section B.4 provides more information about the reform.

[4]Like most parameters of the occupational pension system, the threshold is set as a function of the maximum pension in the pay-as-you-go system in order to avoid overinsurance. Benefit levels in the pay-as-you-go system are usually adjusted every other year based on an index capturing the mean of nominal wage growth and inflation.

ings data. The difference is attributed to workers being enrolled in plans at multiple employers, self-employed individuals joining a plan voluntarily, and employees not covered by the mandate enrolling voluntarily. I cannot observe whether workers below the threshold contribute to an occupational pension account because these contributions are not recorded in the tax data. This could induce some measurement error, but I expect the bias to be limited as the number of workers contributing voluntarily appears to be small.

Mandatory occupational pension savings are calculated by applying a contribution rate to qualifying earnings which equal gross earnings minus a deduction. The deduction has increased from CHF 22,575 in 2005 to CHF 24,675 in 2017 and serves a similar purpose as the mandate threshold. The statutory age-specific contribution rates are 7% for ages 25–34, 10% for ages 35–44, 15% for ages 45–54, and 18% for ages 55–64 among women and ages 55–65 among men. Employers must pay at least half the contribution. The share paid by employees is deducted from their earnings by the employer and directly transferred to the pension fund, along with the employer part. Contributions are exempt from income tax.

Importantly, there is a minimum for qualifying earnings. This has risen from CHF 3,225 to CHF 3,525 over the sample period. For employees whose earnings exceed the mandate threshold by only a small amount, the contribution rate is not applied to the marginal earnings above the threshold or deduction but to that minimum amount. This creates a discontinuity in mandatory pension contributions at the cutoff. I leverage this source of exogenous variation to study the effects of the mandate. Appendix Figure A.1 illustrates the calculation of mandatory retirement contributions as a function of gross earnings for a worker aged 45–54 in 2017.[5]

In addition to mandatory contributions, many occupational pension schemes allow lump-sum "buy-ins" which can also be deducted from taxable income.[6] These buy-ins can be directly observed in the tax records.

Upon retirement, benefits can be received in the form of a lifelong annuity, a lump-sum payment, or a combination of the two. While contributions and returns on investment are exempt from income tax (and there is no capital gains tax in Switzerland) and occupational pension wealth is exempt from wealth tax, pension benefits are taxed.[7]

[5]Equation (4) in Appendix Section C.4 shows how to compute mandatory occupational pension savings.

[6]Individuals can make buy-ins up to the level of savings that they would have accumulated, had they been earning their current salary since they were 25 years old (Kuhn, 2020).

[7]The majority of OECD countries applies a similar "exempt-exempt-taxed" regime (OECD, 2018*b*).

2.2 Private Pension Savings

In addition to contributing to the pay-as-you-go system and occupational pension plans, employees can make voluntary contributions to designated private pension accounts. These contributions can also be deducted from taxable income up to an annual cap. The access to those funds is restricted until individuals enter retirement. Private pension accounts need to be set up separately with a bank or insurance company. In the remainder of this paper, I refer to this savings vehicle as "private pension savings". Total private pension savings in designated accounts equal roughly CHF 10 billion per year, representing 1.5% of Swiss GDP (Schüpbach and Müller, 2019).

The contribution cap depends on whether workers are enrolled in an occupational pension plan. If they are enrolled, they can make yearly private pension contributions up to a fixed cap which has grown from CHF 6,192 in 2005 to CHF 6,768 in 2017. Workers not enrolled in an occupational pension plan can contribute up to 20% of their net earnings.[8] Importantly, this means that the cap is significantly lower for workers just below the mandate threshold who are not enrolled in an occupational pension plan than for workers just above. Below but close to the threshold, the cap is between CHF 3,500 and CHF 4,000 in all years in the estimation sample.[9] Workers above the cutoff are required to be enrolled in an occupational pension plan, so they can all make private pension contributions up to the fixed cap between CHF 6,000 and CHF 7,000. This discontinuity in the contribution cap at the threshold could confound the estimated response of private pension savings to the mandate. In the empirical analysis, I carefully disentangle the impact of the change in the cap from the effect of mandatory retirement contributions.

There are strong tax incentives for private pension savings, in particular for high-income and high-wealth individuals, because contributions can be deducted from taxable income and the accumulated capital is exempt from the wealth tax. Upon retirement, private pension capital can be claimed as an annuity subject to income tax or as a lump sum taxed at special but usually preferential rates.

[8] There is also a fixed upper bound on private pension contributions for individuals not enrolled in an occupational plan which has increased from CHF 30,960 to CHF 33,840 over the sample period. This applies in particular to the self-employed, but it is not relevant for employees included in my analysis because the cap equal to 20% of net earnings binds first.

[9] The mandate threshold is around CHF 20,000 in gross earnings and the employee share of social insurance contributions a bit above 6%, with the exact numbers depending on the year. Therefore, the simplified calculation for the lower contribution cap is: CHF 20,000 $\times$ $(1 - 0.06) \times 0.2$ = CHF 3,760. The cap can be higher if workers have additional earnings, e.g., from working a second job.

3 Data

Assessing the effect of the pension plan mandate on saving behavior requires comprehensive individual-level measures of savings. These are challenging to obtain because high-quality microdata on assets and savings are scarce. Switzerland is a particularly well-suited setting to study saving choices and wealth accumulation due to the availability of administrative tax data on wealth.[10] However, there is no individual-level dataset on wealth with nationwide coverage because the wealth tax is only collected at the cantonal and municipal level.

I draw on administrative tax microdata from the canton of Bern which is the second-largest Swiss canton by population and approximately representative for Switzerland (Brunner, Meier and Näf, 2020).[11] The tax records provide detailed and comprehensive information on income, wealth, and savings. They also contain basic demographic information including the year of birth, gender, marital status, the number of children, and the municipality of residence. The dataset is an annual panel covering all taxpayers in the canton between 2002 and 2017. It is based on the tax returns that virtually all adult residents must file. Accordingly, the composition of individuals in the data only changes due to migration or death. Full coverage of the population is key both for representativeness and to have enough statistical power when zooming in on the group of workers around the mandate threshold in the regression discontinuity analysis. As taxes are levied at the household level in Switzerland, I can link individuals to their partners if they are married or in a civil union. This allows me to include household-level variables in the analysis. The tax records are verified by the tax authority for administrative purposes, limiting the extent of measurement error and misreporting.

Because the pension plan mandate applies at the individual level while the tax unit in Switzerland is the household, I split up married couples into individual observations. Most of the important variables for the analysis, including earnings from work, private pension savings, and occupational pension buy-ins, are reported at the individual level in the tax data. For all income and wealth components reported only at the household level, I equally assign half to each partner (following Fagereng et al., 2020). Appendix C describes the dataset, data cleaning and preparation, and variable construction in more detail.

[10] Since France replaced its wealth tax with a tax on real estate in 2018, only two OECD countries other than Switzerland still levy a wealth tax: Norway and Spain (OECD, 2018*c*).

[11] According to population statistics from the Federal Statistical Office, 1.03 million people were resident in the canton of Bern in 2017: https://www.bfs.admin.ch/bfs/en/home/statistics/population.html [accessed on 22 October 2021].

3.1 Income

The tax records provide detailed information on all types of income. This includes earnings from employment separately for the main job and other jobs, which is crucial for constructing the earnings measure determining whether workers are subject to the pension plan mandate. The data also provide information on self-employment income, business income, financial income, property income, transfer income, and pension income.

The relevant earnings concept for the pension plan mandate is gross earnings in the main job, before deducting social insurance and occupational pension contributions. This is the running variable in the regression discontinuity approach. Because I observe main-job *net* earnings in the tax data, I build a calculator using the year-specific social insurance and occupational pension contribution schedules to back out gross earnings for each individual. While this is straightforward for most individuals, gross earnings narrowly below and above the mandate threshold can result in the same net earnings recorded in the tax data, because workers above the threshold have the employee part of mandatory pension contributions deducted whereas those below do not. Thus, for a small number of individuals within at most CHF 350 of the threshold, I cannot unambiguously impute gross earnings. I exclude these individuals from the main analysis.

3.2 Wealth

The tax data also provide very comprehensive information on wealth which I use to construct savings measures by asset type. This includes financial wealth, business wealth, property wealth, other types of wealth, and debt. Financial wealth captures bank accounts, stocks, bonds, and any other types of financial investments. Property wealth includes any property people own, including primary residences, but the valuation is typically below the true market value and only updated periodically.[12] "Other wealth" includes the value of an individual's share of assets held through joint heirship or other forms of co-ownership and any assets not included elsewhere such as cash, gold, valuable art, cars, boats, horses, etc. Debt covers all types of private debt such as mortgages, loans, overdrafts, and credit card debt.

The only type of wealth missing from the data is pension wealth held in occupational and private pension accounts as these are exempt from the wealth tax. This is of minor concern for my analysis as I can observe voluntary occupational and private pension savings in the tax data and impute mandatory occupational pension savings based on individuals' gross earnings and the relevant contribution schedule.

[12] As a rule of thumb, the tax value of property corresponds to around 60% of the market value (OECD, 2018*c*).

3.3 Savings

To study the effects of mandatory pension plans on the entire savings portfolio, I obtain measures of savings for all types of assets. Whereas some savings measures are directly observable in the tax records, others can be imputed based on available information. Mandatory occupational pension contributions are not included in the data because they are withheld at source by the employer, so I impute these by applying the statutory contribution schedule to gross earnings. I define mandatory pension savings as the sum of the employee and employer contribution as empirical evidence suggests the incidence is likely on workers due to the strong tax-benefit linkage (Bozio, Breda and Grenet, 2023). Voluntary retirement savings such as lump-sum buy-ins into occupational pension plans and contributions to private pension accounts are directly observed in the tax records because they can be deducted from taxable income.

For all other types of savings not explicitly earmarked for retirement, I construct annual savings measures using the wealth data. As is common in the literature (e.g., Chetty et al., 2014; García-Miralles and Leganza, 2024), I compute savings as the change in the reported value of assets in year t relative to year $t-1$. This measure includes both "active savings" and "passive savings" from price changes (see Fagereng et al., 2021). This is conceptually attractive as it is the most comprehensive measure of savings in line with the classic Haig-Simons income concept (Aguiar, Moll and Scheuer, 2024). But practically it means that private savings are highly variable due to fluctuations in asset prices.[13]

To estimate the effects of the mandate on more aggregated measures of savings, I compute three main outcomes: (i) overall private savings are calculated as the change in net wealth relative to the previous year, which takes into account all types of non-pension assets and debt; (ii) overall voluntary retirement savings are defined as the sum of private pension contributions and occupational pension buy-ins; (iii) total savings are computed as the sum of overall private savings, overall voluntary retirement savings, and mandatory occupational pension contributions. To reduce the variance stemming from asset price volatility, I follow García-Miralles and Leganza (2024) and winsorize total savings, overall private savings, and asset-type-specific private savings at percentiles 5 and 95 of the distribution in the main estimation sample.[14]

[13] I cannot strip out asset price changes because data at the level of individual assets or transactions are not available.

[14] The exceptions are savings in business wealth and property wealth which I winsorize at percentiles 2.5 and 97.5 because they are rare for workers in the estimation sample. Only 9.5% and 7.9% of worker-year observations have non-zero business savings or property savings, respectively.

4 Empirical Strategy

Estimating the causal effect of mandatory pension plans on savings is challenging because one needs to disentangle the saving response to the mandate from unobserved heterogeneity in saving preferences. But researchers cannot run experiments that coerce individuals randomly assigned to the treatment group to make contributions to retirement accounts. I approximate the ideal experiment using a regression discontinuity design that leverages the earnings threshold of the Swiss pension plan mandate which requires otherwise similar workers to contribute substantially different amounts to employer-based pension accounts. The sharp mandate threshold provides credibly exogenous variation in mandate coverage that I can use to identify its causal effect. Combined with detailed and comprehensive tax records, this allows me to examine the saving response across the entire portfolio.

4.1 Discontinuity in Mandatory Pension Contributions

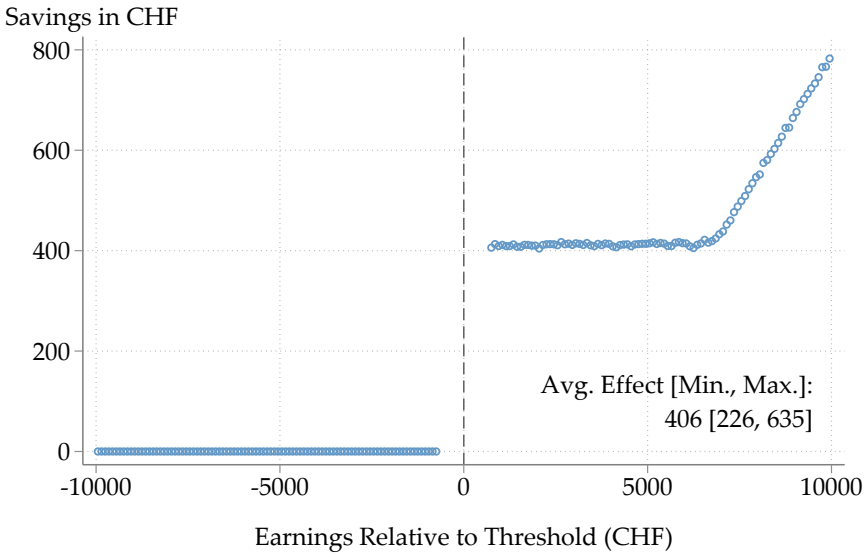
Employees with earnings above the mandate threshold automatically contribute a fraction of their salary to an occupational pension account, while those below are not required to make those savings. For those marginally above the threshold, the contribution rate is applied to the minimum qualifying earnings. Thus, annual mandatory pension savings jump from zero to CHF 225–635 at the cutoff, with the exact amount depending on the age-specific contribution rate and the year-specific minimum qualifying earnings. Figure 1 depicts the mechanical effect of the mandate on average mandatory pension savings. There is a discontinuity of CHF 406 at the threshold, corresponding to roughly 2% of earnings. I leverage this variation in mandate coverage using a sharp regression discontinuity (RD) design to estimate the effect of the mandate on saving behavior.

4.2 Regression Discontinuity Design

Identification. Assuming that workers do not adjust their earnings to sort below or above the mandate threshold, the cutoff generates variation in treatment assignment that is orthogonal to other individual characteristics. The fundamental idea is that workers just below the threshold can be used as a valid counterfactual for those just above the threshold under the assumption that they are comparable in all relevant dimensions except for whether they are subject to the mandate.

Formally, identification requires that the (average) potential outcomes are continuous across the threshold (Hahn, Todd and Van der Klaauw, 2001). The continuity assumption can be expressed in the following way. Let $Y_{it}(1)$ and $Y_{it}(0)$ denote the savings outcome of interest for individual i in year t who is subject or not subject to

Figure 1: Effect of Pension Plan Mandate on Mandatory Pension Savings



Notes: Regression discontinuity plot showing the effect of the pension plan mandate on mandatory occupational pension savings using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. Occupational pension savings are predicted by applying the statutory contribution schedule to gross earnings in the main job following Equation (4). See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

the mandate, respectively. The sharp RD estimand τ_{RD} identifies the local average treatment effect on individuals with near-threshold earnings X_{it}, provided that the conditional expectation functions are continuous in x at the cutoff c_t:

$$\tau_{RD}(c_t) = \mathbb{E}[Y_{it}(1) - Y_{it}(0)|X_{it} = c_t] = \lim_{x \downarrow c_t} \mathbb{E}[Y_{it}|X_{it} = x] - \lim_{x \uparrow c_t} \mathbb{E}[Y_{it}|X_{it} = x] \quad (1)$$

The continuity assumption could be violated if workers or their employers were willing and able to manipulate earnings strategically and precisely to impact workers' treatment status. In this case, potential discontinuities in observable and unobservable characteristics at the cutoff could confound estimates of the causal effects of the mandate. I discuss and test the validity of the identifying assumption in Section 4.3.

Estimation. Following the standard advice of the methodological RD literature (see in particular Gelman and Imbens, 2019), I estimate the target parameter τ_{RD} by $\hat{\beta}_1$ from a local linear regression, allowing the slope of the control functions to vary on

each side of the cutoff. The main specification is given by

$$Y_{it} = \beta_0 + \beta_1 \times \mathbb{1}\{X_{it} \geq c_t\} + \beta_2(X_{it} - c_t) + \beta_3(X_{it} - c_t) \times \mathbb{1}\{X_{it} \geq c_t\} + Z'_{it}\gamma + \epsilon_{it}, \tag{2}$$

where Y_{it} is a savings outcome of interest for individual i in year t, X_{it} denotes earnings in the main job (the running variable), c_t is the mandate cutoff determining treatment assignment, and ϵ_{it} is the error term. Z_{it} represents a vector of controls consisting of year fixed effects, age fixed effects, gender, and marital status. Control variables are not necessary for identification, but their inclusion improves precision (Calonico et al., 2019). The treatment variable is $\mathbb{1}\{X_{it} \geq c_t\}$ which indicates being subject to the pension plan mandate. Provided that ϵ_{it} does not change discontinuously at the threshold, $\hat{\beta}_1$ provides an unbiased estimate of the average treatment effect of the mandate on savings outcome Y_{it} for workers in proximity of the cutoff.

For ease of interpretation and to keep the effective estimation sample consistent, I use a bandwidth of CHF 10,000 for all outcomes in my main analysis.[15] To give more weight to observations close to the cutoff, I use a triangular kernel. To account for potential sorting around the threshold, the main analysis employs a "donut hole" approach excluding workers who have earnings within CHF 700 of the threshold (Bajari et al., 2011; Barreca et al., 2011; Barr, Eggleston and Smith, 2022). This amount corresponds to the maximum mandated pension contribution for workers just above the threshold.[16] This means that even if workers perceive the entire economic incidence of both the employee and employer contribution to be on them (as suggested by Bozio, Breda and Grenet, 2023), they would still prefer to have gross earnings above the threshold and be subject to the mandate over gross earnings more than CHF 700 below the cutoff. Hence, for workers remaining in the sample, manipulation of earnings to affect treatment status is very unlikely. This restriction also takes care of the issue that gross earnings of workers within CHF 350 of the threshold cannot be imputed unambiguously (see Appendix Section C.2).[17]

Inference. I compute standard errors using the heteroskedasticity-robust nearest-neighbor variance estimators proposed by Calonico, Cattaneo and Titiunik (2014*a*) and implemented in statistical software by Calonico, Cattaneo and Titiunik (2014*b*) and Calonico et al. (2017), as they are typically more robust in finite samples than con-

[15] I have also computed mean squared error optimal bandwidths using the data-driven bandwidth selector proposed by Calonico, Cattaneo and Titiunik (2014*a*,*b*). However, their procedure suggests very small bandwidths that leave few observations for estimation and result in large standard errors. Instead, I use a consistent bandwidth across all outcomes and verify the robustness of the results with respect to the bandwidth choice in Section 5.5.

[16] During the sample period, the maximum mandatory pension contribution for workers just above the threshold is: 18% × CHF 3,525 = CHF 634.50

[17] Estimation is performed using the Stata package `rdrobust` developed by Calonico, Cattaneo and Titiunik (2014*b*); Calonico et al. (2017).

ventional Huber-Eicker-White heteroskedasticity-robust standard errors (Calonico, Cattaneo and Titiunik, 2014*a*).

Sample Restrictions. The main analysis uses data from 2005 to 2017. I exclude 2002–2004 because the 2005 reform changed a number of provisions related to the mandate, including substantially lowering the threshold and changing the contribution rates for women (see Appendix Section B.4 for more information on the reform). As the pension plan mandate only applies to workers from the age of 25, I restrict the estimation sample to those aged 25–60.[18] Further, I exclude anyone receiving more than CHF 25,000 in self-employment income because individuals whose main source of income is self-employment can request to be exempt from the mandate even if they have some earnings from employment. Finally, I remove individuals who are not in the data in the preceding year because private savings cannot be computed for them (4% of the sample, most likely people moving to the canton from elsewhere). This leaves me with an effective estimation sample of 597,120 observations from 191,400 unique individuals.

Appendix Table A.1 presents summary statistics for the analysis sample. The average worker is 43 years old. 82% of workers in the sample are women, 67% are married. The average worker receives CHF 25,300 in total income, most of which represents earnings from their main job. Mean total savings are CHF 3,900 per year. Private savings account for 64%, whereas voluntary pension savings account for 31% of total savings. Mandatory pension savings make up 6% of total savings, on average, but more than 10% among workers above the mandate threshold.

Robustness Checks. In Section 5.5, I demonstrate that the estimation results are robust to making different operationalization choices regarding the bandwidth, size of the donut hole, kernel function, control variables, and years of data included in the estimation sample.

4.3 Validity of the Identifying Assumptions

The key identifying assumption is that there is a discontinuity in mandatory pension contributions at the threshold, whereas average potential outcomes are continuous. The main threat to identification stems from employees or employers manipulating earnings to sort around the threshold. The Swiss government usually announces the mandate threshold between the middle of September and the middle of October be-

[18] I impose a lower maximum age threshold than the legal retirement age – 62 years (2002–2004) and 64 years (2005–2017) for women, 65 years for men – to keep the age composition consistent across time and genders and to exclude people who retire early. Early retirement is widespread in Switzerland (Dorn and Sousa-Poza, 2005). I use the age group 20–24 years in a placebo check described in Section 4.3.

fore it comes into force on the 1st of January. To affect their treatment status, employees would need to adjust their working hours, negotiate a change in the wage rate, or switch into a new job. Taking on a second job would not change treatment status because the mandate threshold applies to earnings in the main job only. Employers might try to push the earnings of their employees below the threshold in order to avoid paying the employer share of occupational pension contributions (assuming some of the incidence falls on them).

To rule out sorting around the threshold, the main analysis excludes workers who have earnings within CHF 700 of the threshold. As this exceeds the maximum mandatory retirement contribution of workers just above the threshold, endogenous sorting is unlikely to occur outside that range. Nevertheless, I assess the plausibility of the identifying assumptions by examining the continuity of the density of the running variable and predetermined covariates across the threshold, and by estimating saving responses for a placebo sample of workers aged 20–24 who are too young to be subject to the mandate.

Density Test. Following McCrary (2008), I test for a discontinuity in the density of earnings at the threshold. Panel A of Appendix Figure A.2 shows the frequency distribution of annual earnings in the main job within the bandwidth. Workers with earnings within CHF 700 of the threshold, who are excluded from the main analysis, are represented by the light blue bars. Note that workers with gross earnings within CHF 350 of the threshold are missing because their gross earnings cannot be imputed unambiguously (see Section C.2).[19]

The density looks smooth and has a similar level below and above the mandate threshold. There is not much indication of bunching around the cutoff. The number of workers just below the threshold is slightly higher than just above, but the difference appears small in magnitude relative to the overall frequencies. I test formally for the presence of a discontinuity employing the density test proposed by Cattaneo, Jansson and Ma (2018, 2020), using a local linear regression as throughout the RD analysis. As Panel B shows, the null hypothesis of a continuous density cannot be rejected, with a p-value of 0.65. This is in line with previous research finding that employees fail to precisely sort around earnings thresholds to take advantage of financial incentives (Chetty et al., 2011; Chetty, Friedman and Saez, 2013; Chetty et al., 2014).

Continuity of Predetermined Characteristics. As endogenous sorting around the cutoff would likely result in imbalances on covariates, I assess the continuity of a set of predetermined characteristics across the threshold. I implement this balance test

[19]This affects 16,607 individual-year observations, representing 2.6% of workers within the estimation window.

by estimating the main RD specification in Equation (2) without control variables, using age, gender, marital status, number of children, or household income as the dependent variable.

Appendix Figure A.3 displays the results. I find that workers with earnings marginally below and above the threshold have very similar characteristics. Based on the precision of the estimates, I can rule out even small discontinuities for gender, marital status, number of children, and household income. I do find a significant discontinuity in age, implying that workers just above the threshold are on average a quarter of a year younger than those narrowly below. While the magnitude of this difference is modest, I address this potential source of bias by controlling for age fixed effects in the main analysis.

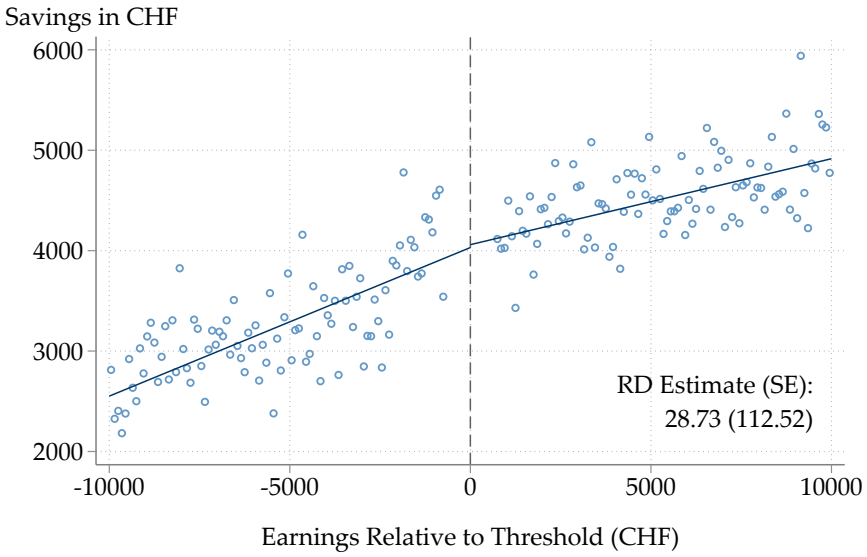
Placebo Sample. Based on the density test and smoothness of covariates across the threshold, endogenous sorting does not appear to be a major concern. But continuity of the potential outcomes can also be violated if there are other discontinuities at the threshold that affect savings, e.g., if the same cutoff value is used in another policy (Imbens and Lemieux, 2008). Ex ante, this seems highly unlikely as I am not aware of any other policies targeting the same cutoff and it moves from year to year between specific non-round numbers, defined as the part of the salary that is covered by the pay-as-you-go old-age insurance system (see Appendix B for more detail).

I can test this empirically, taking advantage of the fact that the mandate only affects workers from the year in which they turn 25. In a placebo exercise, I restrict the sample to workers aged 20–24 and re-run the main regression discontinuity estimation. As these workers are not subject to the mandate, I should not find a saving response in the data. Appendix Figure A.4 shows the estimated placebo effects on total savings, overall private savings, and overall voluntary pension savings. In constrast to the main worker sample, I estimate precise null effects on all three savings outcomes among this group of young workers unaffected by the mandate. This is evidence that there is no other discontinuity at the threshold other than the mandate, at least none that affects both young workers and older workers.

5 Saving Responses to Mandatory Pension Plans

The pension plan mandate forces workers narrowly above the threshold to contribute around CHF 400 per year – close to 2% of their earnings – to an employer-sponsored pension account. This section presents the results from the regression discontinuity analysis leveraging this variation in mandatory retirement contributions. I start by presenting estimates of the mandate's effect on total savings. Subsequently, I investigate potential portfolio reallocation responses. I split up overall savings into private

FIGURE 2: EFFECT OF PENSION PLAN MANDATE ON TOTAL SAVINGS



Notes: Regression discontinuity plot showing the effect of the pension plan mandate on total savings using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. Total savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

savings, which include any form of savings not specifically earmarked for retirement, and voluntary pension savings. I estimate separate effects for these savings categories and decompose them further, down to the asset-type level. Putting all the estimates together, I can characterize the saving response to mandatory pension plans across the entire portfolio. Finally, I conduct a wide range of robustness checks to probe the sensitivity of my results.

5.1 Total Savings

What is the effect of mandatory pension plans on the overall amount of savings that workers set aside? Figure 2 plots total savings against earnings in the main job (i.e., the running variable), providing graphical evidence of the mandate's effect on overall savings. The dots are local sample means of 100 non-overlapping, evenly spaced bins on each side of the cutoff. The lines are linear fits from a non-parametric regression using all underlying datapoints and a triangular kernel. In lieu of a separate results table, the point estimate and standard error for the treatment effect are displayed in the figure, obtained from estimating the RD model in Equation (2).

Strikingly, there is no discontinuity at the cutoff, suggesting that the mandate

does not affect the overall savings of workers. The point estimate of CHF 29 is not statistically significantly different from zero and implies a crowd-out rate of 93%. This suggests that mandatory retirement contributions are fully offset by reductions in other types of savings. Based on the 95% confidence interval, I can rule out increases in total savings by more than CHF 250. Contrasting this headline estimate with the average effect on mandatory retirement savings of CHF 400, this provides evidence of strong individual-level saving responses to the mandate. I proceed by decomposing the overall effect to reveal the type of savings that drive the response.

5.2 Private Savings

Figure 3 displays the effects of the pension plan mandate on overall private savings and its components.

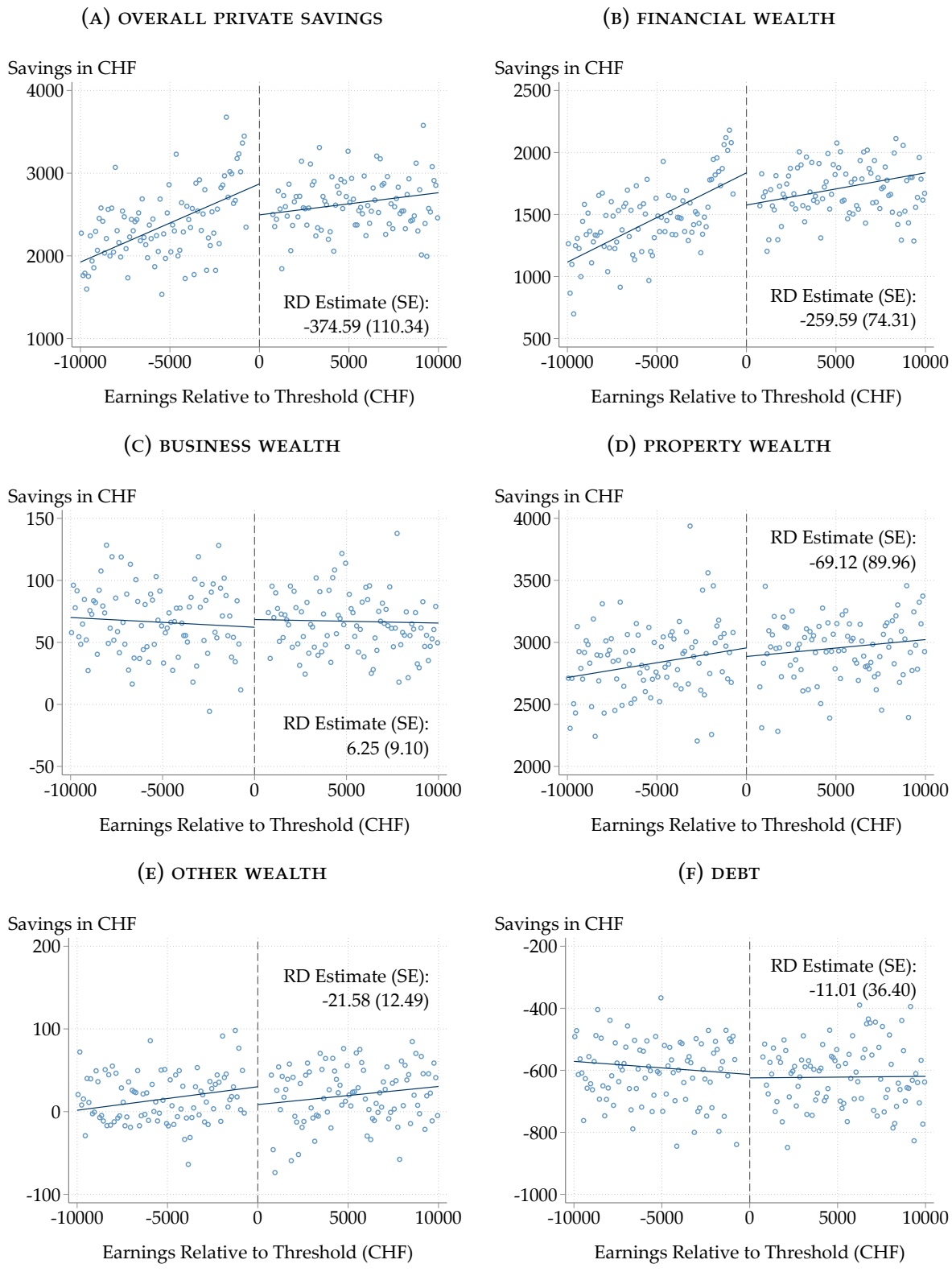
Overall Private Savings. Panel A plots the response of overall private savings. I find that private savings drop by CHF 375 at the cutoff, which is statistically highly significant. The magnitude of this effect is very close to the level of mandatory retirement contributions that workers above the threshold have to make. This implies that workers respond to the mandate by substantially lowering private savings which completely undoes the increasing effect of the mandate on overall savings.

Private Savings by Asset Type. Drawing on detailed information on individual wealth included in the tax data, I can investigate what types of assets account for the large drop in private savings. Panels B through F present the effect of the mandate on savings in financial assets, business assets, property, other types of wealth, or debt, respectively.[20] The results indicate that the overall drop is mainly driven by reduced savings in financial assets. As Panel B shows, the mandate lowers financial savings by CHF 260, again statistically highly significant. Financial assets include bank accounts, stocks, bonds, and other investments. While the data do not allow me to decompose financial assets further to see whether the drop in savings is driven by checking accounts or more long-term investments, it seems plausible that workers use more liquid forms of wealth to fund the mandatory retirement contributions.

Panels C through F show that the mandate does not have much of an effect on savings in business wealth, property wealth, other types of wealth, or debt. Three out of four point estimates are negative but they are not statistically significantly different from zero. For savings in property, I find a decrease by CHF 69 but this is somewhat imprecisely estimated because property investments are lumpy. The effect estimates for business wealth, other wealth, and debt are an order of magnitude smaller than

[20] "Other Wealth" includes an individual's share of assets in joint heirship or other types of co-ownership as well as other assets such as cash, gold, art, boats, etc.

Figure 3: Effects of Pension Plan Mandate on Private Savings



Notes: Regression discontinuity plots showing the effect of the mandate using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. All outcomes are winsorized at percentiles 5 and 95, except savings in business wealth and property wealth which are winsorized at percentiles 2.5 and 97.5.

Source: Author's calculations based on administrative tax data from the canton of Bern.

the effect on financial savings and the precision of these estimates allows me to reject even small changes. This indicates that their response to the mandate is quantitatively negligible. The lack of an effect on debt is in line with Beshears et al. (2022) who do not find an impact of automatic enrollment on debt or credit scores in the US, but at odds with Beshears et al. (2024) and Choukhmane and Palmer (2024) which both find that workers in the UK partially finance higher pension savings induced by automatic enrollment through an increase in debt.

5.3 Voluntary Retirement Savings

Besides reducing private savings, the pension plan mandate could also affect workers' voluntary retirement contributions. Because they can be deducted from taxable income, I can observe both voluntary lump-sum buy-ins into occupational pension plans and private pension savings in separate accounts in the tax data. Below, I first estimate the effect on the sum of the two types of voluntary retirement savings before analyzing the response of each of them separately.

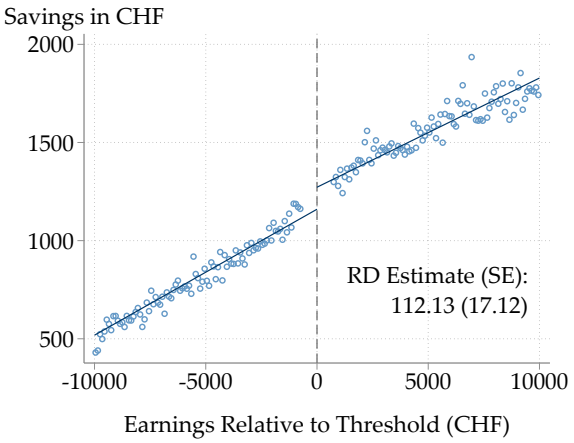
Overall Voluntary Pension Savings. Panel A of Figure 4 shows that workers respond to the mandate by *increasing* their overall voluntary retirement savings by CHF 112. The lower bound of the 95% confidence interval is CHF 79. While voluntary pension savings generally increase linearly with earnings, with similar slopes below and above the cutoff, there is a clear jump upwards at the threshold. The positive sign of the effect is surprising, as mandatory and voluntary retirement savings seem more likely to be substitutes than complements. But the effect is confounded by the change in the contribution cap on private pension savings at the threshold. Below, I remove the impact of the cap to isolate the effect of mandatory retirement contributions only.

Private Pension Savings. Panel B documents that the mandate increases private pension savings by CHF 102. Clearly, this is driving the entirety of the effect on overall voluntary pension savings. While this crowding-in effect could represent a genuine response to the mandate policy, e.g., due to information or salience effects (Duflo and Saez, 2003; Duflo et al., 2006; Goda, Manchester and Sojourner, 2014; Dolls et al., 2018), it is confounded by the discontinuity in the cap on contributions to preferentially taxed private pension accounts at the threshold. This stems from the fact that workers enrolled in an occupational pension plan face a different cap rule than those who are not.

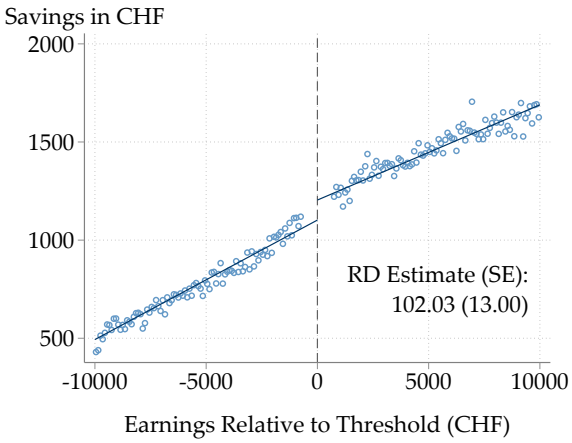
As explained in more detail in Section 2.2, most workers just below the threshold face an annual cap on private pension savings of CHF 3,000–4,000, whereas those just above the threshold can contribute up to CHF 6,000–7,000, with the exact amount depending on the year. To assess the extent to which the effect is driven by the change

Figure 4: Effects of Pension Plan Mandate on Voluntary Pension Savings

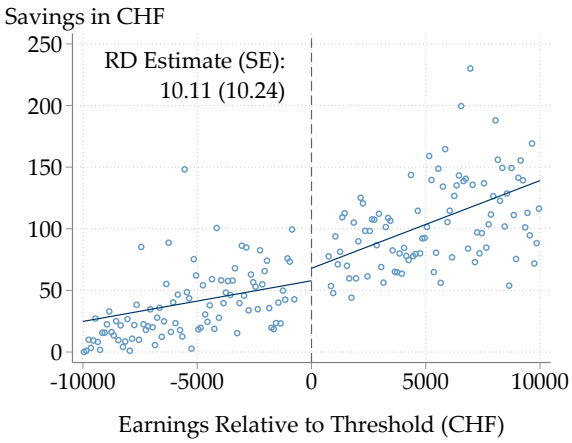
(a) overall voluntary pension savings



(b) private pension savings



(c) occupational pension buy-ins



Notes: Regression discontinuity plot showing the effect of the pension plan mandate on voluntary pension savings using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

in the contribution cap, I estimate the effect of the mandate across the distribution of private pension savings, looking at contribution rates in CHF 1,000 intervals. The idea behind this exercise is that the distribution of private pension savings is truncated at different values below and above the threshold, so looking at the effect on different parts of the distribution allows me to separate out the effect of the cap.

Figure 5 presents the estimated effects on the share making any private pension contributions (extensive margin) in dark blue and the share contributing amounts in

intervals of CHF 1,000 in light blue. Appendix Figure A.5 displays the corresponding RD plots.[21] At the extensive margin, I find a precisely estimated null effect of the mandate on the propensity to have non-zero private pension savings. Looking at the effects across the distribution, I find clear evidence of the impact of the contribution cap. The share of workers with contributions in the interval where the cap below the threshold lies (CHF 3,000–4,000) drops by 4.5 percentage points at the threshold. Conversely, the share contributing more than CHF 4,000 increases by almost 4.5 percentage points. This can be interpreted as the share of workers at the threshold for whom the lower contribution cap is binding. The share contributing CHF 4,000–5,000 increases by 1 percentage point, the share contributing CHF 5,000–6,000 by 0.3 percentage points, and the share contributing more than CHF 6,000 by 3 percentage points at the cutoff. At the same time, there is little change in the distribution of contributions below the lower cap, i.e., below CHF 3,000.[22] This suggests that the positive intensive-margin effect of the mandate on private pension savings is entirely driven by the increase in the contribution cap when being enrolled in a pension plan.

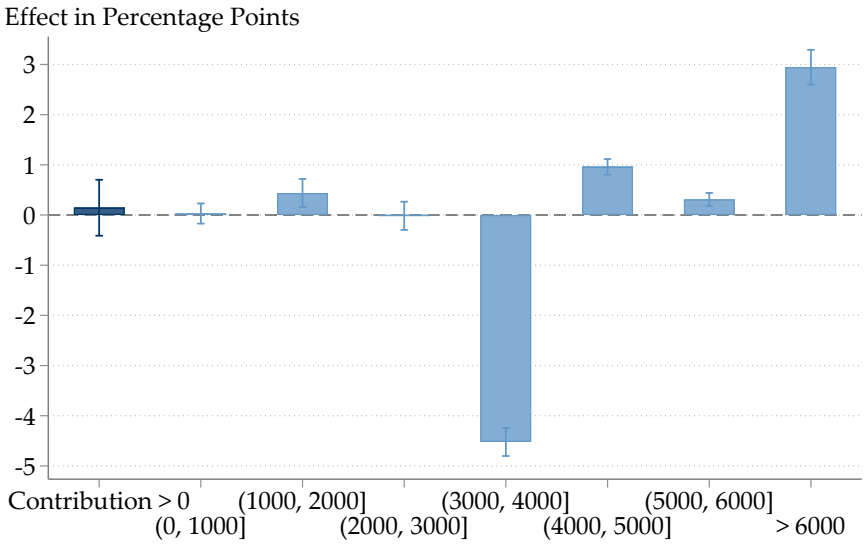
Another way of assessing the extent to which the crowding-in effect is driven by the change in the contribution cap is to set the same cap rule for workers above the threshold as for those below and re-estimate the effect on private pension savings. This exercise shows how private pension savings would respond to the mandate if being enrolled in a pension plan did not alter the cap. I implement this by limiting the private pension contributions of all workers to at most 20% of their net earnings and estimating the effect of the mandate on this capped outcome. As Appendix Figure A.6 shows, this results in a very precisely estimated null effect. This confirms that the mandate does not lead to an increase or decrease in private pension savings once the contribution cap is held fixed.

Occupational Pension Buy-ins. Panel C of Figure 4 depicts the effect of the pension plan mandate on voluntary buy-ins into these plans. I also find a precisely estimated null effect for this type of voluntary pension savings, allowing me to rule out changes by more than CHF 30 at the 5% level. For workers in the income range considered here, buy-ins are of minor importance in general as only 0.7% of the worker-year observations in the estimation sample make non-zero buy-ins. Conditional on making a buy-in, the mean amount is CHF 9,700.

[21] The RD plots in Appendix Figure A.5 clearly document the bunching of workers below the threshold at the lower contribution cap. For example, Panel E shows that a sizeable share of workers with earnings just below the cutoff (i.e., with gross earnings of around CHF 20,000) make contributions of CHF 3,000–4,000 which is where their cap is. This share is much lower above the cutoff where the cap is higher.

[22] There is a statistically significant increase of 0.4 percentage points in the share contributing CHF 1,000-2,000, but this is quantitatively negligible relative to the impact of the cap.

FIGURE 5: EFFECT OF MANDATE ON DISTRIBUTION OF PRIVATE PENSION CONTRIBUTIONS



Notes: Coefficient plot showing the effect of the pension plan mandate for different intervals of private pension savings using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Point estimates and 95% confidence intervals are obtained from estimating Equation (2) using a triangular kernel. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.
Source: Author's calculations based on administrative tax data from the canton of Bern.

5.4 Summarizing the Saving Response Across the Portfolio

The pension plan mandate does not change total savings, on average, as workers respond by lowering their private savings by an amount equal to the mandatory retirement contributions. This allows them to hold their consumption level constant, despite a sizeable increase in forced savings. Nevertheless, this leads to a reallocation of savings from more liquid financial assets, presumably bank accounts as low-income workers are unlikely to hold lots of stocks and bonds, to less liquid retirement accounts. Savings in other types of assets are not significantly affected by the mandate.

What are the welfare implications of mandatory pension plans? As mandated retirement contributions fully crowd out private savings, they only affect the overall consumption-savings decision through the reduced tax burden. The welfare effect of the portfolio reallocation channel is ambiguous. It could be welfare-improving as pension savings are preferentially taxed and less liquid which may help overcome "behavioral" issues such as myopia. But lower levels of liquid financial assets also leave workers more exposed to negative shocks (Choukhmane and Palmer, 2024).

5.5 Robustness Checks

In this section, I check the sensitivity of the estimated effects on the main outcomes – total savings, overall private savings, and overall voluntary retirement savings – to different choices regarding the model specification in Equation (2) and its operationalization. I show robustness with respect to changing the bandwidth, size of the donut hole, kernel weights, set of control variables, and the years of data included in the estimation sample.

Bandwidth. Appendix Figure A.7 plots point estimates and 95% confidence intervals for the effects of the mandate, varying the bandwidth between CHF 2,000 and CHF 18,000. Using different bandwidths does not alter the findings obtained using the main bandwidth of CHF 10,000. Panel A documents that the effect on total savings is close to zero and statistically insignificant for almost all bandwidths. There is no bandwidth at which the mandate is found to significantly increase total savings. As Panel B shows, there is a significant negative effect on private savings using any bandwidth except the smallest one which results in a similar point estimate as the main bandwidth, but the confidence interval becomes much larger and includes zero. Overall, the estimates for total savings and private savings remain very stable for bandwidths larger than CHF 6,000. As the bandwidth is reduced, the point estimates decrease and then rebound, but the magnitudes covered by the confidence intervals are mostly in line with the main estimate. Panel C shows that the positive effect on voluntary pension savings is relatively stable for bandwidths larger than CHF 6,000. Using smaller bandwidths, the point estimates decline and the standard errors increase a lot, so the estimates become statistically insignificant.

Size of Donut Hole. In Appendix Figure A.8, I examine the sensitivity of the estimates to varying the size of the "donut hole" around the cutoff that is removed from the estimation sample (Bajari et al., 2011; Barreca et al., 2011; Barr, Eggleston and Smith, 2022). The main analysis uses a donut hole of CHF 700 as sorting around the threshold is implausible to occur further away from the cutoff (see Section 4.2). Varying the donut hole from zero to CHF 1,400, more than twice the maximum mandatory retirement contributions of workers narrowly above the threshold, the estimates are consistent with the main results. Panel A shows that the point estimate for total savings remains very close to zero for most donut sizes. It increases somewhat for large donut holes, but all confidence intervals still include the main point estimate. The point estimate for private savings in Panel B is very stable for donut sizes up to CHF 1,000 and then increases gradually for larger donut holes. While the confidence interval for the largest donut hole crosses zero, it also still contains the point estimate of the main analysis. Panel C shows that the effect estimates for voluntary

pension savings are also increasing in the size of the donut hole but they always remain statistically significant.

Kernel. Appendix Figure A.9 shows that the results are very robust to using different kernel weights in the local linear regression. Using a uniform kernel or Epanechnikov kernel leads to very similar point estimates and confidence intervals as the main estimates obtained with a triangular kernel.

Control Variables. Appendix Figure A.10 displays the saving responses estimated using different sets of controls. Including only year fixed effects or no controls at all leads to very similar point estimates and confidence intervals as the main analyis that controls for year fixed effects, age fixed effects, marital status, and gender. This also suggests that the controls do not improve precision of the estimates by much.

Sample Period. The main analysis sample excludes years 2003 and 2004 because a reform implemented in 2005 substantially lowered the mandate threshold and changed the contribution schedule for women.[23] Adding these years to the estimation sample, accounting for the year-specific mandate threshold and contribution rates, I estimate very similar effects, as shown in Appendix Figure A.11. The estimates for total savings and private savings are virtually unchanged. The positive effect on voluntary pension savings is slightly attenuated, although still sizeable and highly significant. This makes sense as the discontinuity in the contribution cap at the threshold that accounts for the entirety of the positive effect was smaller before the reform.[24]

6 Saving Responses Under Liquidity Constraints

The average worker responds to mandatory retirement contributions by cutting private savings, especially in financial wealth, by a similar amount. This points to the importance of liquid assets in financing forced savings. But what are the impacts of the mandate on workers who are not able to reduce their private savings because they are subject to liquidity constraints?

I explore the role of liquidity by allowing for heterogeneous responses across workers with different amounts of financial assets and household income.[25] The idea

[23] Note that the tax data go back to 2002, but I do not include that year in the analysis because I cannot calculate private savings as I do not observe wealth levels in the previous year.

[24] As the 2005 reform lowered the threshold by around CHF 6,000, this reduced the contribution cap just below the cutoff (20% of net earnings) by more than CHF 1,000.

[25] Household income includes all types of income that an individual or married couple receive in a given year. Besides their own earnings, the spouse's earnings from employment are by far the most important income source for workers in the estimation sample. 67% of them are married, with partners receiving CHF 79,500 in employment income, on average. Averaging across all workers, with and without a partner, mean household income is CHF 79,800, of which 66% is accounted for by the partner's employment income and 27% by the worker's own employment income.

is that drawing down liquid assets and resource sharing within the household can both enable workers to hold consumption constant despite larger pension contributions. To implement this, I split up the estimation sample by terciles of financial wealth in the previous year (as current wealth may be affected by treatment status) and household income, respectively, and re-estimate the effect of the mandate on total savings, overall private savings, and overall voluntary retirement savings separately for these subsamples.[26] Reassuringly, I obtain similar results when using financial assets or household income as a proxy for liquidity constraints.

Total Savings. Panel I of Figure 6 plots the estimated effects on total savings for subsamples of workers who differ in their likelihood to be affected by liquidity constraints. While none of the estimates are significantly different from zero at the 5% level, partly because splitting the sample reduces precision, the pattern of point estimates is consistent with the idea that workers who face liquidity constraints cannot fully offset the mandatory retirement contributions by reducing other types of savings. For workers in the bottom tercile, I estimate that the mandate increases total savings by CHF 170 when using financial wealth and by CHF 280 when using household income as a proxy. For workers in the top tercile, the point estimate for total savings is close to zero (or even negative).

In contrast to the zero average effect, this provides suggestive evidence that the mandate increases total savings of workers who are not able to fully finance the forced pension contributions by drawing down liquid assets or receiving financial support from their partner. But even for workers in the bottom tercile, the estimated effect on total savings corresponds to not more than 70% of the mandatory pension contributions. To further explore the variation in saving responses by degree of liquidity constraints, I now consider the effects on private savings and voluntary pension contributions for the same subsamples of workers.

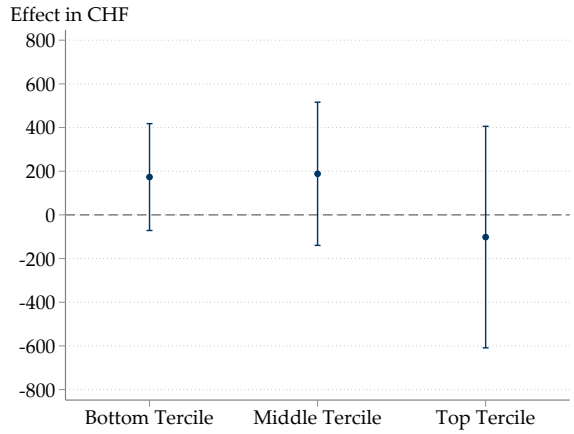
Private Savings. Panel II of Figure 6 shows the estimated effects on private savings. In line with the results for total savings, I find that the drop in private savings is strongly attenuated and statistically insignificant for workers in the bottom tercile. The point estimate is roughly CHF –170 using financial wealth and CHF –30 using household income as a proxy. Again, this suggests that workers who are subject to liquidity constraints cannot reduce their private savings to fully offset the mandated pension contributions. For workers in the top tercile, I estimate a large and statistically significant decline in private savings by more than CHF 600 using either proxy. Strikingly, the magnitude of this reduction exceeds the mandatory retirement contributions. Next, I assess whether this disproportionate drop in private savings is

[26]The tercile cutoff values for financial wealth are CHF 4,700 and CHF 33,000. The tercile cutoffs for household income are CHF 46,100 and CHF 100,200.

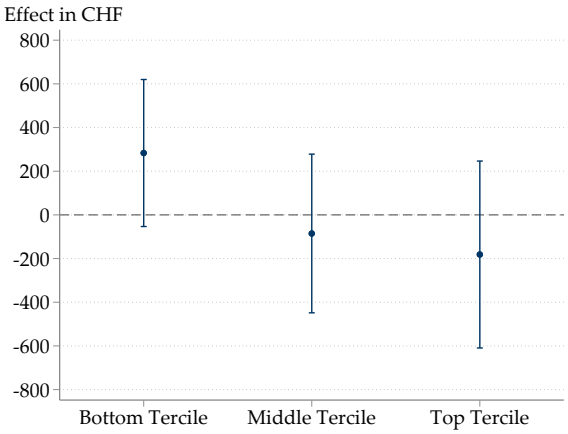
Figure 6: Heterogeneity in Saving Responses by Liquidity Constraints

I. Total Savings

(a) by financial wealth in previous year

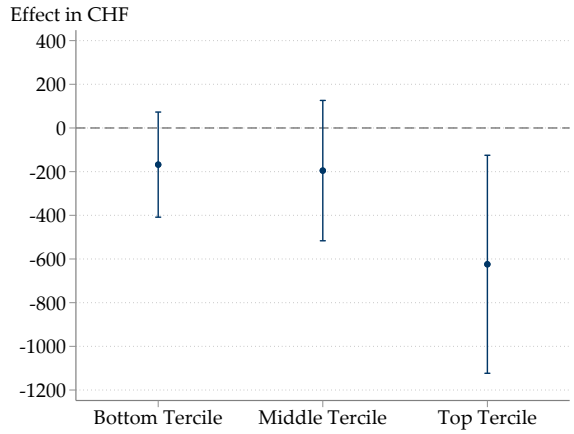


(b) by household income

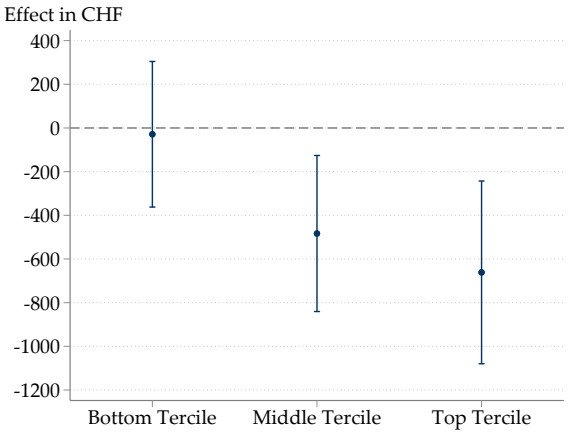


II. Private Savings

(c) by financial wealth in previous year



(d) by household income

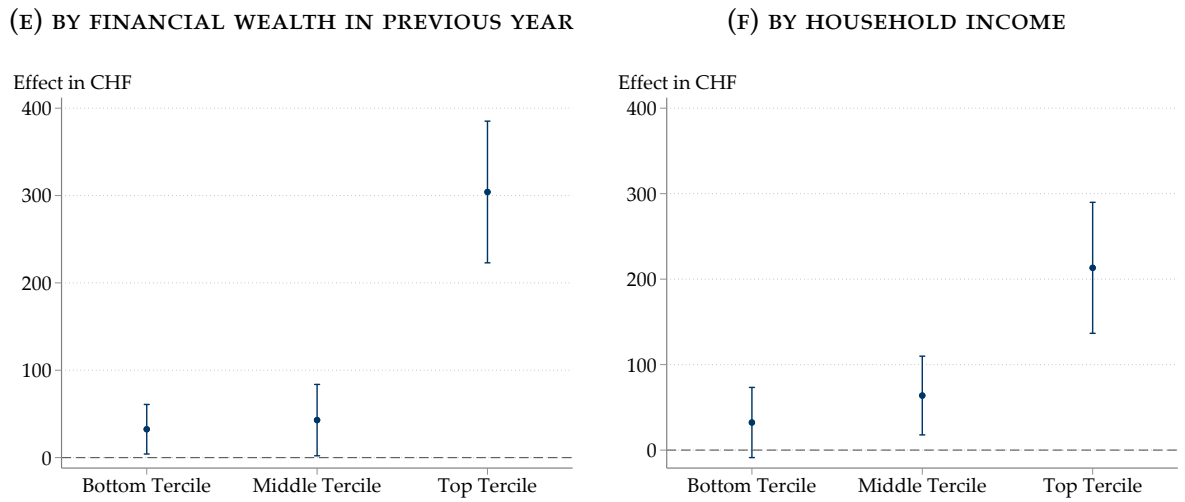


driven by top-tercile workers increasing their voluntary pension savings when facing the higher contribution cap.

Voluntary Retirement Savings. To examine how liquidity constraints affect the extent to which workers above the threshold take advantage of the increased contribution cap for private pension savings, Panel III of Figure 6 displays the estimated effects on voluntary retirement savings. Notwithstanding whether financial wealth or household income is used as a proxy, the positive effect is highly concentrated among workers in the top tercile. This explains why the drop in private savings in the top tercile more than compensates for the mandatory retirement contributions:

Figure 6: Heterogeneity in Saving Responses by Liquidity Constraints (cont.)

III. Voluntary Pension Savings



Notes: Coefficient plot showing the effects of the pension plan mandate by tercile of financial wealth in the previous year and household income, respectively, using data from 2005 to 2017. Overall sample includes 597,120 worker-year observations. Point estimates and 95% confidence intervals are obtained from estimating Equation (2) using a triangular kernel, separately for the tercile groups. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

these workers are reallocating some of their private savings into preferentially taxed private pension accounts in response to pension plan enrollment raising the cap. For workers further down the distribution of financial wealth or household income, I estimate much smaller increases in voluntary pension savings. Presumably, this is both due to liquidity constraints and because they face lower marginal income tax and wealth tax rates which reduces the incentive to make these contributions.

Summary and Discussion. I find suggestive evidence that workers who face liquidity constraints are not able to reduce their private savings enough to completely offset the increase in retirement contributions required by the mandate. As a consequence, the mandate increases their overall savings and, by implication, lowers their consumption spending by roughly CHF 200, corresponding to 1% of earnings. However, I am not able to estimate this effect with great precision. Workers with high levels of financial wealth or household income respond to the mandate (and the associated increase in the private pension contribution cap) by cutting private savings by a disproportionate amount in order to offset the mandated pension contributions and channel more savings into tax-advantaged private pension accounts, while holding overall savings and consumption constant. These results are consistent with Choukhmane and Palmer (2024) who find that workers with low initial deposit balances respond to

increased default pension contributions mainly by cutting spending, whereas workers with high balances shift savings into pension accounts without reducing spending much.

7 Conclusion

In this paper, I present novel evidence on how workers' savings respond to mandatory pension plans which require them to regularly contribute a portion of their earnings to an illiquid retirement account. I combine comprehensive tax data with credibly exogenous variation from the occupational pension mandate in Switzerland to estimate the causal effect throughout the savings portfolio.

I document three main findings. *First*, the mandate fails to increase total savings, with the main estimate implying a crowd-out rate of 93%. *Second*, workers offset mandatory retirement contributions by reducing private savings by a similar amount. The drop in private savings is primarily driven by financial assets, presumably because they are more liquid than other types of wealth. I do not find an effect on other types of assets including business wealth, property wealth, other wealth, and debt. I estimate a precise null effect on voluntary pension savings, once the change in the contribution cap on preferentially taxed private pension savings at the threshold is accounted for. *Third*, I document the role of liquidity constraints in shaping saving responses. Workers who have little financial assets or household income to tap into reduce their private savings by less. Consequently, I estimate a moderate increase in total savings for this group, although this is not statistically significant. Workers with high levels of financial wealth or household income cut their private savings disproportionately to offset the mandated retirement contributions and funnel more savings into tax-advantaged private pension accounts.

These findings have implications for pension policy. If the goal of mandatory pension plans is to raise overall savings levels, they do not appear to be successful, at least for workers who are not subject to liquidity constraints. But mandates could still improve financial preparedness for retirement by shifting savings from financial assets to retirement accounts. However, it is unclear whether this portfolio reallocation channel makes workers better off. Savings in pension accounts are less liquid, making it more likely that they accumulate until retirement, at which point they are mostly converted into annuities. But the lower share of savings in liquid assets also leaves workers more exposed to negative financial shocks. In the long run, potential differences in after-tax rates of return between the two types of assets may also play an important role. More research is needed to thoroughly assess the welfare implications of mandatory pension plans.

References

Aguiar, Mark A., Benjamin Moll, and Florian Scheuer. 2024. "Putting the "Finance" into "Public Finance": A Theory of Capital Gains Taxation." NBER Working Paper No. 32951.

Aguila, Emma. 2011. "Personal Retirement Accounts and Saving." *American Economic Journal: Economic Policy*, 3(4): 1–24.

Annaheim, Melanie, and Lukas Heim. 2021. "Household Wealth in Switzerland: Concepts and Trends in an International Comparison." available on the website of the Swiss National Bank: https://data.snb.ch/en/topics/texts#!/doc/focus_20210429 [accessed on 25 October 2021].

Arnberg, Søren, and Mikkel Barslund. 2014. "The Crowding-Out Effect of Mandatory Labour Market Pension Schemes on Private Savings." CEPS Working Document No. 390.

Attanasio, Orazio P., and Agar Brugiavini. 2003. "Social Security and Households' Saving*." *The Quarterly Journal of Economics*, 118(3): 1075–1119.

Attanasio, Orazio P., and Susann Rohwedder. 2003. "Pension Wealth and Household Saving: Evidence from Pension Reforms in the United Kingdom." *American Economic Review*, 93(5): 1499–1521.

Bach, Laurent, Laurent E. Calvet, and Paolo Sodini. 2020. "Rich Pickings? Risk, Return, and Skill in Household Wealth." *American Economic Review*, 110(9): 2703–47.

Bajari, Patrick, Han Hong, Minjung Park, and Robert Town. 2011. "Regression Discontinuity Designs with an Endogenous Forcing Variable and an Application to Contracting in Health Care." NBER Working Paper No. 17643.

Barr, Andrew, Jonathan Eggleston, and Alexander A. Smith. 2022. "Investing in Infants: the Lasting Effects of Cash Transfers to New Families." *The Quarterly Journal of Economics*, 137(4): 2539–83.

Barreca, Alan I., Melanie Guldi, Jason M. Lindo, and Glen R. Waddell. 2011. "Saving Babies? Revisiting the Effect of Very Low Birth Weight Classification." *The Quarterly Journal of Economics*, 126(4): 2117–23.

Benartzi, Shlomo, and Richard H. Thaler. 2013. "Behavioral Economics and the Retirement Savings Crisis." *Science*, 339(6124): 1152–53.

Beshears, John, James J. Choi, David Laibson, and Brigitte C. Madrian. 2009. "The importance of default options for retirement saving outcomes." In *Social Security Policy in a Changing Environment*. , ed. Jeffrey Brown, Jeffrey Liebman and David A. Wise, 167–195. University of Chicago Press.

Beshears, John, James J. Choi, David Laibson, Brigitte C. Madrian, and William L. Skimmyhorn. 2022. "Borrowing to Save? The Impact of Automatic Enrollment on Debt." *The Journal of Finance*, 77(1): 403–47.

Beshears, John, Matthew Blakstad, James J Choi, Christopher Firth, John Gathergood, David Laibson, Richard Notley, Jesal D Sheth, Will Sandbrook, and Neil Stewart. 2024. "Does Pension Automatic Enrollment Increase Debt? Evidence from a Large-Scale Natural Experiment." NBER Working Paper No. 32100.

Blumenstock, Joshua, Michael Callen, and Tarek Ghani. 2018. "Why Do Defaults Affect Behavior? Experimental Evidence from Afghanistan." *American Economic Review*, 108(10): 2868–2901.

Bottazzi, Renata, Tullio Jappelli, and Mario Padula. 2006. "Retirement expectations, pension reforms, and their impact on private wealth accumulation." *Journal of Public Economics*, 90(12): 2187–2212.

Bozio, Antoine, Thomas Breda, and Julien Grenet. 2023. "Does Tax-Benefit Linkage Matter for the Incidence of Social Security Contributions?" PSE Working Paper No. 43.

Brunner, Marc, Jonas Meier, and Armando Näf. 2020. "Heterogeneity in Returns to Wealth: Evidence from Swiss Administrative Data." Working Paper.

Bucher-Koenen, Tabea, Luisa Wallossek, and Joachim Winter. 2024. "Opt-in or Opt-out? The Power of Defaults in Pension Enrollment Choices." Working Paper.

Bütler, Monika. 2009. "Switzerland: High Replacement Rates and Generous Subsistence as a Barrier to Work in Old Age." *The Geneva Papers on Risk and Insurance - Issues and Practice*, 34(4): 561–77.

Calonico, Sebastian, Matias D. Cattaneo, and Rocio Titiunik. 2014*a*. "Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs." *Econometrica*, 82(6): 2295–2326.

Calonico, Sebastian, Matias D. Cattaneo, and Rocío Titiunik. 2014*b*. "Robust Data-Driven Inference in the Regression-Discontinuity Design." *The Stata Journal*, 14(4): 909–46.

Calonico, Sebastian, Matias D. Cattaneo, Max H. Farrell, and Rocío Titiunik. 2017. "rdrobust: Software for Regression-Discontinuity Designs." *The Stata Journal*, 17(2): 372–404.

Calonico, Sebastian, Matias D. Cattaneo, Max H. Farrell, and Rocío Titiunik. 2019. "Regression Discontinuity Designs Using Covariates." *The Review of Economics and Statistics*, 101(3): 442–51.

Card, David, and Michael Ransom. 2011. "Pension Plan Characteristics and Framing Effects in Employee Savings Behavior." *Review of Economics and Statistics*, 93(1): 228–243.

Cattaneo, Matias D., Michael Jansson, and Xinwei Ma. 2018. "Manipulation Testing Based on Density Discontinuity." *The Stata Journal*, 18(1): 234–61.

Cattaneo, Matias D., Michael Jansson, and Xinwei Ma. 2020. "Simple Local Polynomial Density Estimators." *Journal of the American Statistical Association*, 115(531): 1449–55.

Chalmers, John, Olivia S. Mitchell, Jonathan Reuter, and Mingli Zhong. 2022. "Do State-Sponsored Retirement Plans Boost Retirement Saving?" *AEA Papers and Proceedings*, 112: 142–46.

Chetty, Raj, John N. Friedman, and Emmanuel Saez. 2013. "Using Differences in Knowledge across Neighborhoods to Uncover the Impacts of the EITC on Earnings." *American Economic Review*, 103(7): 2683–2721.

Chetty, Raj, John N Friedman, Søren Leth-Petersen, Torben Heien Nielsen, and Tore Olsen. 2014. "Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark." *The Quarterly Journal of Economics*, 129(3): 1141–1219.

Chetty, Raj, John N. Friedman, Tore Olsen, and Luigi Pistaferri. 2011. "Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records." *Quarterly Journal of Economics*, 126(2): 749–804.

Choi, James J. 2015. "Contributions to Defined Contribution Pension Plans." *Annual Review of Financial Economics*, 7: 161–178.

Choi, James J., David Laibson, Brigitte C. Madrian, and Andrew Metrick. 2004. "For better or for worse: Default effects and 401 (k) savings behavior." In *Perspectives on the Economics of Aging*. , ed. David A. Wise, 81–126. University of Chicago Press.

Choi, James J., David Laibson, Jordan Cammarota, Richard Lombardo, and John Beshears. 2024. "Smaller than We Thought? The Effect of Automatic Savings Policies." NBER Working Paper No. 32828.

Choukhmane, Taha. 2024. "Default Options and Retirement Saving Dynamics." Working Paper.

Choukhmane, Taha, and Christopher Palmer. 2024. "How Do Consumers Finance Increased Retirement Savings?" Working Paper.

Cribb, Jonathan, and Carl Emmerson. 2020. "What happens to workplace pension saving when employers are obliged to enrol employees automatically?" *International Tax and Public Finance*, 27: 664–693.

Derby, Elena, Kathleen Mackie, and Jacob Mortenson. 2023. "Worker and Spousal Responses to Automatic Enrollment." *Journal of Public Economics*, 223: 104910.

Dolls, Mathias, Philipp Doerrenberg, Andreas Peichl, and Holger Stichnoth. 2018. "Do Retirement Savings Increase in Response to Information About Retirement and Expected Pensions?" *Journal of Public Economics*, 158: 168–79.

Dorn, David, and Alfonso Sousa-Poza. 2003. "Why Is the Employment Rate of Older Swiss so High? An Analysis of the Social Security System." *The Geneva Papers on Risk and Insurance - Issues and Practice*, 28(4): 652–72.

Dorn, David, and Alfonso Sousa-Poza. 2005. "The Determinants of Early Retirement in Switzerland." *Swiss Journal of Economics and Statistics*, 141(2): 247–83.

Duflo, Esther, and Emmanuel Saez. 2003. "The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment." *The Quarterly Journal of Economics*, 118(3): 815–42.

Duflo, Esther, William Gale, Jeffrey Liebman, Peter Orszag, and Emmanuel Saez. 2006. "Saving Incentives for Low- and Middle-Income Families: Evidence from a Field Experiment with H&R Block." *The Quarterly Journal of Economics*, 121(4): 1311–46.

Ecoplan. 2010. "Herabsetzung der Eintrittsschwelle in der 1. BVG-Revision." Beiträge zur sozialen Sicherheit. Forschungsbericht Nr. 8/10, Bundesamt für Sozialversicherungen, Bern.

Etgeton, Stefan, Björn Fischer, and Han Ye. 2023. "The effect of increasing retirement age on households' savings and consumption expenditure." *Journal of Public Economics*, 221: 104845.

Fagereng, Andreas, Luigi Guiso, Davide Malacrino, and Luigi Pistaferri. 2020. "Heterogeneity and Persistence in Returns to Wealth." *Econometrica*, 88(1): 115–70.

Fagereng, Andreas, Martin Blomhoff Holm, Benjamin Moll, and Gisle Natvik. 2021. "Saving Behavior Across the Wealth Distribution: The Importance of Capital Gains." Working Paper.

Falk, Justin, and Nadia S Karamcheva. 2023. "The impact of an employer match and automatic enrollment on the savings behavior of public-sector workers." *Journal of Pension Economics & Finance*, 22(1): 38–68.

Federal Statistical Office. 2019. "Pensionskassenstatistik 2017." Bundesamt für Statistik, Neuchâtel.

Feldstein, Martin. 1974. "Social Security, Induced Retirement, and Aggregate Capital Accumulation." *Journal of Political Economy*, 82(5): 905–926.

Friedberg, Leora, Adam Leive, and Wenqiang Cai. 2024. "Does Mandatory Retirement Saving Crowd Out Voluntary Retirement Saving?" *Journal of Economic Behavior & Organization*, 225: 20–36.

García-Miralles, Esteban, and Jonathan M. Leganza. 2024. "Public Pensions and Private Savings." *American Economic Journal: Economic Policy*, 16(2): 366–405.

Gelman, Andrew, and Guido Imbens. 2019. "Why High-Order Polynomials Should Not Be Used in Regression Discontinuity Designs." *Journal of Business & Economic Statistics*, 37(3): 447–56.

Goda, Gopi Shah, Colleen Flaherty Manchester, and Aaron J. Sojourner. 2014. "What Will My Account Really Be Worth? Experimental Evidence on How Retirement Income Projections Affect Saving." *Journal of Public Economics*, 119: 80–92.

Hahn, Jinyong, Petra Todd, and Wilbert Van der Klaauw. 2001. "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design." *Econometrica*, 69(1): 201–209.

Imbens, Guido W., and Thomas Lemieux. 2008. "Regression Discontinuity Designs: A Guide to Practice." *Journal of Econometrics*, 142(2): 615–35.

Kuhn, Ursina. 2020. "Augmented Wealth in Switzerland: The Influence of Pension Wealth on Wealth Inequality." *Swiss Journal of Economics and Statistics*, 156(19).

Lachowska, Marta, and Michał Myck. 2018. "The Effect of Public Pension Wealth on Saving and Expenditure." *American Economic Journal: Economic Policy*, 10(3): 284–308.

Lindeboom, Maarten, and Raymond Montizaan. 2020. "Disentangling retirement and savings responses." *Journal of Public Economics*, 192: 104297.

Madrian, Brigitte C., and Dennis F. Shea. 2001. "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." *The Quarterly Journal of Economics*, 116(4): 1149–87.

McCrary, Justin. 2008. "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test." *Journal of Econometrics*, 142(2): 698–714.

OECD. 2018*a*. *Financial Incentives and Retirement Savings.* OECD Publishing, Paris.

OECD. 2018*b*. *OECD Pensions Outlook 2018.* OECD Publishing, Paris.

OECD. 2018*c*. *The Role and Design of Net Wealth Taxes in the OECD.* OECD Tax Policy Studies No. 26, OECD Publishing, Paris.

OECD. 2023. *Pensions at a Glance 2023: OECD and G20 Indicators.* OECD Publishing, Paris.

Poterba, James M. 2014. "Retirement Security in an Aging Population." *American Economic Review*, 104(5): 1–30.

Schöchli, Hansueli. 2021. "Die geplante Rentenreform ist für Angestellte mit tiefen Löhnen ein zweischneidiges Schwert." *Neue Zürcher Zeitung*. available at: https://www.nzz.ch/wirtschaft/die-geplante-rentenreform-drueckt-nettoloehne-und-kostet-stellen-ld.1641932 [accessed on 15 October 2021].

Schüpbach, Salome, and Stefan Müller. 2019. "Wie viel Kapital steckt in der Säule 3a?" *Soziale Sicherheit CHSS*, 4.

Thaler, Richard H., and Shlomo Benartzi. 2004. "Save More Tomorrow™: Using Behavioral Economics to Increase Employee Saving." *Journal of Political Economy*, 112(S1): 164–87.

Online Appendix

Saving Responses to Mandatory Pension Plans

David Burgherr[1]

January 2025

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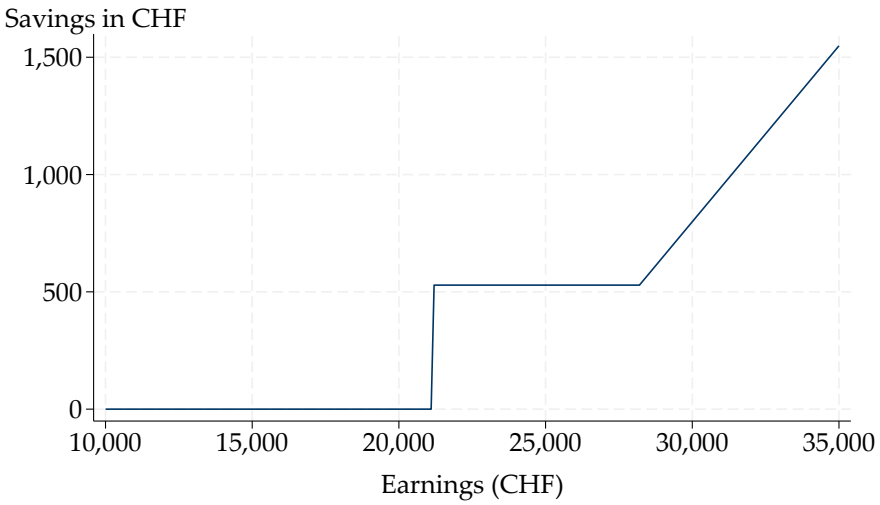
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A Additional Figures and Tables

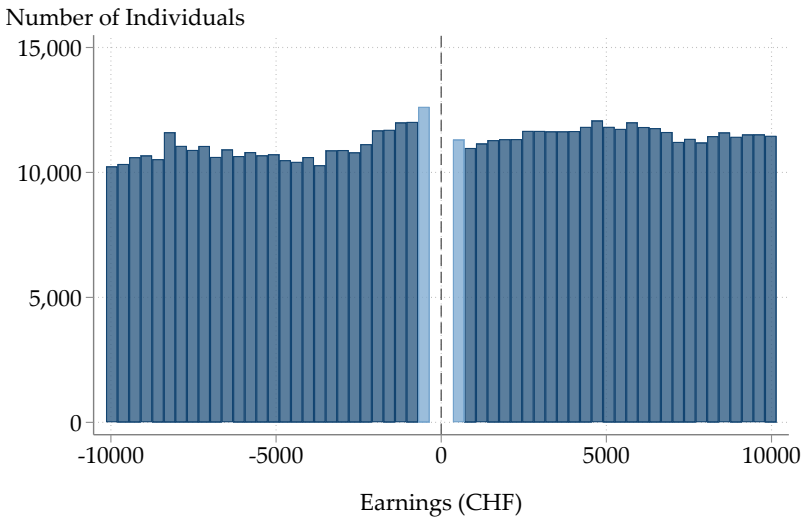
Figure A.1: Mandatory Pension Contributions as a Function of Earnings



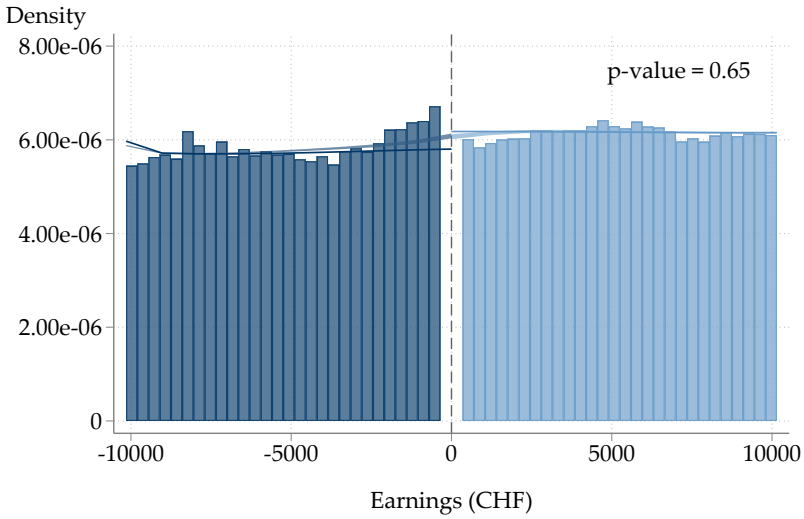
Notes: The figure displays mandated occupational pension contributions as a function of gross earnings for an employee between 45 and 54 years of age in 2017. Contributions are computed according to the statutory contribution schedule, i.e, applying a contribution rate of 15% to qualifying earnings. The relationship is very similar in other years, with slight variations depending on the year-specific parameters of the contribution schedule listed in Appendix Table B.1.
Source: Author's illustration based on information from the Federal Social Insurance Office.

Figure A.2: Density Test for Earnings in Main Job

(a) frequency distribution



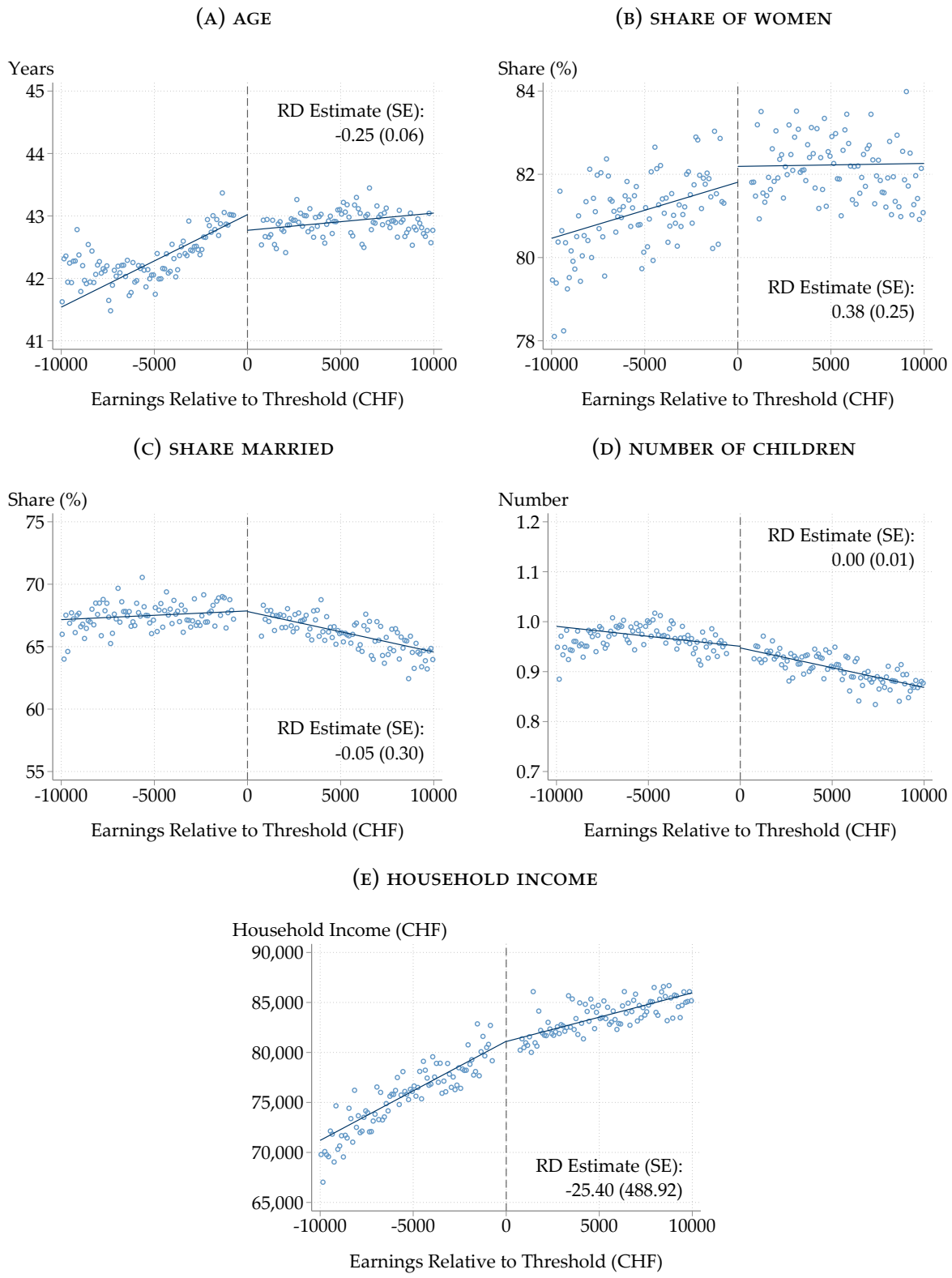
(b) density test



Notes: Panel A displays the frequency distribution of gross earnings in the main job (running variable) within CHF 10,000 of the threshold of the pension plan mandate using data from 2005 to 2017. Panel B plots the results of the density test proposed by Cattaneo, Jansson and Ma (2018, 2020) for the same observations. The bars represent the histogram of the distribution; the lines represent bias-corrected density estimates using local linear regression; the shaded areas represent valid confidence bands. The dashed vertical line indicates the mandate threshold. Workers within CHF 350 of the cutoff are excluded because their gross earnings cannot be imputed unambiguously. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions.

Source: Author's calculations based on administrative tax data from the canton of Bern.

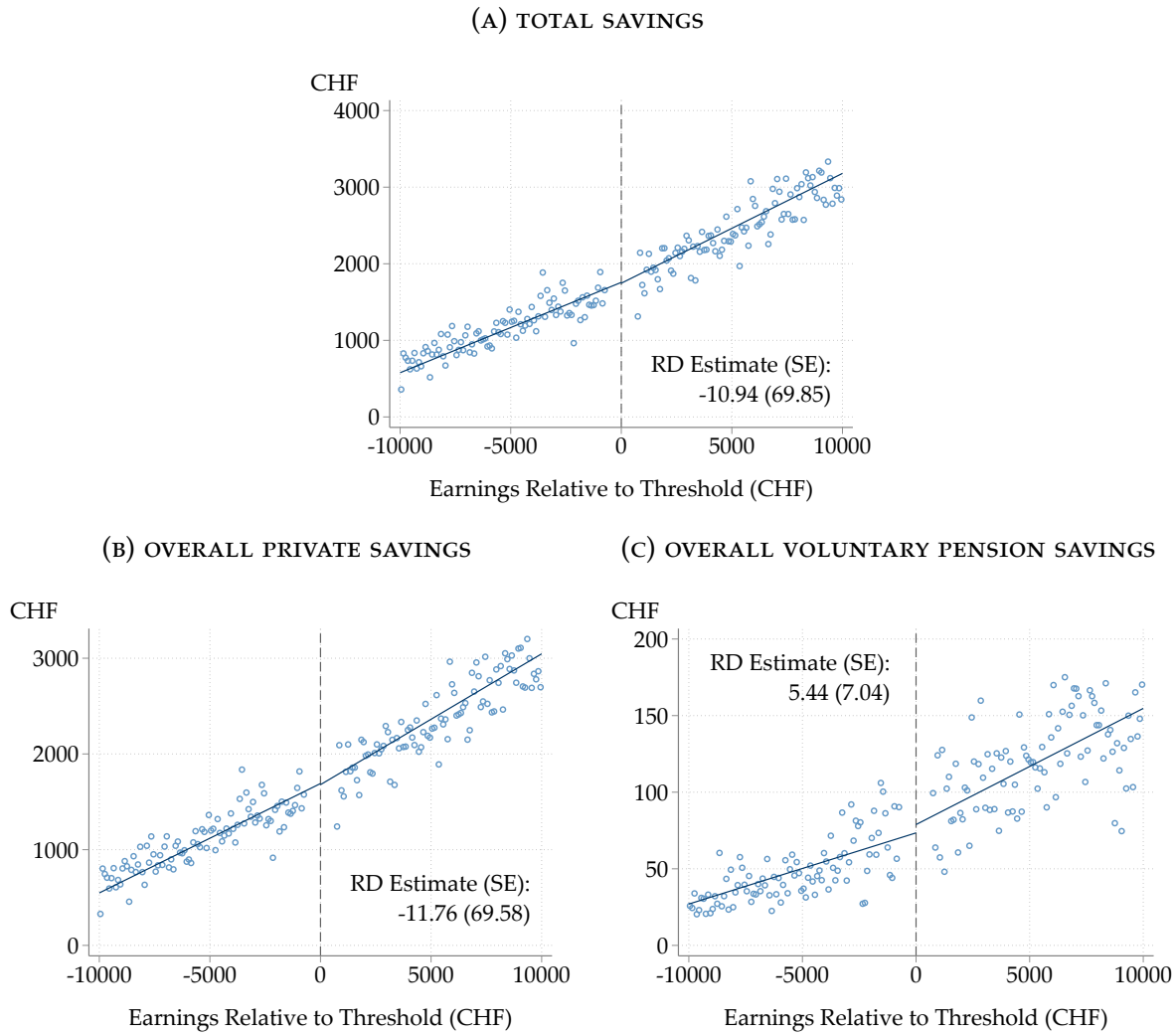
Figure A.3: Continuity of Predetermined Characteristics



Notes: Regression discontinuity plots for a set of predetermined characteristics using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) without control variables, using a triangular kernel. The running variable is recentered around the mandate threshold. See Section 4.2 for more details on estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

Figure A.4: Placebo Test: Effects of Mandate on Workers Aged 20–24

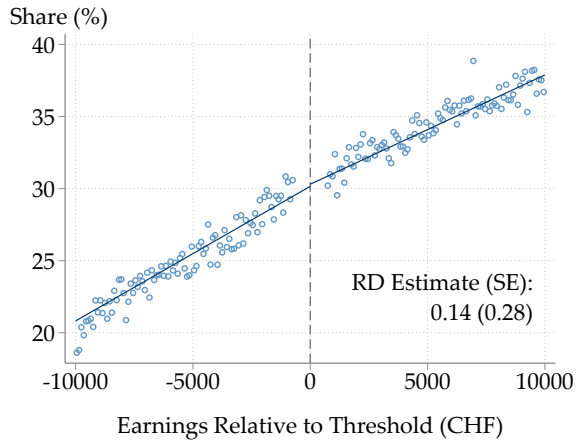


Notes: Regression discontinuity plots showing the effects of the pension plan mandate on a placebo sample of workers who are 20–24 years old and thus not affected by the mandate, using data from 2005 to 2017. Effective estimation sample includes 169,443 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on estimation.

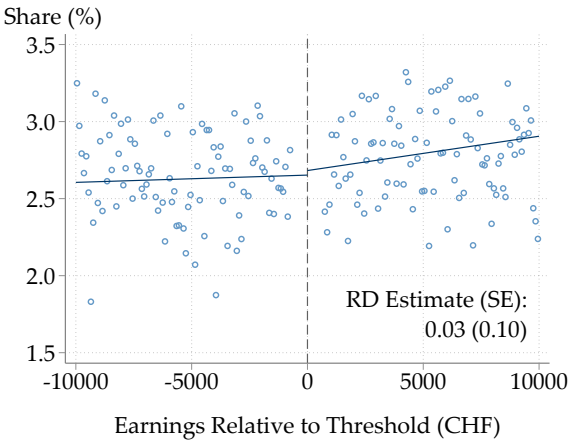
Source: Author's calculations based on administrative tax data from the canton of Bern.

FIGURE A.5: EFFECTS OF MANDATE ON INTERVALS OF PRIVATE PENSION CONTRIBUTIONS

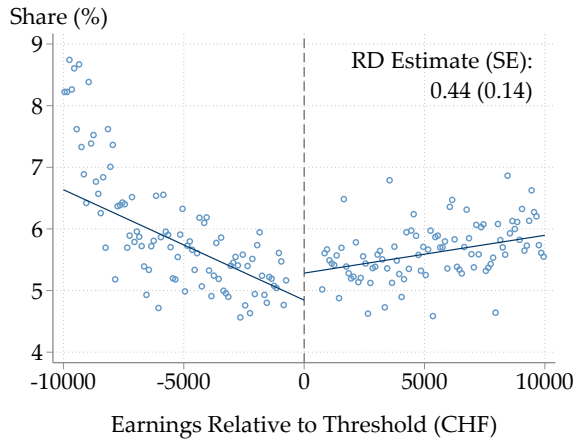
(A) CONTRIBUTION > 0



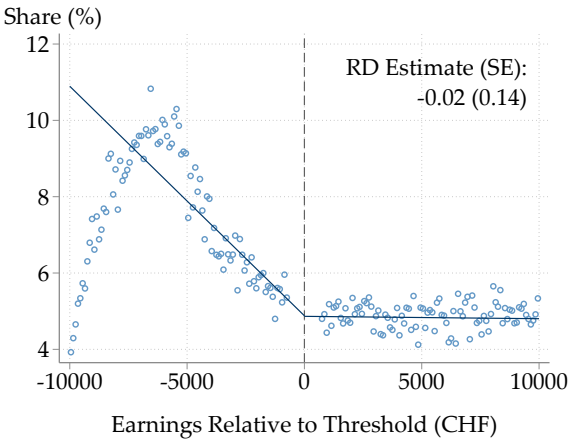
(B) CONTRIBUTION $\in (0, 1000]$



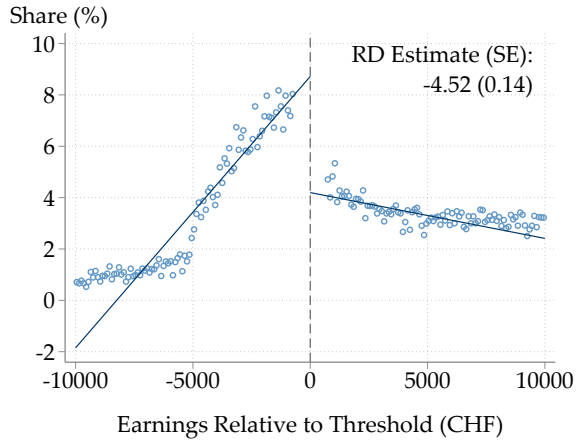
(C) CONTRIBUTION $\in (1000, 2000]$



(D) CONTRIBUTION $\in (2000, 3000]$



(E) CONTRIBUTION $\in (3000, 4000]$



(F) CONTRIBUTION $\in (4000, 5000]$

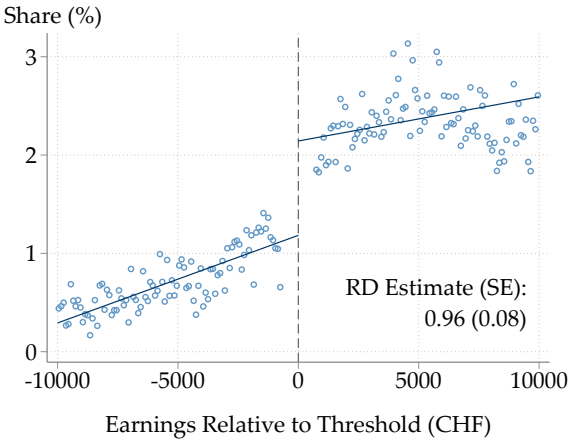
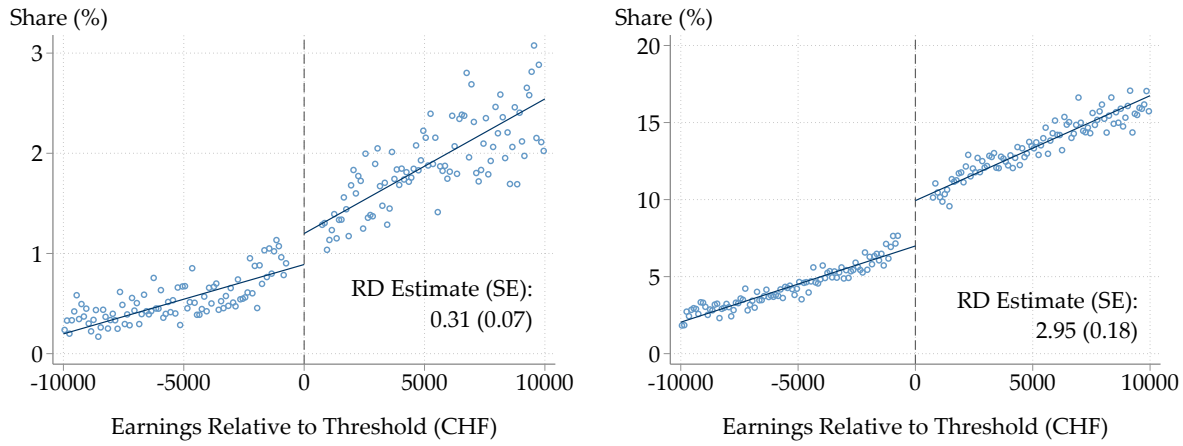


FIGURE A.5: EFFECTS OF MANDATE ON INTERVALS OF PRIVATE PENSION CONTRIBUTIONS (CONT.)

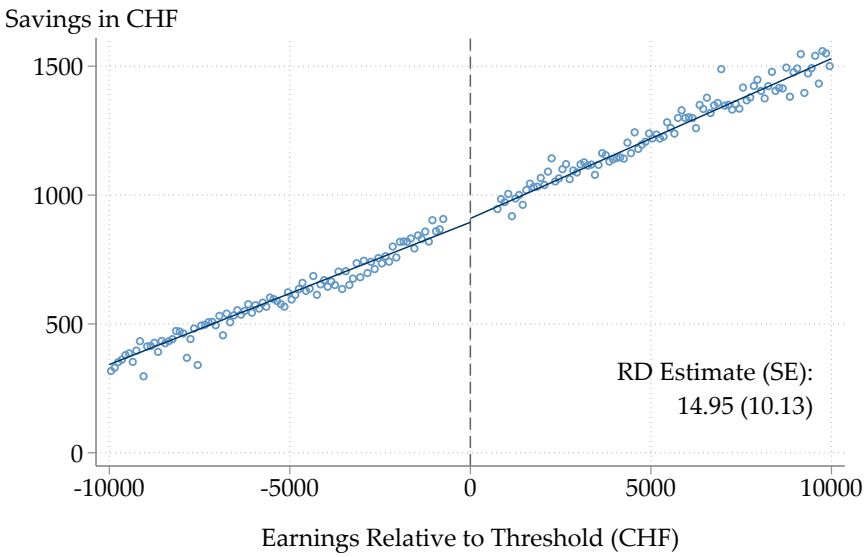
(G) CONTRIBUTION $\in (5000, 6000]$ (H) CONTRIBUTION > 6000



Notes: Regression discontinuity plots showing the effect of the pension plan mandate on the share making any private pension contributions (Panel A) and on the share making contributions in CHF 1,000 intervals (Panels B through H), using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

Figure A.6: Effect of Mandate on Capped Private Pension Savings

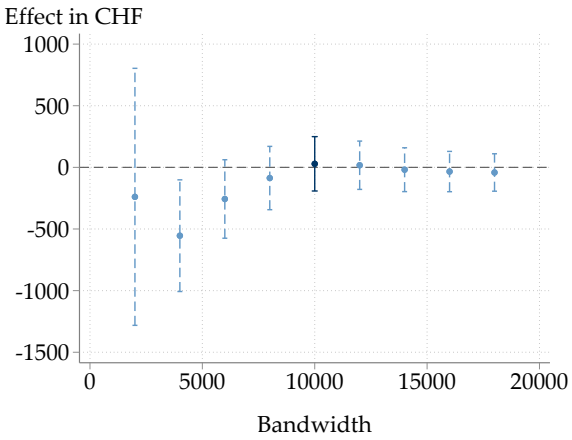


Notes: Regression discontinuity plot showing the effect of the pension plan mandate on private pension savings using data from 2005 to 2017, after imposing the same contribution cap rule below and above the mandate threshold. Effective estimation sample includes 597,120 worker-year observations. Points are local sample means using 100 non-overlapping evenly-spaced bins on each side of the cutoff; lines are linear fits using all the underlying data points. Point estimates and standard errors are obtained from estimating Equation (2) using a triangular kernel. The running variable is recentered around the mandate threshold, indicated by the dashed vertical line. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

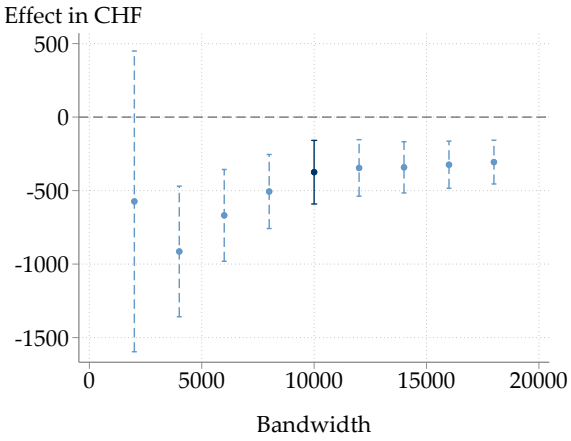
Source: Author's calculations based on administrative tax data from the canton of Bern.

Figure A.7: Sensitivity of RD Estimates to Bandwidth Choice

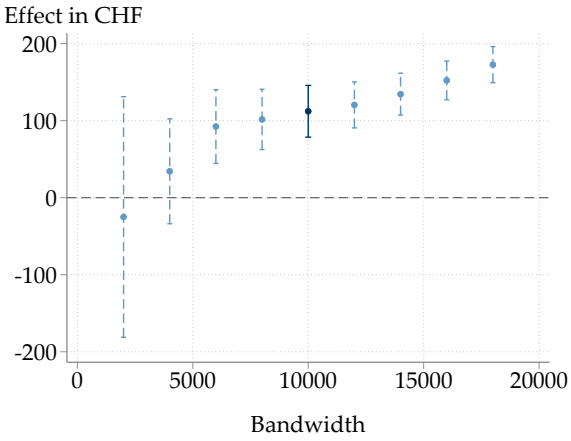
(a) total savings



(b) overall private savings



(c) overall voluntary pension savings

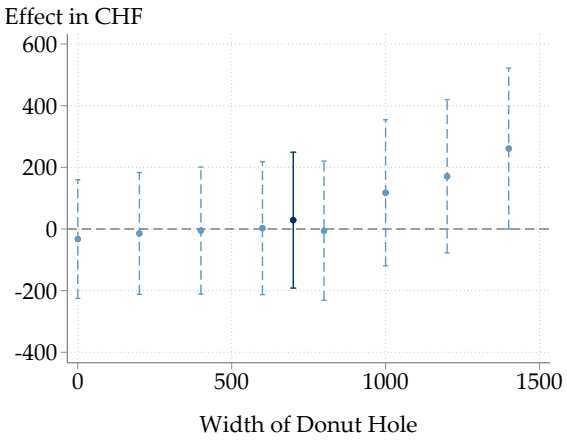


Notes: Coefficient plots showing the effects of the pension plan mandate depending on the bandwidth choice, using data from 2005 to 2017. Point estimates and 95% confidence intervals are obtained from estimating Equation (2) using a triangular kernel. The dark marker represents the main result using a bandwidth of CHF 10,000; the dashed light markers represent estimates using alternative bandwidths. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

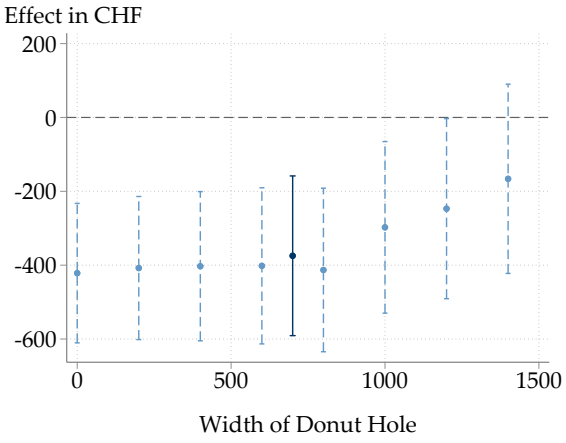
Source: Author's calculations based on administrative tax data from the canton of Bern.

Figure A.8: Sensitivity of RD Estimates to Size of Donut Hole

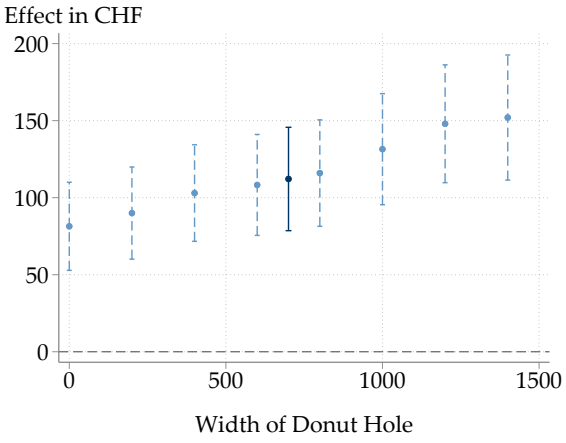
(a) total savings



(b) overall private savings



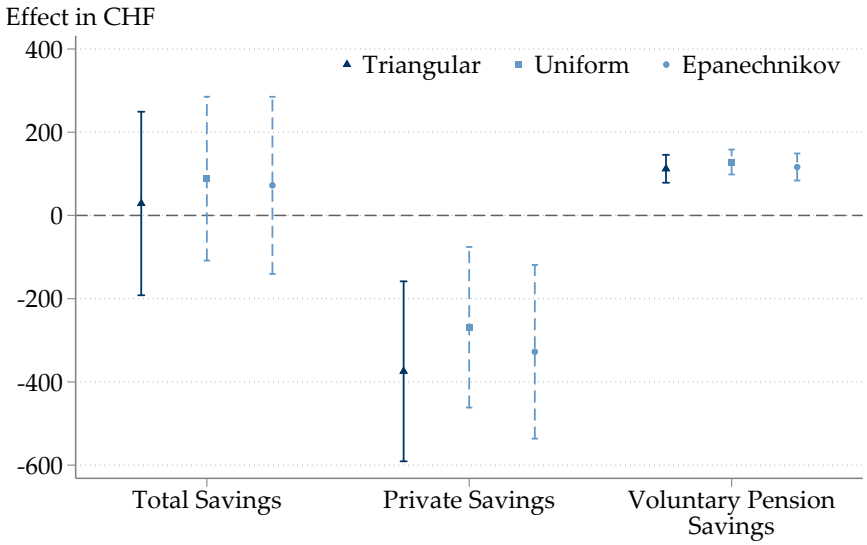
(c) overall voluntary pension savings



Notes: Coefficient plots showing the effects of the pension plan mandate depending on the size of the donut hole removed from the estimation sample, using data from 2005 to 2017. Point estimates and 95% confidence intervals are obtained from estimating Equation (2) using a triangular kernel. The dark marker represents the main result using a donut hole of CHF 700; the dashed light markers represent estimates using alternative donut hole sizes. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

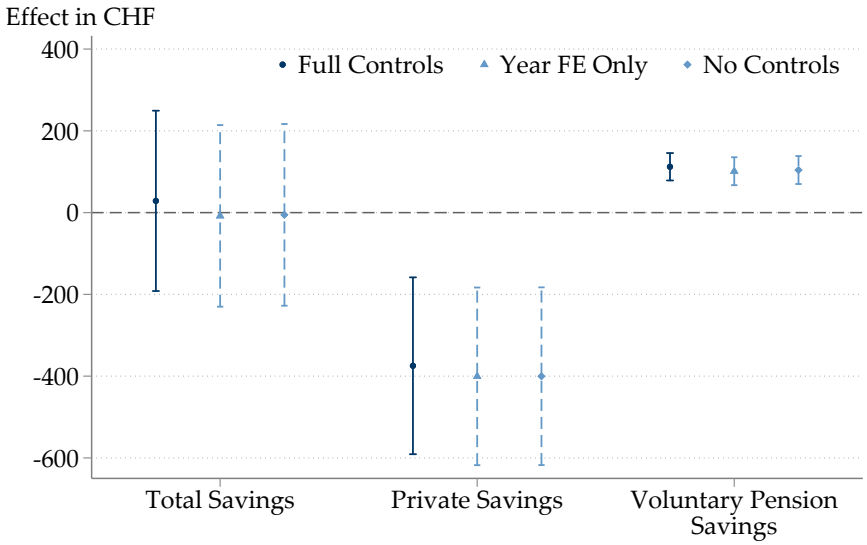
FIGURE A.9: SENSITIVITY OF RD ESTIMATES TO KERNEL CHOICE



Notes: Coefficient plot showing the effects of the pension plan mandate depending on the kernel weights, using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Point estimates and 95% confidence intervals are obtained from estimating Equation (2). The dark marker represents the main result using a triangular kernel; the dashed light markers represent estimates using alternative kernels. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

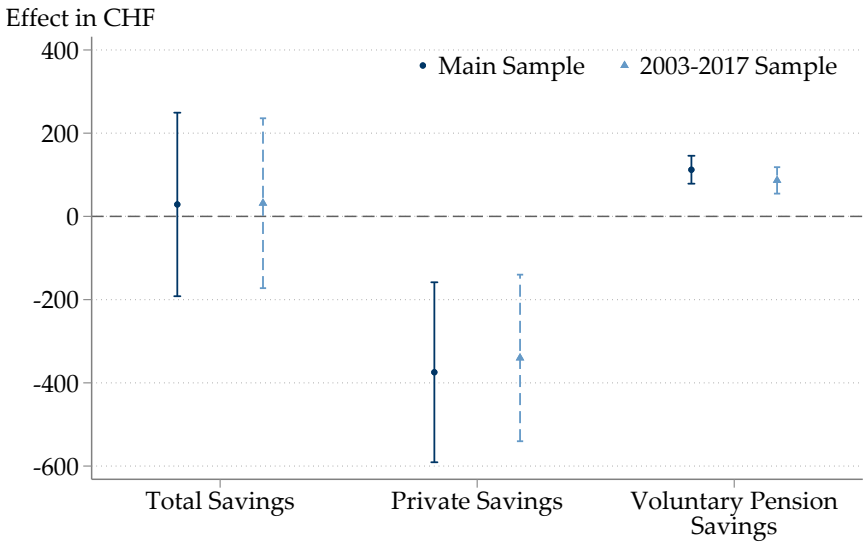
Figure A.10: Sensitivity of RD Estimates to Control Variables



Notes: Coefficient plot showing the effects of the pension plan mandate depending on the set of controls included, using data from 2005 to 2017. Effective estimation sample includes 597,120 worker-year observations. Point estimates and 95% confidence intervals are obtained from estimating Equation (2). The dark marker represents the main result estimated with the full set of controls; the dashed light markers represent estimates including only year fixed effects or no controls at all. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

Figure A.11: Sensitivity of RD Estimates to Sample Period



Notes: Coefficient plot showing the effects of the pension plan mandate depending on the sample period. Point estimates and 95% confidence intervals are obtained from estimating Equation (2). The dark marker represents the main result using data from years 2005–2017; the dashed light markers represent estimates using data from the full period 2003–2017. Total savings and overall private savings are winsorized at percentiles 5 and 95. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions and estimation.

Source: Author's calculations based on administrative tax data from the canton of Bern.

TABLE A.1: SUMMARY STATISTICS

	Mean	Median	Std. Dev.
Panel A: Demographics			
Age	42.61	43	10.22
Female	0.82	1	0.39
Married	0.67	1	0.47
Number of Children	0.93	1	1.07
Panel B: Income			
Household Income	79,783	79,585	70,182
Total Individual Income	25,343	24,123	31,176
Gross Earnings Main Job	20,689	21,146	6,013
Gross Earnings Side Job	734	0	3,043
Self-Employment Income	684	0	5,498
Other Income	3,237	59	30,056
Panel C: Wealth (Stock Variables)			
Net Wealth	60,722	17,648	102,707
Financial Wealth	42,661	15,054	63,191
Business Wealth	488	0	1,902
Property Wealth	87,469	0	122,001
Other Wealth	2,312	0	4,525
Debt	-83,318	-2,000	116,742
Panel D: Savings (Annual Flows)			
Total Savings	3,922	1,112	17,452
Mandatory Pension Savings	245	232	276
Voluntary Pension Savings	1,203	0	2,821
Private Pension Savings	1,132	0	2,113
Occupational Pension Buy-ins	72	0	1,706
Private Savings	2,518	272	17,047
Financial Savings	1,589	0	11,451
Business Savings	66	0	1,389
Property Savings	2,903	0	14,168
Other Savings	18	0	1,953
Debt Savings	-610	0	5,653
Number of Observations		597,120	
Number of Individuals		191,400	

Notes: Mean, median, and standard deviation of demographic, income, wealth, and savings variables in the estimation sample, pooling data from 2005 to 2017. Estimation sample includes workers aged 25–60 with earnings within CHF 10,000 of the mandate threshold. All monetary values are reported in Swiss francs. All wealth variables, all private savings variables, and total savings are winsorized at percentiles 5 and 95, except business savings and property savings which are winsorized at percentiles 2.5 and 97.5. See Section 3 for more information on data preparation and variable construction as well as Section 4.2 for more detail on sample restrictions.
Source: Author's calculations based on administrative tax data from the canton of Bern.

B The Swiss Old-Age Provision System

This appendix provides a comprehensive description of the Swiss old-age provision system, focusing on years 2002 to 2017 which is the period covered by the tax records.[2] Similar to other countries, the Swiss old-age provision system has three pillars: (i) a pay-as-you-go system ("old-age insurance"), (ii) an occupational pension system that is compulsory above an earnings threshold, and (iii) voluntary private pension accounts with a contribution cap. Appendix Table B.1 reports year-specific information on key parameters of the old-age provision system since the introduction of the occupational pension system in 1985.

B.1 Old-Age Insurance

Old-age insurance is organized as a pay-as-you-go scheme and compulsory for all individuals living or working in Switzerland between the age of 18 years and the statutory retirement age which is 64 years for women and 65 years for men. Between 2002 and 2017, the contribution rate applied to gross earnings was constant at 8.4%, of which employer and employees each pay half. The contribution of employees are deducted from their earnings by the employer and directly transferred to the social insurance administration. There is no cap on contributions, even if they do not lead to higher benefits. While benefit levels do depend on average earnings and the number of contribution years, the maximum benefit level is only double the minimum benefit level. From 2002 to 2017, the minimum annual benefit level was gradually increased from CHF 12,360 to CHF 14,100, while the maximum benefit level, accordingly, was rising from CHF 24,720 to CHF 28,200. This is relevant because key parameters of the occupational pension system are defined with respect to the maximum pension from old-age insurance as I explain in more detail in the next section. Benefit levels are usually adjusted every other year based on the evolution of an index reflecting the arithmetic mean of nominal wage growth and inflation.

B.2 Occupational Pension System

In contrast to old-age insurance, the occupational pension system is fully funded. Female employees between 25 and 64 years of age as well as male employees between 25 and 65 years of age must be enrolled in an occupational pension plan by their employer if the annual gross earnings in their main job with the same employer

[2] For more information on the Swiss old-age provision system and relevant changes over time, see the website of the Federal Social Insurance Office: https://www.bsv.admin.ch/bsv/en/home/social-insurance.html [accessed on 20 October 2021].

exceed the threshold specified in the law. Employees cannot opt out of contributing to an occupational pension account if they meet the legal criteria.

Occupational pension funds are a key tool for wealth accumulation in Switzerland. Savings in occupational pension accounts total around 8% of GDP per year. Wealth accumulated in those accounts reached almost CHF 900 billion or 130% of GDP in 2017 (Federal Statistical Office, 2019).[3] According to data published by the Swiss National Bank, insurance and pension schemes – which mainly consist of capital in occupational pension funds – accounted for about 23% of total household wealth in Switzerland in 2020 (Annaheim and Heim, 2021).

The mandate threshold determining enrollment into occupational pension plans provides the identifying variation for the empirical strategies employed in the paper. From 1985 until 2004, the threshold had been equal to the maximum pension from old-age insurance in order to avoid overinsurance of the salary already covered by old-age insurance. As part of a multi-step reform of the occupational pension system that was implemented between 2004 and 2006, the threshold was lowered to 3/4 of the maximum benefit level in 2005, resulting in a drop of the threshold from CHF 25,320 in 2004 to CHF 19,350 in 2005. Before and after the reform, the threshold was gradually increased in proportion to the rising maximum old-age insurance benefit level.[4] Note that the mandate only applies to earnings in the main job.[5] Employees with multiple jobs who exceed the mandate threshold only when summing up multiple salaries can join an occupational pension fund on a voluntary basis. Yet, the number of individuals making use of that option seems to be negligible (Ecoplan, 2010).[6] Self-employed individuals can also voluntarily join an occupational pension plan in which case they subject themselves to the cap on tax-deductible private pension savings that applies to employees (see Section B.3).

To compute mandatory occupational pension contributions, the qualifying earnings are multiplied by the age-specific contribution rate.[7] Qualifying earnings are equal to gross earnings minus a deduction. Similar to the mandate threshold, the deduction's purpose is to prevent overinsurance. It had been equal to the threshold between 1985 and 2004, but in the 2005 reform the threshold was reduced by more than the deduction. Since then, the deduction equals 7/8 of the maximum benefit

[3]Switzerland's GDP in 2017 was CHF 694 billion according to data from the State Secretariat for Economic Affairs: https://www.seco.admin.ch/seco/en/home/wirtschaftslage---wirtschaftspolitik/Wirtschaftslage/bip-quartalsschaetzungen-/daten.html [accessed on 19 October 2021].

[4]Figure B.1 displays the evolution of the earnings threshold since 1985.

[5]If employees are not working for the same employer for the whole year, the mandate threshold applies to the hypothetical earnings that they would have received if they had worked at that salary for the full year. However, employees must be on a permanent contract or work for the same employer for at least three months. I cannot distinguish these individuals from those who are not subject to the mandate because the tax data only contain information on annual earnings (see Appendix Section C.2).

[6]This finding holds up in more recent data, see Schöchli (2021).

[7]See Equation (4) in Appendix Section C.4 for the computation of occupational pension savings.

from old-age insurance while the threshold is 3/4, as mentioned earlier. The deduction ranges between CHF 22,575 and CHF 25,320 during the sample period.

The statutory contribution rates are 7% for employees aged 25–34, 10% for those aged 35–44, 15% for those aged 45–54, and 18% for women aged 55–64 and men aged 55–65.[8] Employers are legally obliged to pay at least 50% of the contribution. Occupational pension funds have some autonomy in designing their plans if they want to go beyond the minimum standards defined in the law (Dorn and Sousa-Poza, 2003).

For employees whose earnings are only slightly higher than the mandate threshold, there are minimum qualifying earnings equivalent to 1/8 of the maximum old-age insurance pension, varying between CHF 3,090 in 2002 and CHF 3,525 in 2017. Their contributions are calculated by applying the contribution rate to minimum qualifying earnings, not just to the marginal earnings above the threshold or deduction. Hence, there is a discontinuity in occupational pension savings at the cutoff.

If employees' earnings exceed an upper bound, there are maximum qualifying earnings equal to the upper bound minus the deduction. The upper bound is defined as three times the maximum pension from old-age insurance, gradually increasing from CHF 74,160 in 2002 to CHF 84,600 in 2017.[9] Furthermore, many occupational pension plans allow one-off "buy-ins" that individuals can voluntarily make beyond the mandatory contributions. These can also be deducted from taxable income.

To illustrate the calculation of contributions, Appendix Figure A.1 displays the relationship between mandatory occupational pension contributions and gross earnings for an employee aged 45–54 (contribution rate of 15%) in 2017. The discontinuity in mandatory pension savings at the cutoff is clearly visible. This relationship follows the same pattern in all other years with slight differences based on the year-specific parameters listed in Appendix Table B.1.

Retirees can choose to receive occupational pension benefits as some combination of a lifelong annuity and a lump-sum payment. By law, they are entitled to receive at least a quarter of their occupational pension capital as a lump sum.

The transformation of pension capital into an annuity is subject to a legally defined minimum conversion rate. The minimum conversion rate is only binding for the calculation of benefits based on pension capital deriving from qualifying earnings. It does not apply to voluntary occupational pension savings. The rate was reduced

[8] Women's legal retirement age in the occupational pension system was raised from 62 to 64 years in 2005 in order to be aligned with the rules of old-age insurance. Because of the lower retirement age, the statutory contribution rates applied to slightly different age groups for women before 2005 – specifically, 7% for the age group 25–31 years, 10% for the age group 32–41 years, 15% for the age group 42–51 years, and 18% for the age group 52–62 years.

[9] Most occupational pension funds provide insurance for the portion of the salary above the upper bound on a voluntary basis (Bütler, 2009). This practice is not relevant for employees in the earnings range studied in this paper.

gradually from 7.2% to 6.8% over the sample period as a consequence of the reform implemented between 2004 and 2006. The conversion rate translates the occupational pension capital into annual benefit entitlements. Accordingly, CHF 100,000 are converted into an annuity of CHF 6,800–7,200 depending on the year-specific conversion rate. Old-age insurance and occupational pension benefits are designed to jointly replace around 60% of pre-retirement earnings.

The tax treatment of occupational pension savings is quite favorable. Contributions and investment returns are exempt from income tax, and there is no capital gains tax in Switzerland. Moreover, pension capital is exempt from wealth tax. Benefits are subject to tax: while standard income tax is levied on annuities, lump-sum receipts are taxed at special, rather advantageous rates.

B.3 Private Pension Savings

Individuals can make voluntary contributions to designated private pension accounts. Because these savings can be deducted from taxable income, they are subject to a contribution cap. Employees enrolled in an occupational pension plan are allowed to make annual contributions to private pension accounts of up to 8% of the upper bound of qualifying earnings in the second pillar (equivalent to 24% of the maximum old-age insurance pension benefit). This cap has gradually increased from CHF 5,933 in 2002 to CHF 6,768 in 2017. Self-employed individuals who voluntarily join an occupational pension plan are subject to the same cap on private pension savings. Individuals who are not enrolled in an occupational pension plan, whether employed or self-employed, can contribute up to 20% of their net income but at most 40% of the upper bound of qualifying earnings in the occupational pension system (ranging between CHF 29,664 in 2002 and CHF 33,840 in 2017) to private pension accounts.

Private pension accounts are set up independently from occupational pension accounts, either at a bank or insurance company. The law allows contributions to standard savings accounts as well as investments into stocks and other securities. Use of this savings vehicle is fairly widespread: private pension capital in designated accounts totalled CHF 121 billion or 17.4% of GDP in 2017.[10]

Until people enter retirement, they have limited access to the accumulated capital in these designated private pension accounts. Once eligible, disbursement can be in the form of an annuity or lump sum.

The tax treatment of private pension savings is similar to occupational pension savings: contributions can be deducted from taxable income, capital is exempt from

[10]Statistics on the occupational pension and private pension system are available from the Federal Social Insurance Office: https://www.bsv.admin.ch/bsv/en/home/social-insurance/bv/statistik.html [accessed on 20 October 2021].

wealth tax, while annuities are subject to income tax and lump-sum payments are taxed at preferential rates at the time of receipt.

B.4 Reform of the Occupational Pension System in 2004–2006

The 2004–2006 reform was the first major reform of the occupational pension system since its introduction in 1985, and it remains the only one to date.[11] It was implemented in three steps between 2004 and 2006. Before the reform, from 1985 to 2004, both the earnings threshold and the deduction for computing mandatory occupational pension savings had been equal to the maximum pension in the pay-as-you-go system. Accordingly, they had been increasing one-for-one with the rising maximum benefit level during that period, reaching CHF 25,320 in 2004.

As part of the reform, both the threshold and the deduction were lowered in 2005. Appendix Figure B.1 plots the evolution of the threshold since introduction of the occupational pension system in 1985, demonstrating the significance of the 2005 reduction. The 2005 reform reduced the threshold to 3/4 of the maximum pay-as-you-go pension. As a consequence, it fell from CHF 25,320 in 2004 to CHF 19,350 in 2005. Around 140,000 employees in Switzerland who otherwise would not have been subject to the mandate became covered due to the reform, the majority of which were female, working part-time, and had low hourly wages below CHF 25 (Ecoplan, 2010). This represents an increase in the number of workers covered by roughly 4%. The purpose of the reduction of the threshold was to improve financial preparedness for retirement among low-income workers.

The deduction was lowered to 7/8 of the maximum pay-as-you-go pension, i.e., to CHF 22,575 in 2005. This increased mandatory occupational pension savings at almost all earnings levels above the threshold. Lowering the deduction aimed to offset some of the decline in pension benefit levels caused by the decrease in the conversion rate implemented in the same reform.

The reform included further policy changes such as lowering the statutory rate for converting pension account balances into annuities from 7.2% to 6.8% over a transition period of ten years, increasing women's retirement age in the occupational pension system to 64 years in line with the rules in the pay-as-you-go system, and aligning the contribution rate schedule for women with that of men.

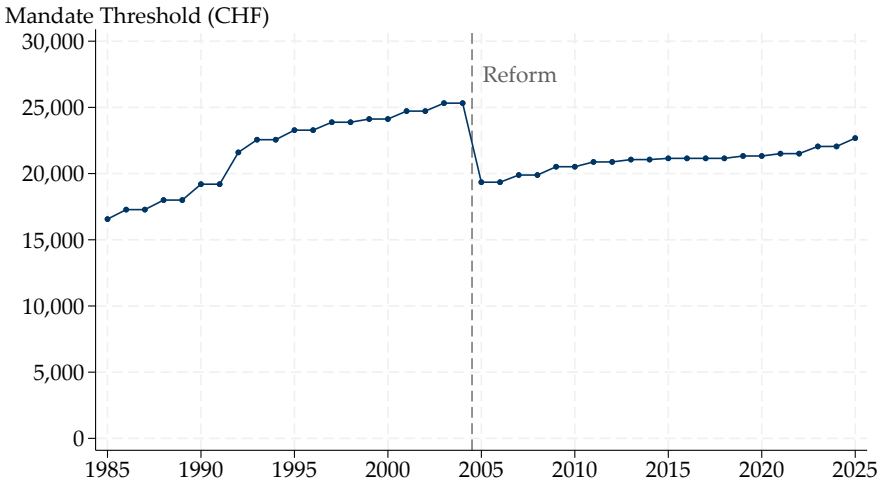
[11] Detailed information on the reform ("1. BVG-Revision") is available from the Federal Social Insurance Office: https://www.bsv.admin.ch/bsv/de/home/sozialversicherungen/bv/reformen-und-revisionen/revision-1-bvg.html [accessed on 30 October 2021].

Table B.1: Key Parameters of the Old-Age Provision System in Switzerland

	Old-age insurance		Occupational pension system				Private pension savings
Year	Minimum benefit	Maximum benefit	Threshold	Deduction	Upper bound	Min. qual. earnings	Contribution cap
1985	8,280	16,560	16,560	16,560	49,680	2,070	-
1986	8,640	17,280	17,280	17,280	51,840	2,160	-
1987	8,640	17,280	17,280	17,280	51,840	2,160	4,147
1988	9,000	18,000	18,000	18,000	54,000	2,250	4,320
1989	9,000	18,000	18,000	18,000	54,000	2,250	4,320
1990	9,600	19,200	19,200	19,200	57,600	2,400	4,608
1991	9,600	19,200	19,200	19,200	57,600	2,400	4,608
1992	10,800	21,600	21,600	21,600	64,800	2,700	5,184
1993	11,280	22,560	22,560	22,560	67,680	2,820	5,414
1994	11,280	22,560	22,560	22,560	67,680	2,820	5,414
1995	11,640	23,280	23,280	23,280	69,840	2,910	5,587
1996	11,640	23,280	23,280	23,280	69,840	2,910	5,587
1997	11,940	23,880	23,880	23,880	71,640	2,985	5,731
1998	11,940	23,880	23,880	23,880	71,640	2,985	5,731
1999	12,060	24,120	24,120	24,120	72,360	3,015	5,789
2000	12,060	24,120	24,120	24,120	72,360	3,015	5,789
2001	12,360	24,720	24,720	24,720	74,160	3,090	5,933
2002	12,360	24,720	24,720	24,720	74,160	3,090	5,933
2003	12,660	25,320	25,320	25,320	75,960	3,165	6,077
2004	12,660	25,320	25,320	25,320	75,960	3,165	6,077
2005	12,900	25,800	19,350	22,575	77,400	3,225	6,192
2006	12,900	25,800	19,350	22,575	77,400	3,225	6,192
2007	13,260	26,520	19,890	23,205	79,560	3,315	6,365
2008	13,260	26,520	19,890	23,205	79,560	3,315	6,365
2009	13,680	27,360	20,520	23,940	82,080	3,420	6,566
2010	13,680	27,360	20,520	23,940	82,080	3,420	6,566
2011	13,920	27,840	20,880	24,360	83,520	3,480	6,682
2012	13,920	27,840	20,880	24,360	83,520	3,480	6,682
2013	14,040	28,080	21,060	24,570	84,240	3,510	6,739
2014	14,040	28,080	21,060	24,570	84,240	3,510	6,739
2015	14,100	28,200	21,150	24,675	84,600	3,525	6,768
2016	14,100	28,200	21,150	24,675	84,600	3,525	6,768
2017	14,100	28,200	21,150	24,675	84,600	3,525	6,768
2018	14,100	28,200	21,150	24,675	84,600	3,525	6,768
2019	14,220	28,440	21,330	24,885	85,320	3,555	6,826
2020	14,220	28,440	21,330	24,885	85,320	3,555	6,826
2021	14,340	28,680	21,510	25,095	86,040	3,585	6,883

Notes: Year-specific parameters of the old-age provision system in Switzerland since the introduction of the occupational pension system in 1985. All values are reported in Swiss francs. The option to contribute to preferentially taxed private pension accounts was established in 1987. The cap on these private pension contributions applies to individuals enrolled in an occupational pension plan which includes all employees with earnings above the mandate threshold.
Source: Official information from the Federal Social Insurance Office.

Figure B.1: Earnings Threshold of the Occupational Pension Plan Mandate



Notes: The figure displays the evolution of the earnings threshold determining coverage of the occupational pension savings mandate from the introduction of the occupational pension system in 1985 to 2025. The dashed vertical line indicates the timing of the reform that lowered the threshold in 2005. Employees with gross earnings in their main job exceeding the threshold are subject to the savings mandate.

Source: Author's illustration based on information from the Federal Social Insurance Office.

C Data Appendix

In this appendix, I describe the administrative data provided by the tax authority of the canton of Bern in more detail. I start by discussing what variables are available at the individual or the household level, and how I split up couples into individual observations. Subsequently, I turn to the income, wealth, and savings data used in the paper. Finally, I discuss data cleaning and sample restrictions.

C.1 Individual-Level vs. Household-Level Information

In Switzerland, the relevant tax unit is the household. Thus, married couples jointly file one tax return. Because the savings mandate applies at the individual level, I follow the approach of Fagereng et al. (2020) and split up married couples into individual observations, equally assigning half of the value of income and wealth variables that are only reported at the household level to each partner. All wealth information is reported at the household level. Income variables reported at the household level include self-employment income, business income, financial income, and property income. Most important for my analysis, earnings from employment are reported at the individual level, as are transfer income and pension income. The same is true for occupational pension buy-ins and private pension savings.

C.2 Income

The pension plan mandate applies to gross earnings in the main job, before any deductions are applied. The tax records contain separate information for earnings in the main job and other jobs. The definition of earnings in the main job used by the tax administration overlaps to a large degree with the definition relevant for the mandate (see Appendix Section B.2). Both refer to total earnings with the same employer. There is a difference in that the tax authority includes positions at multiple employers as part of the main job if they are similar in terms of working hours or income received, while the mandate applies only to the main job at one employer. Yet, this distinction is unlikely to be relevant for many employees in the data, so the resulting measurement error should be limited.

Employees report earnings net of social insurance and occupational pension contributions to the tax administration because these are deducted directly from their salary by the employer. Therefore, I impute gross earnings based on net earnings recorded in the tax data and the year-specific social insurance and occupational pension schedules. Because social insurance and occupational pension contributions vary along the earnings distribution, the calculation must differentiate between certain

earnings ranges.[12] Taking as an example an individual subject to the pension plan mandate for whom neither the minimum nor maximum qualifying earnings of the occupational pension system are binding, the calculation must take into account that social insurance contribution rates are applied to total gross earnings and occupational pension contribution rates are applied to gross earnings above the deduction. Overall, gross earnings in the main job, G_{it}, of employee i in year t can be imputed from net earnings as

$$G_{it} = \begin{cases} \frac{N_{it}}{1-i^e_{it}} & \text{if} \quad N_{it} < (C_t \times (1-i^e_{it}) - p^e_{it} \times M_t) \\ \frac{N_{it}+p^e_{it}\times M_t}{1-i^e_{it}} & \text{if} \quad N_{it} \geq (C_t \times (1-i^e_{it}) - p^e_{it} \times M_t) \quad \text{and} \\ & \quad\; N_{it} < ((D_t + M_t) \times (1-i^e_{it}) - p^e_{it} \times M_t) \\ \frac{N_{it}-p^e_{it}\times D_t}{1-i^e_{it}-p^e_{it}} & \text{if} \quad N_{it} \geq ((D_t + M_t) \times (1-i^e_{it}) - p^e_{it} \times M_t) \quad \text{and} \\ & \quad\; N_{it} < (B_t \times (1-i^e_{it}) - p^e_{it} \times (B_t - D_t)) \\ \frac{N_{it}+p^e_{it}\times (B_t-D_t)}{1-i^e_{it}} & \text{if} \quad N_{it} \geq (B_t \times (1-i^e_{it}) - p^e_{it} \times (B_t - D_t)), \end{cases} \tag{3}$$

where N_{it} denotes net earnings, C_t is the cutoff value of the pension plan mandate, D_t is the deduction, M_t are the minimum qualifying earnings, and B_t is the upper bound in the occupational pension system, while i^e_{it} represents the employee share of the social insurance contribution rate, and p^e_{it} represents the employee share of the age-specific occupational pension contribution rate.[13] Employees and employers each pay half of total social insurance contributions. Equally, I set the employee share of occupational pension contributions to 50 % which is the maximum employee share defined in the law. Some employers may bear more than 50% (which cannot be observed in the tax data), so this may result in slight measurement error.

Note that due to discontinuity in mandatory occupational pension contributions, gross earnings slightly below and slightly above the mandate threshold can result in the same net earnings recorded in the tax data. Thus, gross earnings cannot be unambiguously imputed from net earnings for a small number of individuals. This problem only concerns a narrow earnings range of less than CHF 350 below and above the threshold (with the exact width depending on the age-specific contribution rate and the year-specific minimum qualifying earnings). As defined in Equation

[12]Note that the definition of the different earnings ranges with respect to net earnings in Equation (3) is equivalent to the definition in terms of gross earnings in Equation (4).

[13]Social insurance contributions include contributions for old-age insurance, disability insurance, loss of earnings compensation, and unemployment insurance. Above a high earnings cutoff, unemployment insurance contribution rates are reduced in most years that I have data on. I account for the reduced unemployment insurance contributions when calculating gross earnings but omit it from Equation (3) because it does not matter for individuals in the earnings range of interest for this paper. More information on the social insurance system in Switzerland and historical contribution schedules are available on the website of the Federal Social Insurance Office: https://www.bsv.admin.ch/bsv/de/home/sozialversicherungen/ueberblick/beitraege.html [accessed on 23 October 2021].

(3), I treat all individuals with ambiguous gross earnings as if they were above the mandate threshold. In the regression discontinuity analysis, I address this issue by using a "donut hole" approach that removes the problematic observations.

The tax records also include information on other types of income which are less relevant for this paper such as self-employment income, business income, financial income, property income, transfer income, and pension income.

C.3 Wealth

The tax records contain detailed information on wealth by asset type, including business wealth, financial wealth, property wealth, other types of wealth, and debt. The Swiss wealth tax is quite comprehensive, covering all types of assets except for pension wealth in occupational and private pension accounts which is thus missing from the data. This is not a problem for the empirical analysis in this paper, because pension savings can be observed or imputed even without directly observing pension wealth. Information on pension contributions is sufficient because pension wealth generally cannot be accessed during the work life.

It needs to be noted that the valuation of property for tax purposes systematically underestimates the true market value. As a rule of thumb, residential property is valued at around 60% of its market value in Switzerland (OECD, 2018*c*), although in individual cases the valuation may deviate significantly from that benchmark. To analyze the discrepancy between tax value and market value of residential property, the tax administration of the canton of Bern conducted an analysis comparing the observed price of all housing transactions in a given year to the value of these properties in the tax records.[14] On average, the tax value of property was 71% of its market value in 2002. Because there was no revaluation during the sample period and property prices in Bern have generally been increasing, the tax value has gradually declined to about 55% of the market value in 2017.

C.4 Savings

Various types of pension and private savings could be affected by the occupational pension plan mandate. Some of these are directly observable in the tax data; others need to be imputed based on information available in the dataset.

As mentioned earlier, mandatory occupational pension contributions are withheld at source by the employer, so they are not recorded in the tax data. I impute these

[14]The analysis of property valuation for tax purposes is available on the website of the tax authority of the canton of Bern: https://www.sv.fin.be.ch/sv_fin/de/index/navi/index/steuersituationen/kauf-verkauf_liegenschaft/amtlicher_wert/allgemeine-neubewertung20.html [accessed on 23 October 2021].

by applying the statutory contribution rates – the sum of the employer and employee shares – to individuals' gross earnings in the main job. Based on the contribution schedule explained in Section 2.1, mandatory occupational pension savings, S_{it}^{occ}, of employee i in year t are calculated as

$$S_{it}^{occ} = \begin{cases} 0 & \text{if} \quad G_{it} < C_t \\ p_{it} \times M_t & \text{if} \quad G_{it} \geq C_t \quad \text{and} \quad (G_{it} - D_t) < M_t \\ p_{it} \times (G_{it} - D_t) & \text{if} \quad G_{it} \geq C_t \quad \text{and} \quad (G_{it} - D_t) \geq M_t \\ p_{it} \times (B_t - D_t) & \text{if} \quad G_{it} > B_t, \end{cases} \tag{4}$$

where p_{it} is the age-specific total occupational pension contribution rate, i.e., employer and employee share. All other variables are defined as in Equation (3). Appendix Figure A.1 illustrates how mandatory occupational pension savings are computed from gross earnings.

Private pension savings in preferentially taxed accounts as well as voluntary occupational pension buy-ins are directly observed at the individual level in the tax data, because they must be reported in the tax return in order to be deductible from taxable income.

I compute overall private savings as the change in net wealth relative to the previous year. Hence, private savings, $S_{i,t}^{priv}$, of individual i in year t are given by

$$S_{i,t}^{priv} = W_{i,t} - W_{i,t-1}, \tag{5}$$

where $W_{i,t}$ denotes net wealth of individual i in year t. Net wealth represents the difference between gross wealth and debt, and can be directly observed in the tax records. This savings measure corresponds to *gross savings* as it includes accrued capital gains from changes in asset prices (which are sometimes called "passive savings" in the literature) (see Fagereng et al., 2021). Note that my measure of private savings does not capture accrued gains on property because there has not been a revaluation of property during the observed period. I cannot separate gross savings into *net savings* (sometimes called "active savings") and capital gains because realized gains are not observed as Switzerland does not have a capital gains tax and I do not have data down to the level of single assets or transactions.[15] An implication of this savings measure is that private savings are highly variable due to fluctuations in asset prices. Another reason for the variability of private savings is the purchasing timing of durable goods, services, and lumpy non-durables (Chetty et al., 2014).

[15]The latter is a common challenge in the literature on the measurement of savings. A few papers leverage very detailed administrative data to distinguish net savings and capital gains, including Bach, Calvet and Sodini (2020), Fagereng et al. (2020), and Fagereng et al. (2021). Fagereng et al. (2021) provide a helpful discussion of the distinction between gross and net savings and its implications, using both economic theory and an empirical application drawing on Norwegian data.

Total savings are defined as the sum of all savings variables discussed above, including mandatory occupational pension savings, occupational pension buy-ins, private pension savings, and private savings.

C.5 Data Cleaning and Sample Restrictions

To prepare the data for the empirical analysis, I remove observations that are unreliable or not comparable to standard taxpayers (similar to Brunner, Meier and Näf, 2020). This group includes individuals who are only taxed for part of the year because they move abroad or arrive from abroad (1.9% of all observations), individuals who fail to hand in a tax return and are assessed by the tax authority (2.8%), duplicate observations for individuals in the same year (0.6%), and observations with obvious errors in the reported information (0.1%).