Liberalizing Access to Private Retirement Wealth*

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Abstract

The paper assesses the economic and welfare consequences of loosening restrictions on private retirement wealth in the context of the United States, in the spirit of recent proposals to make retirement accounts more flexible. In the empirical section, I document novel facts on withdrawals. Early withdrawals from individually managed accounts are infrequent but sizeable, whereas withdrawals from employer-sponsored retirement plans are virtually absent. In retirement, the median withdrawal share closely tracks the statutory required minimum, indicating that minimum distribution rules bind for a substantial fraction of households. Guided by these facts, I build a rich life-cycle model with heterogeneity, portfolio choice, and a progressive tax-transfer system. The model features three frictions that govern access to retirement wealth: lock-in of employer-sponsored balances, early-withdrawal penalties, and required minimum distributions during retirement. I evaluate an unanticipated, permanent reform that removes these frictions while leaving the income-tax treatment of withdrawals unchanged. The reform shifts withdrawal activity toward earlier ages and away from the statutory penalty-free threshold and generates an initial reallocation from retirement wealth toward liquid wealth and higher consumption. Cohorts alive at implementation gain on average 0.2% in consumption-equivalent variation, while cohorts born after the reform experience long-run welfare losses of up to 0.15%.

Keywords: Private retirement accounts; Capital market access; Early-withdrawal rules; Lifecycle portfolio choice.

JEL codes: E2, E6, H2, H3.

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1 Introduction

In many developed countries, access to private retirement accounts (PRAs) is constrained both before and after retirement: during working life, withdrawals are either discouraged by early-withdrawal penalties or prohibited altogether; in retirement, households are forced to draw down assets so that tax-deferred balances are converted into taxable income. This institutional asymmetry raises a fundamental policy question. If the policymaker's goal is to broaden household participation in capital markets, why should saving in one particular vehicle be so rigidly earmarked for old-age consumption? Why not allow households greater discretion to deploy private retirement funds for other purposes – such as investing in housing, financing education, or smoothing consumption in the face of adverse income shocks?

Recent policy debates in many developed countries consider whether PRAs should be made more flexible by expanding access to accumulated balances during working life and by relaxing penalties tied to early withdrawals. In the United States, recent proposals have moved in this direction by advocating more flexible accounts that support earlier-life savings and can later be used for purposes such as education, home purchase, or retirement.[1] This paper quantifies the economic and welfare implications of such proposals in the United States.

The paper combines an empirical component with quantitative modelling. In the empirical part, I use micro-level data to study withdrawals from individually managed accounts, such as IRAs. I show that withdrawals during working life are rare, consistent with early-withdrawal penalties discouraging routine use of retirement wealth as liquidity. However, when households do withdraw, the amounts are large, indicating that withdrawals occur in states with a high liquidity need. By contrast, withdrawals from employer-sponsored retirement plans (ESRPs) during working life are virtually absent in the data, reflecting the much stricter access rules for these plans. For the retired population, I find that minimum distribution requirements are binding for the typical household: the median withdrawal closely tracks the statutory minimum, indicating that policy rules materially constrain households' preferred decumulation paths in retirement.

Guided by these novel empirical facts, I develop a rich quantitative model that incorporates the key institutional features of the U.S. private retirement system and embeds them into the progressive income tax-transfer system. I use this framework to evaluate the welfare and fiscal effects of an unexpected and permanent reform that liberalizes ac-

[1] Aspen Institute blog post discussing a proposal for IRA-style investment accounts for children: https://www.aspeninstitute.org/blog-posts/trump-accounts-are-here-now-lets-make-them-work/.

cess to private retirement wealth along two dimensions. First, the reform removes the early-withdrawal penalty for individually managed accounts and abolishes required minimum distributions in retirement. Second, the reform also grants penalty-free access to ESRP funds during working life. Preliminary results indicate that liberalizing access induces a sizeable portfolio reallocation away from tax-deferred retirement accounts toward housing during working life and shifts tax-deferred wealth to older ages, thereby altering the timing and composition of bequeathed wealth.

The main data source for the empirical analysis is the Survey of Consumer Finances (SCF), covering the years 2004 to 2022, which provides detailed information on household balance sheets, retirement account participation, and withdrawals from private retirement plans. In the empirical analysis, I distinguish between individually managed accounts (IRAs, rollover IRAs, and Roth plans) and ESRPs, as access and withdrawal rules differ substantially across these two account types. When studying withdrawals during the working life, I restrict the sample to households participating in individually managed accounts, since households have full access to these accounts, while there is only a handful of withdrawals from ESRPs due to their strict withdrawal rules, which is why I do not report them.

The first set of empirical findings concerns withdrawals from individually managed accounts during the working life. Only a small share of working-age households makes early withdraws in a given year (3.9%), but this share rises markedly over the life cycle from 2.5% at the start of the working career to 4.7% by age 58 as households approach the penalty-free threshold, and it almost doubles once the threshold is crossed. Conditional on withdrawing early, amounts are large and increase steeply with age: from about $3,400 at younger ages to $15,099 by age 58, and to $16,763 once withdrawals become penalty-free (all in 2022 U.S. dollars).

The SCF does not identify the purpose of a withdrawal or if a withdrawal triggered a penalty or qualified for an exception. I rely on further survey questions in the SCF to infer both the likely purpose of withdrawals and their potential exemption status. Specifically, I classify early withdrawals as "purpose-driven" if they occur in the same year as a mortgage application, an educational-loan application, or a reported unemployment spell. The data show that 6% of all withdrawals from individually managed accounts coincide with a home purchase, and these withdrawals are sizeable, averaging $46,742. A further 16% of withdrawals occur during an unemployment spell of the head or spouse ($15,855), and 2% coincide with educational-loan applications ($8,956). The remaining 73% of withdrawals are not directly associated with these events, suggesting that a large majority of early withdrawals in the data are likely penalized.

The final set of empirical findings concerns withdrawal behavior during retirement. Under U.S. tax law, individuals are required to withdraw a minimum fraction of their PRA balances once they reach age 72. I document that average withdrawals after the minimum applies the median withdrawal share between ages 72 and 83 closely tracks this statutory schedule, implying that required minimum distribution rules are binding for a substantial fraction of retirees during this phase of their lifecycles.

Motivated by these empirical findings, I construct a rich life-cycle model to quantify the welfare and fiscal implications of providing free access to the PRAs. I build on my previous work in Ábrahám et al. (2025), where we develop a framework that embeds the main tax advantages of PRAs into a rich life-cycle environment with heterogeneity (both ex ante and ex post), endogenous labor supply, endogenous retirement, and portfolio choice between private retirement wealth and "regular" assets (all residual wealth, including housing and liquid assets). We show that that framework is capable of matching life-cycle wealth accumulation in both asset types, so it provides an excellent starting point for the analysis of early withdrawals (which we rule out) and minimum required distributions (which we don't focus on).

Each period, the worker faces a fixed probability of receiving an ESRP, which depends on the worker's permanent income type and which is calibrated from the SCF data. If the worker chooses to contribute to the ESRP, the employer matches the contribution up to a statutory limit. Workers without access to an employer-sponsored plan can contribute to the retirement account unilaterally.

Access to accumulated retirement wealth is frictional in three respects. First, workers without an active ESRP are assumed to have full access to their balances; however, withdrawals made before age 59 are subject to a 10% early-withdrawal penalty. These assumptions mimic the rules governing individually managed accounts in the data.[2]

Second, workers with access to an ESRP are assumed to hold a fixed fraction of their accumulated retirement wealth inside the plan. This "locked-in" portion of their retirement wealth cannot be accessed until the worker either separates from the employer or retires. The remaining fraction is implicitly assumed to be held in an individually managed account and is therefore subject to the same early-withdrawal penalty. The locked-in share varies with the agent's age and permanent income type and is calibrated from the SCF data.

Third, starting at the statutory age of 72, retirees are required to withdraw at least an age-dependent fraction of their retirement wealth. This minimum withdrawal fraction in

[2]I abstract from statutory exemptions to the early-withdrawal penalty, but I plan to relax this assumption in ongoing work.

the model is set such that by the time of expected death, the agent has fully depleted her retirement account. Note that both regular assets and retirement wealth can be bequeathed. Bequests made out of retirement wealth are subject to income taxation, and agents derive utility from the after-tax bequest.

The model replicates several key empirical patterns of withdrawal behavior over the life cycle. It matches the steep increase in participation rates in PRAs and, conditional on having a positive balance in this account, a small fraction of agents making a withdrawal in a given period. The model also reproduces a spike in withdrawals upon reaching age 59, when the early-withdrawal penalty is lifted. As for retirement, the model is consistent with the empirical fact that required minimum distributions bind for the median household, while average withdrawals lie well above the minimum.

The paper's main quantitative experiment studies an unanticipated, permanent reform that liberalizes access to PRAs by removing the three frictions governing retirement-wealth liquidity. First, it grants workers access to accumulated balances held in ESRPs. Second, it eliminates the 10% early-withdrawal penalty on withdrawals from both individually managed accounts and ESRPs during working life. Third, it abolishes required minimum distributions from age 72 onward. Importantly, the reform leaves the income-tax treatment of withdrawals unchanged: distributions continue to be included in the household's taxable income.

There are several interesting findings in the paper. First, the policy reform induces households to tap retirement wealth more frequently, particularly at younger ages. Relative to the calibrated model, the share of agents making a withdrawal roughly doubles at young ages, rising from 8.1% to 15.9% among 25–34 year-old and from 2.0% to 5.7% among 35–44 year-old agents, with a more modest increase for the middle-aged agents. Conditional on withdrawing, the average withdrawal increases for the young by as much as 54%, but remains roughly unchanged in midlife. After the penalty-free age of 59, both the withdrawal frequency and the withdrawn amounts decline.

Second, the reform generates a non-monotone transition path for aggregate outcomes. On impact, households draw on retirement balances and reallocate wealth toward liquid assets and housing, while retirement wealth falls. This portfolio shift is accompanied by a temporary rise in consumption, driven in part by an immediate increase in taxable withdrawals, which expands the income tax base and allows the government to reduce the income tax level. Over time, however, households adjust their saving and withdrawal plans to the permanently higher liquidity of retirement accounts. The elimination of penalty revenue and the greater scope for tax smoothing, especially through delaying withdrawals toward late retirement once minimum distribution rules are abolished, reduces the tax

base. As the income tax level rises during the transition, consumption and regular wealth decline. These results suggest that the reform primarily reshuffles the timing and composition of wealth rather than permanently raising aggregate resources.

Finally, agents who are alive when the reform is implemented benefit immediately from being able to use previously illiquid, tax-deferred balances for consumption smoothing and from the fall in the income tax level due to the expansion of the tax base. This delivers an average welfare gain of 0.2% in consumption-equivalent terms, with the largest gains accruing to retirees (0.25%) and smaller gains to working-age agents (0.17%). By contrast, newborn cohorts experience welfare losses of up to 0.15% in the long run, implying that the reform redistributes welfare from future generations to those alive at the time of implementation.

Literature review A closely related paper is Coyne et al. (2022), where the authors use high-frequency administrative tax data to measure households' willingness to pay to avoid early-withdrawal penalties on retirement accounts in the United States. Their empirical analysis provides evidence that penalized withdrawals are infrequent but sizeable and that households are willing to incur substantial penalties to access retirement wealth, highlighting the liquidity value of tax-deferred accounts. Using the SCF data, I document very similar patterns, but the advantage of the SCF is that it allows me to link withdrawal behavior to rich household characteristics, such as age, education, income, and wealth composition, providing empirical targets for the quantitative framework.

On the modeling side, my paper departs from Coyne et al. (2022) by embedding early-withdrawal penalties and required minimum distributions into a fully fledged lifecycle model with portfolio choice. While their framework focuses on measuring the valuation of liquidity and welfare effects of penalties in partial equilibrium, I study a broader policy reform that liberalizes access to retirement accounts both before and during retirement, allowing for general-equilibrium feedback through wages and taxes.

This paper is also related to my previous work in Ábrahám et al. (2025), which incorporates private retirement wealth into a rich framework in the style of Huggett (1996). However, I implicitly impose a 100% penalty on early withdrawals, while in the current paper households decide how much to withdraw from their PRAs, anticipating the penalty should they withdraw before reaching the minimum age. Furthermore, I focus on minimum withdrawals during retirement, which were not the focus of the analysis in that paper. At the same time, I abstract from endogenous human capital accumulation and intergenerational bequest transmission to simplify numerical computations that arise with the endogenous withdrawal decision.

2 Empirical evidence

The empirical analysis draws on publicly available, cross-sectional data from the Survey of Consumer Finances (SCF), covering seven survey waves from 2004 to 2022 (earlier surveys are not included because they do not report withdrawals). The unit of observation is the household, which is the relevant unit for consumption and saving decisions. Throughout the section, participation in and withdrawals from a PRA are defined at the household level. A household is classified as having access to a PRA or as having made a withdrawal if either the household head or the spouse (if present) has access to such an account or reports a withdrawal. When computing accumulated balances or withdrawal amounts for a household, the balances and withdrawals of both spouses are summed up.

The empirical analysis below is divided into two parts: Section 2.1 examines withdrawal behavior during the working stage, while Section 2.2 studies withdrawals by the retired population.

2.1 Withdrawals by working population

To study the withdrawal behavior of the working population, I restrict the sample to households whose head (and spouse, if present) is aged 25–65 and is either in dependent employment, self-employed, or unemployed. This sample selection excludes retired and disabled households, for whom withdrawals would reflect planned decumulation or disability-related income replacement.

Since withdrawal rules differ across retirement plans, I analyze all different types of PRAs available in the SCF by dividing them into two categories. The first category of PRAs comprises Employer-Sponsored Retirement Plans (ESRPs), such as 401(k), 403(b), and similar defined contribution plans. The second category comprises *individually managed accounts*, which are owned directly by households. This group includes traditional Individual Retirement Accounts (IRAs), Roth IRAs, and Keogh accounts,[3] but more importantly, rollover IRAs, which are former ESRPs that have been rolled over following job separation. For the sake of brevity, all individually managed accounts will be referred to as *IRA*s below.

Withdrawals from ESRPs are subject to very strict access rules: participants cannot withdraw funds while still employed unless a specific "hardship" condition is met, such as avoiding foreclosure or covering medical expenses, or when separating from an employer. Upon job separation, workers have the choice to leave the balance in the ESRP, roll it over

[3]Keogh accounts, although designed for self-employed individuals, follow withdrawal rules similar to traditional IRAs, which is why I include them in the first category.

into an individual retirement account, or cash it out after paying a 10% penalty should the withdrawal take place before age 55.[4]

As opposed to ESRPs, households have unrestricted access to these accounts and can make withdrawals at any time. However, distributions made before age $59\frac{1}{2}$ are almost always subject to a 10% early withdrawal penalty, with some exceptions. The tax law specifies several "qualified" uses for which early distributions are not penalized, including unreimbursed medical expenses above a specified share of adjusted gross income, health insurance premiums while unemployed, qualified higher education expenses, and first-time home purchases up to a statutory cap of $10,000. In all cases, distributions are subject to income taxation.

I define a household as a participant in a given account category if the combined balance of the head and spouse (if present) across all accounts of this category is positive. A household is classified as participating in an ESRP if the head's (or the spouse's) account has a strictly positive balance and the employer is actively making contributions to the account.[5]

2.1.1 Participation in private retirement accounts

Given these definitions and sample selection criteria, I first document the prevalence of these accounts among the working population and the amount of wealth households hold in them. This information is important for two reasons. First, it reveals how participation varies across asset types with different access and withdrawal rules and how much wealth households potentially have access to as a liquidity buffer. Second, it provides a benchmark for the subsequent analysis of withdrawal behavior, in which withdrawal rates and withdrawal amounts are measured relative to participation and accumulated balances.

Table 1 reports participation rates and average accumulated balances for each account category, conditional on participation. The final column shows participation in at least one account category and the corresponding average balance among participating households.

As one can see, 52% of working households have an IRA or ESRP (or both). Participation in ESRPs is 35%, which is slightly higher than in IRAs (30%). Conditional on participation in either account type, average balances are sizeable, amounting to $107k for IRAs and $105k for the ESRPs. The last row of the table shows the average account balance prior

[4] According to Vanguard, 30% of workers (enrolled in Vanguard defined contribution plans) chose to cash out their ESRPs upon job separation in 2024, and these cash-outs accounted for only 5% of the total ESRP assets held by separating workers (Clark 2025).

[5] The additional restriction that the employer must be actively contributing is imposed to align the empirical analysis with the quantitative model. In the model, every ESRP is associated with an employer co-payment.

Table 1: Participation and account balance among working-age population, by plan category.

	IRAs	ESRPs	All
Participation rate, %	29.65	34.87	51.86
Account balance (2022 U.S. $)	60,993	85,957	146,951
Account balance at age 60–65 (2022 U.S. $)	151,779	150,997	302,777
Share in total retirement wealth, %	38.99	61.01	100

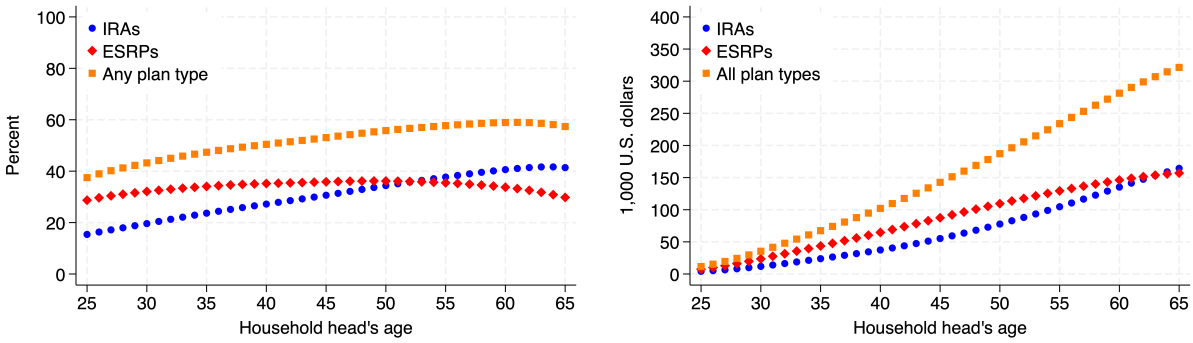
Notes: The sample is restricted to households whose head (and spouse, if present) is aged 25–65 and is not retired or disabled. *IRAs* refers to individually managed accounts (regular or other IRAs, rollover IRAs, Roth IRAs, and Keogh accounts). *ESRPs* refers to employer-sponsored retirement plans. Account balances are computed conditional on participation. The results are based on the SCF 2004–2022.

to retirement (age 60–65), conditional on participation. Households holding any PRA accumulate almost $303k by the time they approach retirement. Taken together, the broad summary statistics point to broad participation in both account categories and sizeable balances, implying that the issue of access to and potential withdrawals from these assets must be quantitatively important.

Next, I examine participation and wealth accumulation in each account type over the life cycle. This analysis reveals potential access to liquidity over the lifecycle and the stock of wealth that households potentially have access to.

Figure 1(a) reports participation rates by age of the household head for IRAs, ESRPs, and for holding at least one of these account categories. The panel shows that the share of households with any account type rises from 40% at age 25 to almost 60% by age 65. Participation in IRAs more than doubles with age, from 17% at age 25 to 40% near retirement. ESRPs are more prevalent at younger ages and fall as households approach retirement, while IRA participation rises steeply over the life cycle. Because ESRPs are frequently rolled over into IRAs when workers change jobs, an increasing share of lifetime retirement savings is ultimately held in IRAs by the time households enter retirement.

Figure 1(b) reports the total accumulated amount in each account category, conditional on participation in that category. Households build up substantial retirement wealth over the life cycle: average balances rise from around $15k at age 25 to about $320k by age 65 (in 2022 U.S. dollars). Among participants, balances in IRAs and ESRPs reach roughly $160k by age 65. The figure also displays the average accumulated amount conditional on participating in either account category, which is the sum of the previous two amounts. One of the key requirements for the quantitative model introduced below is to match the life-cycle profile of wealth accumulation depicted by this line as well as the participation rates in each account category shown in Figure 1(a).



(a) Participation rate.

(b) Accumulated balance.

Figure 1: Participation and accumulated amount in the private retirement accounts (SCF).

Notes: The sample is restricted to households whose head (and spouse, if present) is aged 25–65 and is not retired or disabled. *Individually managed accounts* include regular or other IRAs, rollover IRAs, Roth IRAs, and Keogh accounts. *All PRAs* include individually managed accounts and ESRPs. Accounts of the household head and the spouse (if any) are included. Accumulated balance in a given account category (IRA or ESRP) is computed conditional on participation in that category and given in 2022 U.S. dollars. The results are based on the SCF 2004–2022.

2.1.2 Withdrawals from IRAs

Next, I study households' withdrawal behavior. The SCF asks each respondent whether they made a withdrawal from their IRA or ESRP in the past 12 months. As previously noted, access to ESRP funds is strictly limited. Consequently, there are only a handful of withdrawals in the data, which do not warrant a separate empirical analysis, so I do not present them.[6] By contrast, households have substantially more flexible access to their IRA funds, and the SCF contains a solid record of IRA withdrawals.

Withdrawals from IRAs are almost always subject to a 10% penalty when made before age 59, thereby restricting the use of these funds despite free access. An important limitation of the data is that the SCF does not report whether a given withdrawal from an IRA is subject to an early-withdrawal penalty, nor does it record the purpose of the withdrawal, which could help determine whether a penalty applies.

To address this limitation, I proceed in two steps. First, I report summary statistics for withdrawals from IRAs, including all withdrawals, and disaggregate the data by age bins, where age is the household head's age. In particular, I define a separate bin for ages 59–65, which should contain penalty-free withdrawals, whereas withdrawals made before age 59 are most likely penalized.[7] Second, I attempt to identify penalized withdrawals

[6]The average withdrawal rate from ESRPs among participants is less than 1% in the SCF.

[7]If the household head is aged 59 or above while the spouse is below age 59 and makes a withdrawal, I disregard that withdrawal. Conversely, if the head is below age 59 while the spouse is above age 59 and makes a withdrawal, I also disregard the withdrawal.

more precisely by exploiting additional survey questions on events that make households eligible for penalty-free withdrawals.

Table 3 summarizes key facts about withdrawals from the IRAs during the working stage. The results are reported by the age of the household head.

Table 2: Withdrawals from IRAs (SCF).

	Household head age			
	25–34	35–44	45–58	59–65
Withdrawal incidence (%)	2.53	3.23	4.66	8.99
Mean withdrawal amount ($)	3,447	5,927	15,099	16,763
Withdrawal as a share of IRA (%)	22.78	33.01	19.88	14.07
Withdrawal as a share of income (%)	2.89	5.33	10.06	18.28

Notes: The sample is restricted to households whose head (and spouse, if present) is aged 25–65 and is not retired or disabled. The sample comprises withdrawals from all individually managed accounts of the household head and the spouse (if any). Withdrawals of spouses aged below (above) the statutory age threshold for early-withdrawal penalties of 59 are discarded if the household head is above (below) age 59. Withdrawal incidence is calculated relative to the IRA participants (Figure 1(a)). Average and median withdrawals are in 2022 U.S. dollars. Withdrawal shares are reported for the mean withdrawal amount. Income is defined at the household level and comprises pre-tax wage and salary income, business income (income from a sole proprietorship or a farm), capital income (interest and dividends), and government transfer income. The results are based on the SCF 2004–2022.

The first row reports the fraction of households that make a withdrawal from an IRA in the last 12 months among all households participating in the IRAs (Figure 1). The withdrawal incidence rises from 2.5% for 25–34-year-olds to 4.7% for households aged 45–58, i.e., before hitting the statutory threshold for the early withdrawal penalty. A particularly pronounced increase occurs after age 59, when withdrawals become penalty-free, with the share of withdrawing households being almost twice as much. Importantly, given the sample selection criteria described above, this rise in withdrawal activity for the 59–65 year olds is not driven by the retirement of the household head or spouse.

The second row of Table 3 reports the average size of the distribution, conditional on making a withdrawal (in 2022 U.S. dollars). Withdrawals are sizeable on average, rising from $3,447 at young ages to around $15,099 by age 45–58. Beyond age 59, when the early-withdrawal penalty is lifted, the average withdrawal remains the highest at $16,763.

Measured relative to the household's accumulated IRA balances, withdrawals are fairly large and stable over the lifecycle. Households withdraw roughly 1/4 of their account balance, on average. When scaling withdrawal amounts by household market income, the final row shows that withdrawals account for an increasing share of income, rising from 2.9% at younger ages to about 18% at older ages.

Withdrawals from most PRAs are subject to an early withdrawal penalty of 10% if they

Table 3: Extensive and intensive margins of withdrawals (SCF).

	All	Of which related to:			
		Mortgage application	Educ. loan application	Unempl.	Other
Share withdrawing (%)	3.83	0.23	0.07	0.60	2.81
Share in all withdrawals, %	100.0	6.00	1.83	15.67	73.40
Average withdrawal (2022 USD)	11,360	46,742	8,956	15,855	9,400

Notes: The sample is restricted to households whose head (and spouse, if present) is aged 25–65 and is not retired or disabled. The sample comprises withdrawals from all individually managed accounts of the household head and the spouse (if any). Column *All* reports the share of households with an account that withdrew a positive amount in the past 12 months and the corresponding average withdrawal in 2022 U.S. dollars. The remaining columns disaggregate these withdrawals by showing the fraction that also applied for a mortgage or an educational loan in the past 12 months or were unemployed in the last 12 months; the last column captures all remaining withdrawing households. The results are based on the SCF 2004–2022.

are taken before age $59\,1/2$. However, early withdrawals used for purposes that qualify for penalty exemptions under U.S. tax law, such as a first-home purchase or higher-education expenses, or taken during periods of financial hardship, such as home eviction or sickness, are penalty-free.

To explore what share of withdrawals reported for households aged 25–58 in Table 3 are (potentially) penalty-free, I exploit additional survey questions in the SCF dataset. The idea is that early withdrawals used for purposes such as a first-home purchase or higher-education expenses or taken during spells of unemployment are more likely to be penalty-free, whereas withdrawals in other circumstances are more likely to have incurred the penalty.

The SCF asks whether the household applied for a mortgage or an educational loan in the past 12 months, or whether the household head (or spouse) was unemployed in the past 12 months. Table 3 decomposes observed withdrawals from IRAs by distinguishing households that also applied for a mortgage or an educational loan or were unemployed from all other withdrawing households. For this analysis, the sample is restricted to household heads aged 25–58.[8]

Among all households participating in an IRA, almost 3.8% withdrew a positive amount in the previous 12 months. The next three columns break down this extensive margin, while the last row reports the conditional share.

Turning to the intensive margin (second row), the average withdrawal across all withdrawing households amounts to $12,508 (in 2022 U.S. dollars). Mortgage-related withdrawals are by far the largest in size, averaging $34,201, and account for roughly one quar-

[8]Footnote 7 applies for this analysis.

ter of the aggregate amount withdrawn (third row). Withdrawals related to educational loans are much smaller, averaging $8,495, and represent only a negligible share of aggregate withdrawals. Withdrawals associated with unemployment are also sizeable on average ($15,829) and, together with mortgage-related withdrawals, account for nearly half of all withdrawn funds. The majority of withdrawn amounts, however, fall into the residual category not directly linked to these qualifying events, which alone accounts for about 60% of total withdrawals, with an average withdrawal of $9,397, close to the overall mean.

Taken together, the results indicate that while hardship events explain some withdrawal behavior, a substantial share is unrelated to these categories, reinforcing the earlier conclusion that non-qualified withdrawals account for most withdrawal activity.

2.2 Withdrawals during retirement

As already mentioned above, the tax code aims to discourage early access to retirement wealth during the working stage: access to the funds in ESRPs is heavily restricted, while there is a 10% penalty on non-qualified withdrawals from IRAs before age $59\ 1/2$ and, as the analysis above has demonstrated, withdrawals during the working age are therefore relatively infrequent.

The tax rules governing PRAs reverse once households enter retirement: the government requires households to draw down balances so that deferred tax liabilities are eventually realized and funds do not remain sheltered. This is implemented through required minimum distributions (RMDs). According to the law, account owners must begin taking annual RMDs in the year they reach age 72.[9] The distributions are then taxed as ordinary income in the year of withdrawal.

The required share of the PRA balance is determined by an age-specific distribution-period factor prescribed by the IRS. Figure 2 reports statutory required minimum distributions as a percentage of the accumulated PRA balance over retirement ages (plus marker). At the onset of mandatory withdrawals at age 72, the IRS projects a life expectancy of 27.4 years, resulting in the forced withdrawal share of $1/27.4 = 3.6\%$. The required share increases gradually with age and reaches 11.2% at age 95.[10]

To understand whether the RMD rules are binding, I again resort to the SCF dataset, this time restricting the sample to households with retired heads aged 65–100. An additional sample selection criterion is applied when analyzing withdrawals subject to mandatory minimum distribution rules, which apply from the statutory age of 72 onward. To

[9] Failure to withdraw at least the required amount is subject to a substantial tax.

[10] At age 100, the required share equals 15.6%.

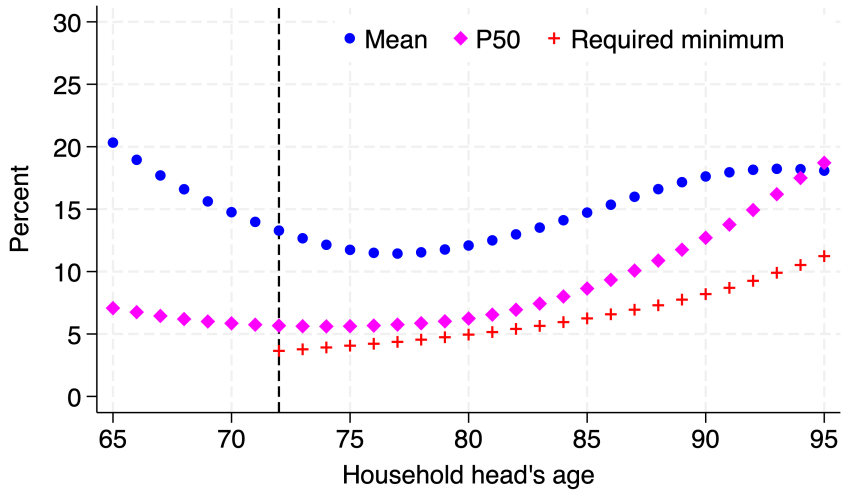


Figure 2: Distribution of withdrawals as percent of IRA balance, by household head's age (SCF).

Notes: At each age, the figure reports the mean and median withdrawal as a percentage of the total accumulated IRA balance, conditional on making a withdrawal. The vertical dashed line at age 72 marks the onset of mandatory withdrawals. All results are computed at the household level: withdrawals and balances of the household head and spouse (if any) are summed. From age 72 onward, the spouse's withdrawals and balances are included only if he or she is also aged 72 or above. The results are based on the SCF 2004–2022.

ensure that the observed withdrawal behavior of a household is consistent with the minimum distribution requirements, the sample is restricted to spouses aged at least 72.

Figure 2 depicts the mean withdrawal of a household (head and spouse if present) as a share of their total IRA balance (circle markers), conditional on making a withdrawal. The average shares are substantially above the required minimum, suggesting that for the average withdrawing household the RMD constraint is not binding. A different picture emerges at the median (diamond markers): during ages 73–82, the median withdrawal share is at the required minimum, while it is above the minimum at older ages.

These results have two important implications. First, they suggest that for the median household in their 70s, the constraint on withdrawals is binding. Hence, for the majority of owners of tax-deferred accounts, the choice set is effectively bounded below by the RMD schedule. As a result, many retirees will withdraw at least the mandated minimum even if they would otherwise prefer to keep assets invested or to backload withdrawals for tax-smoothing or bequest reasons. Second, they suggest that a non-trivial fraction of households must be withdrawing substantial amounts of wealth from their accounts as a fraction of the accumulated balance. As a result, many retirees will withdraw at least the mandated minimum even if they would otherwise prefer to keep assets invested or to backload withdrawals for precautionary or bequest reasons.

3 Model

3.1 Overview

The economy is populated by overlapping generations of agents. Each period, a continuum of agents is born. Agents enter the economy as workers at age $j = 1$ corresponding to the real-life age of 25, and continue working until they retire. Mandatory retirement occurs at age J^R, but agents can retire early starting from the age of $J^E < J^R$ incurring a penalty on their public pension annuity. At age 1, agents draw an educational level z from the invariant distribution P_z. Agents can be either college graduates ($z = z_H$) or non-college graduates ($z = z_L$), and their education remains constant throughout their life. At age $j = 1$, agents also draw a fixed effect v that represents unobserved productivity and can also take two values (v_H or v_L).

Agents live up to a maximum of $J > J^R$ periods, but they may die earlier due to stochastic mortality. We denote by $\psi_j^{z,v}$ the probability that a type (z, v) agent survives up to age $j + 1$, conditional on surviving up to age j. Population size is normalized to one,[11] and population is assumed to stay constant over time.[12]

Financial markets are incomplete due to the fact that there is no insurance against idiosyncratic mortality and labor productivity shocks. Agents can self-insure against the shocks by accumulating two types of risk-free assets: private retirement accounts a_p and regular assets a_r. Borrowing is ruled out, and agents enter the economy with no assets. The economy is assumed to be a small open economy with a fixed interest rate r. Private retirement wealth and non-housing regular wealth earn the interest rate r, while housing wealth earns a zero rate of return.

3.2 Households

Households have time-separable preferences over consumption c, housing services c_h, and leisure $1 - l$ given by $u(c, c_h, 1 - l)$. Households also derive utility $q(b)$ from leaving an after-tax bequest b.

For an agent that works l hours, the pre-tax earnings are given by

$$e = w_t h_{j,z} v y_j l. \tag{1}$$

[11] This value best matches the age profile of population weights in the Survey of Consumer Finances, which is the main empirical source for the calibration of the model.

[12] Throughout the section, all the aggregate variables, prices, and policy variables are indexed by time. To simplify notation, individual variables are indexed only by those characteristics that appear necessary in a given context, but it is understood that they also depend on time and the agent's characteristics.

The deterministic part of the hourly wage is given by $w_t h_{j,z} v$, composed of the wage rate w_t (determined in equilibrium), the education- and age-specific efficiency level $h_{j,z}$ (exogenous), and the fixed effect v, while the stochastic part of the hourly wage is given by an AR(1) idiosyncratic shock y_j that varies over the lifecycle.

3.3 Private retirement accounts and withdrawals

As already discussed in the introduction, a key extension relative to existing models of private wealth accumulation (e.g., Brendler et al., 2024; Ábrahám et al., 2025) is that households are allowed to access and withdraw (some) funds from private retirement accounts during working life.

As I have documented in the empirical section, withdrawal rules differ sharply across account types. In particular, withdrawals from employer-sponsored retirement plans (ESRPs) are virtually absent in the SCF, consistent with strict access restrictions while the employment relationship is ongoing. By contrast, individually managed accounts (IRAs) are accessible, and most early withdrawals observed in the SCF are subject to the statutory 10% penalty if taken before age $59\frac{1}{2}$.

To incorporate these facts without introducing two continuous state variables for ESRP and IRA balances, I model retirement wealth as a single account with restricted and unrestricted components. Each worker has access to an IRA and chooses each period a contribution rate $\kappa \in [0, 1]$ as a share of earnings e, so that contributions equal κe. Consistent with U.S. tax law, contributions are capped by an IRS limit χ_w, implying $\kappa e \leq \chi_w$. A worker may choose not to contribute, in which case $\kappa = 0$.

Some workers are employed by firms that offer an ESRP with employer matching. Access to employer-sponsored plans is frictional and modelled exogenously. Each period, the worker faces a fixed probability ν of receiving a new draw of ψ_e, which can be interpreted as an employer switch or a change in the employer's benefit offering. Conditional on such a redraw, the worker gains access to an ESRP with probability $\pi^{z,v}$, which depends on the agent's income type (z, v) and is calibrated directly from the data. I capture ESRP coverage with a dummy state variable $\psi_e \in \{0, 1\}$, where $\psi_e = 1$ indicates that the worker is currently covered by an ESRP (and therefore eligible for matching contributions), and $\psi_e = 0$ otherwise. Firms match the employee's contributions up to a proportion χ_f of earnings.

If the worker is not offered an ESRP ($\psi_e = 0$), her accumulated retirement wealth p is treated as IRA wealth. Under this assumption, the entire balance can be withdrawn; however, any withdrawal made before the statutory age of $59\frac{1}{2}$ is subject to an early-withdrawal

penalty, as explained below. If the worker is offered an ESRP ($\psi_e = 1$), I assume that a share of total retirement wealth p is held inside the ESRP and is therefore illiquid, consistent with the strict withdrawal rules governing employer-sponsored plans. The ESRP share is exogenous and denoted by $q_j^{z,v}$. It depends on the agent's age j and permanent income type (z, v), and is calibrated from the SCF. The remaining share, $1 - q_j^{z,v}$, is assumed to be held in an IRA and is thus accessible, subject to the same early-withdrawal penalty. Hence, the worker's withdrawals ω are bounded by

$$\omega \leq \begin{cases} (1+r)p & \text{if } \psi_e = 0, \\ (1-q_j^{z,v})(1+r)p & \text{if } \psi_e = 1. \end{cases} \tag{2}$$

If a worker who currently has ESRP access loses access in the subsequent period, the balance held in the ESRP is implicitly rolled over into the IRA and becomes liquid, again subject to the penalty if withdrawn early. Once the agent retires, the distinction between the two account types becomes immaterial, and the agent can access the full accumulated balance.

This structure is a simplification that avoids introducing an additional state variable tracking the ESRP component of wealth. I deliberately model $q_j^{z,v}$ as a function of the access state ψ_e rather than of the worker's choice whether to contribute to an ESRP, so that the degree of illiquidity is outside the agent's control.[13]

Early withdrawals from the IRA portion of retirement funds are penalized. The statutory threshold for early withdrawals, J^P, is set to the real-life age of 59. The penalty rate is $\bar{\varphi}$, leaving only $1 - \bar{\varphi}$ dollars available for consumption per dollar withdrawn; withdrawals made at age J^P and thereafter are penalty-free. Hence, the penalty function for withdrawals can be summarized as:

$$\varphi_j = \begin{cases} \bar{\varphi} & \text{if } j < J^P, \\ 0 & \text{otherwise.} \end{cases} \tag{3}$$

Once the worker chooses to make a withdrawal, the amount withdrawn is treated as taxable income and is subject to income taxation. Note that if pension contributions and withdrawals were both allowed in the same period, a worker with access to an ESRP would optimally choose contribution rate $\kappa = \chi_f$ so as to capture the maximum possible employer match and then withdraw her own portion of contributions κe in the same period.

[13] One implication of this assumption is that a worker with ESRP access may choose not to contribute to the plan ($\kappa = 0$), yet the model still assigns a positive share of her wealth to the ESRP. This is not entirely counterfactual: in the data, some workers hold balances in employer-sponsored plans from past employers even when they do not contribute to an active plan in the current job.

This strategy would generate employer copay at a zero cost for the worker. To rule this out, I assume that the worker forfeits the employer match in any period in which she also makes a withdrawal.[14]

Given the assumptions above, the law of motion for retirement wealth during the working stage can be written as:

$$a_p' = \begin{cases} (1+r)a_p + \kappa e + \psi_e \min(\kappa, \chi_f)e & \text{if } \omega = 0, \\ (1+r)a_p + \kappa e - \omega & \text{if } \omega > 0. \end{cases} \tag{4}$$

During retirement, agents can no longer make contributions to their retirement accounts or benefit from the tax advantages associated with these plans. The IRS does not impose any minimum requirements before age 72 (which corresponds to $J^M = 48$ in the model).[15] However, from age 72 onward, the IRS requires individuals to withdraw at least a minimum share of the account. To implement this in the model, the model-based life expectancy at each age is used based on the model's survival probabilities $\psi_j^{z,v}$, averaged across types at each age, such that the account is exhausted by the time of expected death. The minimum withdrawal share at age $j \geq J^M$ is then given by $S_j = 1/(1+s_j)$, where s_j is the expected life-span of an agent at age j.[16,17]

Hence, withdrawals during retirement are subject to the statutory constraint:

$$\omega \geq S_j(1+r)a_p, \tag{5}$$

where S_j represents a statutory minimum proportion of the accumulated wealth $(1+r)a_p$ that the agent has to withdraw every period, which will be one of the policy parameters in the experiment. Consistent with the empirical evidence, there are no minimum withdrawal requirements for households below real-life age 72 ($S_j = 0$ for $j < J^M = 48$ and $S_j > 0$ for $j \geq J^M$). The term $1 + s_j$ reflects that the current retirement-account balance

[14]This assumption makes workers indifferent between withdrawing and contributing a positive amount in the same period. In the numerical implementation, I therefore assume that the worker can either contribute or withdraw but not both.

[15]This cutoff applies to the majority of cohorts observed in the SCF sample. For younger cohorts, the statutory age has been increased to 73, but I abstract from this distinction in the model.

[16]The required minimum distributions are determined by dividing the account balance by a remaining life-expectancy factor. These factors are based on cohort-specific mortality and, for married individuals, account for spousal age differences. I abstract from these details in the model.

[17]For an agent of age j, the probability of surviving to age $k > j$, conditional on being alive at age j, is given by $\Pi_{l=j}^{k-1}\bar{\psi}_l$, where $\bar{\psi}_l$ denotes the conditional survival probability at age l (averaged across types). The probability of dying at age $k > j$, conditional on being alive at age j, is $(\Pi_{l=j}^{k-1}\bar{\psi}_j) \cdot (1 - \bar{\psi}_k)$. Hence, the probability that an agent of age j lives exactly $0 < k-j \leq J-j$ more years is given by $(\Pi_{l=j}^{k-1}\bar{\psi}_l) \cdot (1-\bar{\psi}_k) \cdot (k-j)$ and the expected life-span of an agent at $j < J$ is $s_j = \sum_{k=j+1}^{J}(\Pi_{l=j}^{k-1}\bar{\psi}_l) \cdot (1-\bar{\psi}_k) \cdot (k-j)$. Note that $s_J = 0$.

must be spread over the current period plus an expected s_j additional periods of life.

Any withdrawals during retirement are treated as taxable income and are subject to income taxation at the prevailing tax rates. Hence, while contributions reduce taxable income during the working years, withdrawals increase taxable income during retirement, effectively deferring taxation until funds are accessed. The law of motion for the PRA balance during retirement reads:

$$a_p' = (1 + r)a_p - \omega. \tag{6}$$

In summary, the model captures three key frictions that govern households' access to accumulated retirement wealth. First, workers who have access to an ESRP have a share of their retirement wealth locked inside the plan and cannot access it until job separation or retirement. Second, withdrawals from the accessible portion of retirement balances are subject to a penalty if made before age 59. Third, beyond the statutory age of 72, households are required to withdraw a minimum fraction of their remaining retirement wealth in every period. The quantitative experiment below relaxes the three frictions by varying three policy parameters: the share of pension wealth inaccessible for withdrawals, $q_j^{z,v}$, the penalty rate $\bar{\varphi}$, and the minimum withdrawal share S_j.

3.4 Regular wealth and housing

Following Ábrahám et al. (2025), housing is modelled in a reduced form. First of all, households with regular wealth holdings below a certain level $\hat{a}_r$ do not own a house but rent instead. In contrast, if $a_r \geq \hat{a}_r$, all households own a house, and the value of their house is exogenously determined by their regular wealth according to the function $a_h(a_r)$ explained in the calibration. The housing services c_h for homeowners are given by:

$$c_h(a_r) = \begin{cases} \underline{c}_h & \text{if } a_r < \hat{a}_r, \\ a_h(a_r) & \text{otherwise,} \end{cases} \tag{7}$$

where $\underline{c}_h$ is the housing service for renters.

Similar to the modelling of the housing value, the value of home equity $a_e(a_r)$ and the outstanding mortgage $a_m(a_r)$ for homeowners are assumed to be exogenous and wealth-dependent. For renters, $a_e(a_r) = a_m(a_r) = 0$. Only non-housing regular wealth earns a financial return r, but housing services bring direct utility.

To save on notation below, the dependence of housing variables (c_h, a_h, a_e, a_m) on a_r is omitted below whenever there is no confusion.

3.5 Income tax-and-transfer program

The agent's taxable income is given by

$$\iota = \begin{cases} e + r(a_r - a_e) + \omega - \kappa e - r a_m - 0.5\tau_{SS,t}\tilde{e} & \text{if } j^R = 0, \\ p_g + r(a_r - a_e) + \omega - r a_m & \text{otherwise.} \end{cases} \tag{8}$$

The first line is the taxable income of workers, where the individual state variable j^R denotes the agent's retirement age, and the convention is to set it to zero for workers. e are pre-tax earnings defined in eq. (1) and $r(a_r - a_e)$ is the return on the non-housing part of regular wealth. κe are contributions to the private retirement plan that can be deducted from the taxable income. ω are withdrawals from the PRA. ra_m is the interest rate due on mortgages, which also reduces taxable income. All workers pay a proportional Social Security tax $\tau_{SS,t}$ on their taxable earnings given by $\tilde{e} = \min(e, cap)$, where cap is an exogenous maximum taxable earnings threshold. Since the part of labor income that is paid by the employee as Social Security contributions is not subject to income taxes, a corresponding portion is deducted from the worker's taxable income.

The second line of the expression above corresponds to the taxable income of retired agents. Consistent with the U.S. tax code, both public pensions g and withdrawals ω from the PRA are taxable. This implies that deferred taxes are paid at the time of the withdrawals.

Following Heathcote et al. (2017), the net income tax liability is specified as

$$\Psi_t(\iota; j^R) = \begin{cases} \iota - \mathcal{I}_t \cdot (1 - \bar{\lambda}_{I,t}) \cdot (\iota/\mathcal{I}_t)^{1-\lambda_I} & \text{if } j^R = 0 \\ \max(0, \iota - \mathcal{I}_t \cdot (1 - \bar{\lambda}_{I,t}) \cdot (\iota/\mathcal{I}_t)^{1-\lambda_I}) & \text{otherwise,} \end{cases} \tag{9}$$

where ι denotes the agent's taxable income (defined below), $\iota/\mathcal{I}_t$ is the agent's taxable income normalized by the economy-wide average taxable income $\mathcal{I}_t$. λ_I governs income tax progressivity, while $\bar{\lambda}_{I,t}$ controls the average income tax level and adjusts each period to balance the government budget, as explained below.

The first line of eq. (9) applies to workers. When $0 < \lambda_I < 1$, the income tax system is progressive in the sense that the marginal tax is increasing in income and the average tax rate is higher (lower) than $\bar{\lambda}_{I,t}$ for any agent whose income is above (below) $\mathcal{I}_t$. In this case, the tax liability $\Psi_t(\iota; j^R)$ can be negative for low levels of income, implying that households with low income are entitled to transfers. This feature reflects the negative income tax many low-income households face through the EITC program in the U.S. The second line of eq. (9) applies to retired agents. Since retirees are not entitled to the EITC,

retired agents with low taxable income will not pay income taxes but are not entitled to transfers either.

The government finances an exogenous stream of wasted spending G_t by collecting the non-linear income tax, the penalty on early withdrawals, consumption taxes at a linear rate τ_c, and by taxing inherited pension wealth and by issuing debt $D_{t+1} > 0$. The income tax level, $\bar{\lambda}_{I,t}$, balances the government budget every period:

$$G_t + (1+r)D_t = \sum_j \int \Psi_t(\iota; j^R) dF_{t,j} + \sum_j \varphi_j \int \omega_t(\boldsymbol{x}) dF_{t,j} + \tau_c C_t + D_{t+1}$$
$$+(1+r)\sum_j \int (1-\psi_j^{z,v}) \max\{0, \Psi_t(a'_{p,t-1}; j^R)\} dF_{t-1,j}, \tag{10}$$

where C_t is the aggregate consumption level.

3.6 Public pension system

Workers must retire once they reach the mandatory retirement age J^R, but they already become eligible to receive pension benefits starting from age $J^E < J^R$ and, therefore, may choose to retire early. Households belonging to each income type (z, v) are entitled to receive a constant public pension $\bar{g}^{z,v}$ if they retire at the mandatory retirement age J^R. When the agent retires early, the pension annuity $\bar{g}^{z,v}$ is reduced according to a penalty function described in the calibration. The actual pension benefit is denoted $g = g(\bar{g}^{z,v}, j^R)$.

The social security tax, $\tau_{SS,t}$, balances the social security budget every period:

$$\tau_{SS,t} \sum_j \int_{j^R=0} \tilde{e} dF_{t,j} = \sum_j \int_{j^R \neq 0} g(\bar{g}^{z,v}, j^R) dF_{t,j}. \tag{11}$$

3.7 Bequests

Households leave bequests both because they gain utility from it ("warm glow" motive) and because they die earlier than expected ("accidental bequests"). As will be specified in the calibration, bequests are a luxury good. Also, both the retirement wealth a'_p and the regular wealth a'_r can be bequeathed.

As for the inherited pension wealth a'_p, it is assumed to be subject to the same general income tax formula as for withdrawals ω, since private pensions are subject to deferred taxes before they are inherited. By assumption, taxes are paid in isolation from any other income of the recipients. Besides, the after-tax amount cannot exceed the pre-tax amount. Hence, the bequeathed amount after the deferred taxes are paid is equal to: $a'_p - \max(0, \Psi_t(a'_p; j^R))$.

Agents derive warm-glow utility from the *after-tax* bequest.

The inherited regular wealth a'_r is not subject to any taxes. Note that only the non-housing part $a'_r - a_e(a'_r)$ pays interest, which implies that, at the beginning of the period, the bequeathed regular wealth, together with the interest payment, is given by $a'_r + r(a'_r - a_e(a'_r))$. The inherited regular wealth then equals to $a'_r - \frac{ra_e(a'_r)}{1+r}$, which makes sure that recipients inherit the right amount $a'_r + r(a'_r - a_e(a'_r))$.

Regular assets and after-tax private pension wealth are perfect substitutes from the recipient's point of view and are therefore pulled together. The after-tax bequest at time t left by a deceased agent at the end of time $t-1$ is given by

$$b_t(a'_r, a'_p) = a'_r - \frac{ra_e(a'_r)}{1+r} + a'_p - \max(0, \Psi_t(a'_p; j^R)). \tag{12}$$

All after-tax bequests are pooled and equally distributed among all agents as a lump-sum transfer T_t:

$$T_t = (1+r) \sum_j \int (1 - \psi_j^{z,v}) b_t(a'_r, a'_p) dF_{t-1,j}. \tag{13}$$

The quantitative experiment presented below liberalizes access to PRAs. This has important implications for bequest behavior, particularly for asset-rich households. In the model, bequests are a luxury good, so agents with high lifetime resources optimally choose to leave sizeable bequests. Under the baseline policy, required minimum distributions force retirees to withdraw pension wealth during their early and middle retirement years, when they still hold substantial amounts of regular wealth and receive pension income. As a result, these withdrawals increase taxable income at ages when marginal tax rates are relatively high. By contrast, under the reform that eliminates minimum required distributions, retirees can keep pension wealth invested until very late in life. Since rich agents die late in life when regular assets and other taxable income are low, wealth-rich households are able to shift the realization of deferred taxes to periods with lower tax exposure.

3.8 Household's maximization problem

This subsection spells out the agent's optimization problems at different stages of a household's lifecycle. Workers become eligible for early retirement benefits once they reach the age of J^E. Hence, they have to make an additional decision whether to retire early during the periods $J^E, ..., J^R - 1$. All agents must retire at age J^R, since there is no late retirement in the model.

Let $\boldsymbol{x} = (j, j^R, z, v, y, a_p, a_r, \psi_e)$ denote the agent's current state, where j is age, j^R – retirement age, z – educational level, v – fixed effect, y – idiosyncratic AR(1) productiv-

ity shock, a_p – retirement wealth, a_r – regular wealth, and ψ_e – the indicator function of whether the worker has access to an ESRP. In each period, working agents draw the labor productivity shock y before making any decisions.

Problem of workers who cannot retire early (age $1, ..., J^E - 1$)

Let $V_t(\boldsymbol{x})$ denote the agent's value function at time t and state $\boldsymbol{x}$. The dynamic programming problem of a worker reads

$$V_t(\boldsymbol{x}) = \max_{\kappa,\omega,a_r',l} \left\{ u(c, c_h, 1-l) + \beta\psi_j^{z,v}\mathbb{E}_{\psi_e'|\psi_e}\mathbb{E}_{y'|y}\left[V_{t+1}(\boldsymbol{x}')\right] + (1-\psi_j^{z,v})v(b_{t+1}) \right\} \tag{14}$$

subject to the budget constraint:

$$a_r' + (1+\tau_c)c = e + a_r + r(a_r - a_e) + (1-\varphi_j)\omega + T_t - \kappa e - ra_m - \tau_{SS,t}\tilde{e} - \Psi_t(\iota; j^R), \tag{15}$$

and the withdrawal constraint in eq. (2).

Workers decide on the amount they want to contribute to the retirement plan $\kappa e \in [0, \min(e, \chi_w)]$, the amount they would like to withdraw from their PRA ω, the allocation of regular wealth $a_r' \geq 0$, and the amount of work hours $l \in [0, 1]$. Withdrawals are constrained by eq. (2). Given these decisions, the agent's consumption follows from the agent's budget constraint. Their housing consumption c_h is solely determined by their current holdings of regular wealth a_r according to the function $c_h(a_r)$ defined in eq. (7).

The agent dies with age- and type-specific probability $1-\psi_j^{z,v}$, in which case she derives utility from leaving a bequest to their "offspring", represented by the last term $v(b_{t+1})$ in the problem above, where b_{t+1} is the after-tax bequest defined in eq. (12).

In the agent's budget constraint in eq. (15), e denotes pre-tax earnings, $\tilde{e}$ – capped earnings for the purpose of Social Security taxation, a_r is regular wealth, and $r(a_r - a_e)$ captures the return on non-housing regular wealth. The term κe represents contributions to the private retirement plan, while $(1-\varphi_j)\omega$ denotes withdrawals from the private pension account net of any applicable early-withdrawal penalties, where the penalty rate φ_j is defined in eq. (3). The function $\Psi_t(\iota)$ represents the income tax liability, and T_t is the lump-sum transfer received by the agent.

Since the agent remains in the labor force next period, her retirement status next period will remain unchanged: $j^{R\prime} = j^R = 0$. The agent's next period stock of retirement wealth a_p' follows from the law of motion in eq. (4). Current period consumption c follows from the budget constraint in eq. (15).

Problem of workers who can retire early (age $J^E, ..., J^R - 1$)

Once an agent reaches the age of J^E, she may choose to enter retirement, which is assumed to be an absorbing state. The retirement choice is given by

$$V_t(\cdot) \equiv \max\{V_t^W(\cdot), V_t^R(\cdot)\}. \tag{16}$$

Here, $V_t^W(\cdot)$ is the value of continuing to work, defined as in eq. (14), while the term $V_t^R(\cdot)$ is the value function of a retired agent defined below in eq. (17). If $V_t^W(\boldsymbol{x}) < V_t^R(\boldsymbol{x})$ for a given state variable $\boldsymbol{x}$, then the worker retires and $j^{R'} = j$.

Problem of retired agents (age $J^E, ..., J$)

Retired agents devote their unitary time endowment to leisure and decide how to allocate their regular wealth and how much to withdraw from their retirement account. Since the pension plan indicator ψ_e and the productivity shock y do not affect the household's decisions and welfare during retirement, we redefine the state vector as $\boldsymbol{x}^R = (j, j^R, z, v, a_p, a_r)$. The retirement age indicator remains unchanged for retirees, namely, $j^{R\prime} = j^R$. Hence, the agent transits from the current state $\boldsymbol{x}^R$ to the next period's state $\boldsymbol{x}^{R'} = (j{+}1, j^R, z, v, a_p', a_r')$.

The retired agent's maximization problem reads

$$V_t^R(\boldsymbol{x}^R) \;=\; \max_{c, a_r', \omega} \Big\{ u(c, c_h, 1) + \beta \psi_j^{z,v} V_{t+1}^R(\boldsymbol{x}^{R'}) + (1 - \psi_j^{z,v}) v(b_{t+1}) \Big\},$$

subject to $a_r' \geq 0$, the law of motion for a_p in eq. (6), the function for c_h in eq. (7), the budget constraint:

$$a_r' + (1 + \tau_c)c + r a_m = a_r + r(a_r - a_e) + \omega + g - \Psi_t(\iota; j^R) + T_t, \tag{17}$$

and the constraint on withdrawals in eq. (5).

In the budget constraint, g is the public pension benefit, ω – a withdrawal from a private pension account, and T_t – a lump-sum transfer. The taxable income ι is defined in eq. (8) and the income tax schedule $\Psi_t(\cdot)$ is specified in eq. (9).

3.9 Production technology

The economy is populated by a firm that rents capital and labor from households. College graduate workers and non-college graduate workers are assumed to be perfect substitutes

in the production function. The representative firm produces the final output good according to the production function

$$Y_t = Z K_t^{\varpi} N_t^{1-\varpi}, \tag{18}$$

where Z is the total factor productivity (TFP), K_t – the aggregate capital stock, N_t – the aggregate effective labor, and $\varpi \in (0,1)$ measures the elasticity of output with respect to the input of capital services. The output Y_t can be consumed or invested in capital.

Since the economy is small and open, the interest rate r is taken as exogenous and fixed over time. The condition

$$r = \varpi Z \left(K_t/N_t\right)^{\varpi-1} - \delta \tag{19}$$

therefore pins down the capital-labor ratio demanded by firms. Aggregate capital adjusts endogenously through international capital flows so that domestic savings need not equal net domestic investment in equilibrium.

Some firms (those with $\psi_e = 1$) offer compensation packages that include matched contributions for retirement accounts. It is assumed that these firms cannot discriminate between workers in terms of hourly wages per efficiency unit, so they have to break even (make zero profits), taking into account the whole pool of workers. Given $l_t(\mathbf{x})$ and $\kappa_t(\mathbf{x})$, and given the optimal choice of contributions of workers with characteristics $\mathbf{x}$, the optimality condition of the firm determining the wage rate w_t is:

$$w_t \left[1 + \sum_j \int_{\boldsymbol{x}} \frac{\psi_e h_{j,z} v y_j l_t(\boldsymbol{x})}{N_t} \min(\kappa_t(\boldsymbol{x}), \chi_f) dF_{t,j}\right] = (1-\varpi) Z \left(\frac{K_t}{N_t}\right)^{\varpi}, \tag{20}$$

where $F_{t,j}$ is the distribution of agents of age j over the state space in time t. Since employers with $\psi_e = 1$ offer a one-to-one match of the per hour contribution of the worker $\kappa_t(\boldsymbol{x})$ up to the limit, the marginal cost of hiring an additional hour of labor in efficiency units is augmented by the expected (hourly) employee contributions to the retirement plans.

3.10 Equilibrium

The equilibrium of this economy is defined in Appendix A.1. The equilibrium is consistent with the optimal decisions of households and firms, given equilibrium prices, bequests, and government policies. It also guarantees that, given prices and optimal decisions, markets clear. For these conditions, a key object is $F_{t,j}(\boldsymbol{x})$ defined as the distribution of households across the state $\boldsymbol{x}$ for a given age j at time t.

4 Quantitative experiments

The main quantitative experiment evaluates a policy reform that eliminates the three frictions governing access to private retirement wealth. First, I allow all working agents to access the total amount of their accumulated retirement wealth, whereas in the baseline model an ESRP portion of wealth was inaccessible. Formally, I set the ESRP share $q_j^{z,v}$ in eq. (2) equal to zero for all types and ages. Second, I permit penalty-free withdrawals by setting the early-withdrawal penalty rate $\bar{\varphi}$ in eq. (3) to zero for all ages. Finally, I relax withdrawal constraints during retirement by setting the required minimum distribution shares S_j in eq. (5) to zero for all ages j. Importantly, the reform leaves the tax treatment of withdrawals unchanged: as in the benchmark, withdrawals ω enter taxable income in eq. (8) and are taxed according to the progressive income tax-transfer schedule $\Psi_t(\cdot)$ defined in eq. (9).

A change in the policy parameters $(\bar{\varphi}, \{q_j^{z,v}\}, \{S_j\})$ will trigger transitional dynamics for all the aggregate variables (wage rate, income tax level, and social security tax rate) from the pre-reform to the final steady state associated with the new policy. During the transition, the social security tax rate $\tau_{SS,t}$ adjusts in each period to balance the social security government budget in eq. (11) and the income tax level $\bar{\lambda}_{I,t}$ balances the government budget in eq. (10).

5 Calibration

Overview. The economy is in a steady-state equilibrium, so the time subscripts is dropped throughout this section. The model period is one year, and the parameters are calibrated to the recent U.S. data.

Most parameters are calibrated using the Survey of Consumer Finances (SCF), which has been the basis for the empirical analysis in Section 2. Building on the sample selection criteria outlined in Section 2, I apply a small set of additional restrictions to better align the data with the model environment. Specifically, households whose earnings fall within the top 1% of the earnings distribution or households whose total wealth is in the top 0.1% of the wealth distribution are excluded from the sample.

Table 4 summarizes the parameters, distinguishing those set outside the model from those calibrated within the model, for which empirical targets appear in brackets. Below, we provide more details on the calibration strategy.

Demographics. Agents enter the model as workers at the real-life age of 25 ($j = 1$). The maximum possible age is $J = 76$ (real-life age of 100). The early-retirement age is

Table 4: Model parameters.

Parameter	Interpretation	Value
Parameters determined outside the model:		
Demographics and preferences		
J	Maximum age	76
P_H	Share of college graduates at birth	0.38
$\{\psi_j^{z,v}\}$	Type- and age-specific survival rates	Vectors
Retirement plans		
χ_f	Limits on firm's contributions, %	4.5
v	Probability of switching employers	0.25
$\{q_j^{z,v}\}$	Share of ESRP wealth in agent's retirement wealth	Figure **??**
Portfolio composition		
$\xi_h(a_r)$	Share of housing in regular wealth for homeowners	See text
$\xi_e(a_r)$	Share of equity in housing for homeowners	See text
Labor productivity		
$\{h_{j,z}\}$	Education- and age-specific efficiency levels	
ρ_y	Persistence of AR(1) shock	0.98
Production		
(ϖ, δ)	Capital share and capital depreciation, %	(33.0, 8.0)
Government policies regarding access to PRAs and withdrawals		
$\bar{\varphi}$	Early-withdrawal penalty rate, %	10.0
J^P	Age threshold for penalty-free withdrawals	35
J^M	Age threshold for required minimum withdrawals	48
$\{S_j\}$	Required minimum withdrawal rate	Figure 4
Other government policies		
λ_I	Income tax progressivity	0.216
τ_c	Consumption tax, %	4.1
(d_y, g_y)	Debt-to-GDP ratio and Wasted spending-to-GDP ratio, %	(100.0, 7.8)
(J^E, J^R)	Early and normal retirement age	(38, 42)
Parameters calibrated inside the model (target in brackets):		
Demographics, preferences, and bequests		
β	Discount factor (total wealth-to-income = 5.7)	0.96
η	Curvature for utility from leisure (Frisch elasticity = 0.5)	1.6
ς_l	Relative utility weight on leisure (average hours = 0.4)	0.83
ς_h	Relative utility weight on housing (regular wealth-to-income = 4.4)	0.63
$\underline{c}_h$	Housing for renters (regular wealth-to-income at age 25–40 = 1.8)	0.6
γ_1	Degree of altruism (total wealth-to-income at age 95–99 = 6.2)	10.0
γ_2	Degree of bequests as luxury good (% with zero bequests = 20%)	6.0
Retirement plans		
$\{\pi^{z,v}\}$	Type-specific probability to be offered an ESRP, % (See text.)	(30, 80, 80, 88)
χ_w	Cap on worker's contributions ($\chi_w/\mathcal{E}$ = 0.32)	0.12
Housing		
$\hat{a}_r$	Threshold for homeownership (7.7% of total regular wealth)	0.14
Labor productivity		
σ_ϵ^2	Variance of AR(1) shock (curvature of residual earnings var. by age)	0.01
(v_H, v_L)	Fixed effect (Gini index for pre-government earnings = 0.40)	(1.29,0.78)
Production		
Z	TFP (wage rate $w = 1.0$)	0.27
Social Security		
$\{\bar{g}^{z,v}\}$	Type-specific benefit at normal retirement age (rep. rate schedule)	See text.
δ_g	Penalty for early retirement (share of retired agents at age 62 = 26%)	0.2
cap	Maximum taxable earnings ($cap/\mathcal{E}$ = 2.1)	0.7

$J^E = 38$ (real-life age of 62), while the mandatory retirement age, J^R, is equal to 42 (real-life age of 66). The share of college graduates at birth, P_H, is set to 38%, consistent with the SCF sample.[18] The estimates for the age- and type-specific mortality rates, $1 - \psi_j^{z,v}$, are borrowed from Ábrahám et al. (2024).

Preferences and bequest parameters. The agent's period utility function u is given by:

$$u(c, c_h, 1-l) = \log(c) + \varsigma_h \log(c_h) + \varsigma_l \frac{(1-l)^{1-\eta}}{1-\eta}, \tag{21}$$

where ς_h is the relative utility weight on housing services, ς_l is the relative utility weight on leisure, and η governs the intertemporal elasticity of substitution in labor supply. The parameter ς_l is set it to match a 40.0% share of disposable time devoted to market work, and η is set to 3.0.

Two of the parameters are calibrated internally to match the aggregate age profiles of wealth in the SCF. The discount factor β targets the total wealth-to-income ratio of 5.7. The weight on housing services ς_h targets the total regular wealth-to-income ratio of 4.4. The housing level of renters, $\underline{c}_h$, is a key determinant of the demand for regular assets by young households (aged 25–40), and we use the ratio of regular wealth-to-income of these households, which is equal to 1.8, to calibrate this parameter. By construction, matching the previous aggregate ratios implies the aggregate split between pension and non-pension wealth.

The utility from leaving bequests is specified as:

$$v(a'_r + a'_p) = \phi_1 \log(\phi_2 + b_{t+1}(a'_r, a'_p)), \tag{22}$$

where the after-tax bequest b_{t+1} is defined in eq. (12). Furthermore, ϕ_1 is the degree of altruism, and ϕ_2 captures how much bequests are a luxury good. ϕ_1 is set to match the total wealth-to-income ratio at ages 95–100 and ϕ_2 is set to match the share of deceased agents who leave no bequests, equal to 20% according to Hurd and Smith (2001).

Private retirement plans. Workers with access to an ESRP are assumed to hold an exogenous, age- and type-dependent share of their retirement wealth inside the plan. To calibrate this share, denoted by $q_j^{z,v}$, I use the same SCF sample as in the empirical analysis, additionally restricting the sample to working-age households that are offered an ESRP, meaning that an employer-sponsored plan is available and the worker is eligible to enroll. Consistent with the empirical analysis above, ESRP access is defined at the household

[18] Household heads with a completed college degree or higher are assumed to be *college graduates* and all remaining households are assumed to be *high-school graduates*.

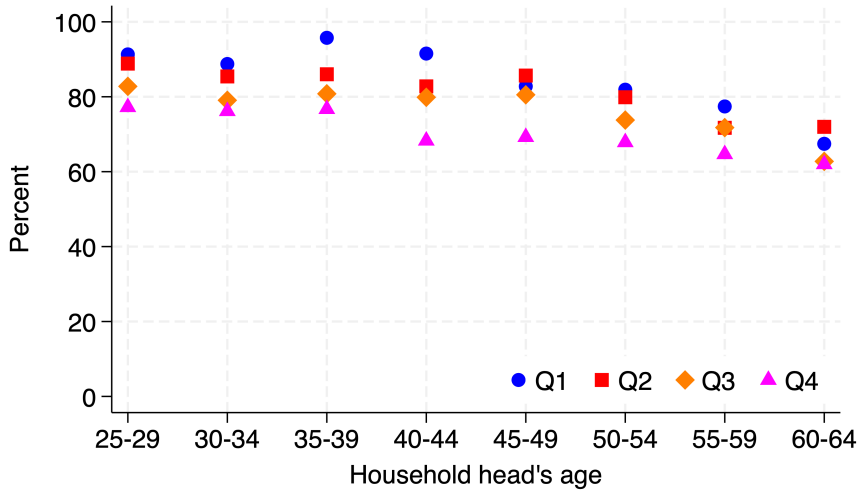


Figure 3: Share of private retirement wealth held in an ESRP, conditional on being offered an ESRP, by age and income type (SCF).

Notes: The figure plots the share of ESRP in total retirement wealth for participants in ESRPs, $q_j^{z,v}$ from eq. (2), which is an input into the model. The sample is restricted to households (i) whose head (and spouse, if present) is aged 25–65 and is not retired or disabled and (ii) who are offered an ESRP. Income quartiles are defined within 5-year age groups. Income is the sum of earnings and capital interest income. The results are based on the SCF 2004–2022.

level. A household is classified as having access to an ESRP if either (i) the plan is offered to the household head or (ii) it is not offered to the head but is offered to the spouse and the spouse earns more than 50% of the couple's combined labor income. In all other cases, the household is assumed to have no access to an ESRP. The resulting share of ESRP wealth in total retirement wealth among the participants in ESRPs is shown in Figure 3, by the household head's age and income type.

I calibrate the statutory cap on household's contributions to PRAs, χ_w, matching the ratio of maximum contributions to average earnings equal to 0.32.[19] The maximum employer-matching contribution rate is set to $\chi_f = 4.5\%$. The probability of "switching employers", ν, is set to 0.25, implying an average job tenure of 4 years. The type-dependent probability of access to an ESRP $\pi(z, v)$ is calibrated inside the model to match the schedule of offer rates by income in the SCF data. As documented in Ábrahám et al. (2025), the offer rates for the ESRP are roughly constant by age for each income type and equal to 30%, 80%, 80%, and 88% for the 1st to 4th income quartiles.[20]

[19] In 2022, individual employee contributions could not exceed an annual limit of $\$20{,}500$. This amount is scaled by a factor of 1.6 to account for the average number of earners in a household in the SCF, yielding an adjusted contribution cap of $\$32{,}800$. Given that the households' average taxable earnings in the 2022 SCF sample of my dataset are $\$102{,}688$, the ratio of the maximum contribution to average earnings is 0.32.

[20] Since the offer rate in the SCF data is a *stock* of households having received an offer, the share of households receiving an offer per period of time (*flow* rate) must be calibrated inside the model.

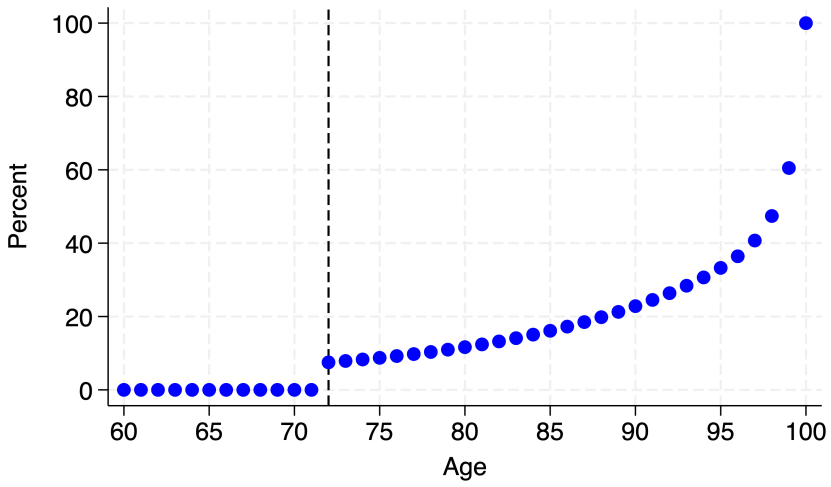


Figure 4: Required minimum withdrawal share from a PRA in the model, by age.

Notes: The figure plots the minimum withdrawal shares, S_j, from eq. (5), which are used as an input in the model. The shares are based on expected remaining life expectancy conditional on survival to age j. Expected longevity is computed from age-specific survival probabilities $\psi_j^{z,v}$, averaged over types (z, v) at each age. The vertical dashed line at age 72 marks the onset of mandatory withdrawals. S_j is set to zero for ages below 72.

Minimum required distributions As already explained in Section 3.3, the minimum withdrawal share S_j in the constraint (5) is determined using the agent's life expectancy at each age, which are computed based on the survival probabilities $\psi_j^{z,v}$ and averaged across types at each age. The minimum withdrawal shares S_j are plotted in Figure 4.

Housing. I follow Ábrahám et al. (2025) in modelling the housing market. Homeownership is modeled as a binary function of regular wealth, and I set the ownership threshold $\hat{a}_r$ at 7.7% of total regular wealth in the steady state. This corresponds to the 30th percentile of the regular wealth distribution, where the homeownership rate is approximately 50%. To construct the schedules of $\xi_h(\cdot)$ and $\xi_e(\cdot)$ in the model, we first express the percentiles as multiples of aggregate regular wealth and then fit smooth, strictly monotonic functional forms for each schedule.

Education- and age-specific efficiency levels. The education- and age-specific efficiency levels $h_{j,z}$ are estimated outside the model to match the profiles of pre-government earnings by age and education in the SCF. To obtain the empirical profiles, I regress log hourly wages on the household head's age, age squared, and education.

Persistent shock. The idiosyncratic productivity shock y_j follows an AR(1) process, with the initial shock realization at age 1 set to $y_1 \equiv 1$. The persistence parameter ρ is set to 0.98, and the innovation variance σ_ϵ^2 is calibrated inside the model to match the slope of the empirical age profile of residual earnings dispersion. To obtain this profile in the data

and the model, the log of household earnings is regressed on a third-degree polynomial in the household head's age and a college dummy.

Fixed effect. The fixed effect v can take two values (v_L, v_H), and these are calibrated inside the model to match the Gini index for pre-tax earnings inequality equal to 0.40.

Production. The capital share ϖ and the depreciation rate δ are set outside the model to match the average ratio of capital income to GDP, equal to 33%, and the average ratio of investment to GDP, equal to 8%, respectively. The TFP factor Z is normalized such that the wage rate w is 1.0.

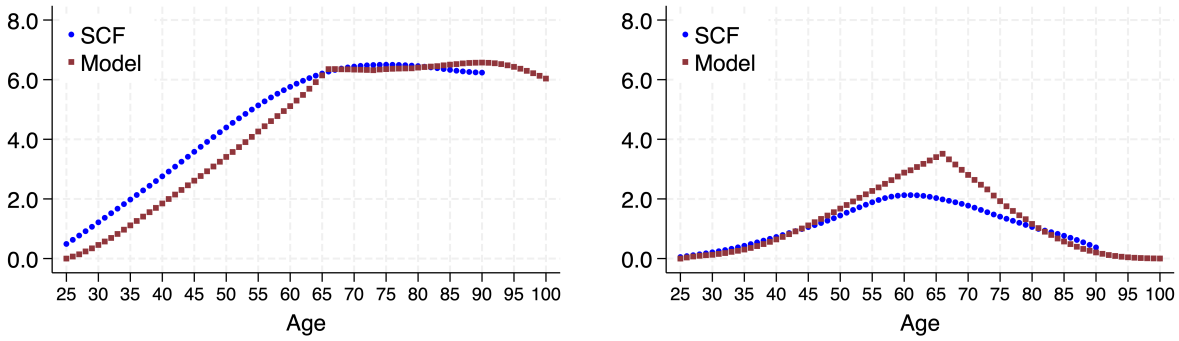
Social Security. To set the four levels of public pensions at the normal retirement age for each income type, $\bar{g}^{z,v}$, I follow Ábrahám et al. (2025), where instead of tracking lifetime earnings for each agent, we computed the normalized lifetime earnings by type, $\bar{e}^{z,v}/\mathcal{E}$, among those agents who enter retirement and used the statutory replacement rate schedule to compute the associated replacement rates for each type.[21] The resulting replacement rates for Type 1 to Type 4 agents are 37.8%, 30.8%, 28.3%, and 24.4%, respectively. The pension levels at the normal retirement age are then determined by multiplying the replacement rate with $\bar{e}^{z,v}$. The actual pension benefit g depends on the actual age of retirement j^R. If the agent retires early, the pension benefit is reduced proportionately to the number of years before the normal retirement age:

$$g(\bar{g}^{z,v}, j^R) = (1 - \delta_g) \cdot \bar{g}^{z,v} + (j^R - J^E)/(J^R - J^E) \cdot \delta_g \cdot \bar{g}^{z,v}.$$

If retirement occurs at the earliest age ($j^R = J^E$), the agent loses (permanently) a fraction δ_g of the full pension amount. When the agent retires at the mandatory retirement age ($j^R = J^R$), the expression above boils down to the full pension amount. The penalty factor for early retirement δ_p is estimated inside the model by targeting the share of households at age 62 in the SCF who report receiving pension benefits (26%). Finally, the parameter cap is set to 2.1 times the average taxable earnings $\mathcal{E}$ following the SCF.

Income tax-transfer program. The income tax progressivity λ_I is set to 0.216 (Heathcote et al. 2020). Following Ábrahám et al. (2024), I set the consumption tax τ_c to 4.1% and government spending G such that the share of government spending-to-GDP in the steady state, G/Y, is equal to 7.8%, which is the share of government spending net of transfers in the data. The share of federal government debt to GDP, D/Y in the steady state is set to 100%. The resulting equilibrium level of the income tax rate $\bar{\lambda}_I$ is 12.4%, corresponding to the average income tax rate of an agent with economy-wide average taxable income.

[21] I adjust inside the level of the replacement rate schedule to match the Social Security rate of 10.6%.



(a) Normalized regular wealth.

(b) Normalized retirement wealth.

Figure 5: Model fit of the regular wealth and private retirement wealth by age.

Notes: Wealth is normalized by economy-wide average income in the model and data.

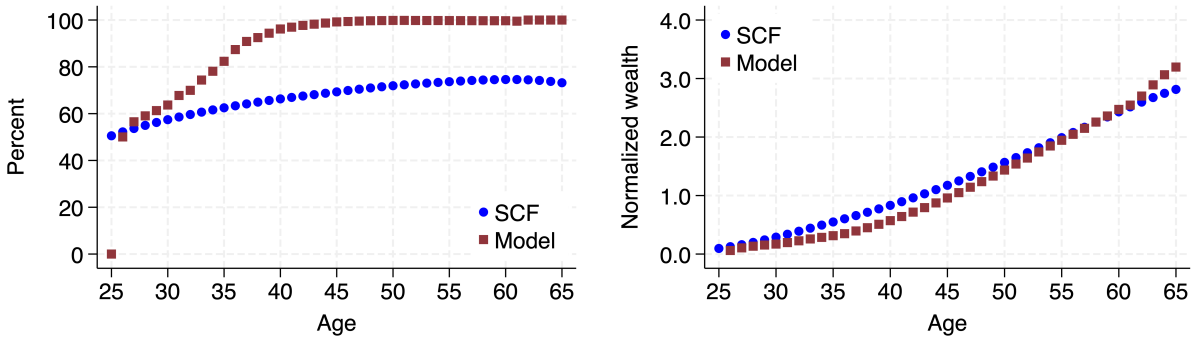
6 Findings

This section presents the results of the policy experiment that eliminates restrictions on withdrawals from PRAs.

6.1 Untargeted moments

Figure 5 shows the model fit of the lifecycle profiles of regular wealth (Panel a) and retirement wealth (Panel b), with wealth normalized by economy-wide average market income in both the model and the data. Overall, the model provides a good fit for both wealth components, which has already been the point in the paper by Ábrahám et al. (2025). The model slightly underestimates retirement wealth between ages 55 and 70 and exhibits a sharper decline starting at age 65, when most agents transition into retirement. In the data, retirement wealth decumulates more gradually, likely reflecting household composition effects, such as staggered retirement of spouses, which smooths observed household-level wealth profiles.

Figure 6 compares the life-cycle profiles of participation in private retirement wealth and accumulated balances in the data and in the model. Panel (a) shows that the participation rate rises steeply early in working life, from about 50% at age 25 to more than 70% by age 50, before flattening toward retirement. The model closely matches the rapid early increase but overpredicts participation at older working ages. Panel (b) displays the intensive margin, where average retirement wealth conditional on participation increases monotonically with age in both data and model. The model's fit is remarkably good, reproducing the steep rise in balances observed in the SCF.



(a) Participation rate.

(b) Normalized retirement wealth.

Figure 6: Model fit of the extensive and intensive margins for retirement wealth by age.

Notes: Panel (a) shows participation rate in private retirement wealth. Panel (b) shows average retirement wealth, conditional on participation, normalized by economy-wide average income in the model and data. The empirical data in both panels comes from Figure 1 (line "All accounts").

Table 5 compares the model fit of the key moments of the withdrawal behavior during the working stage discussed in the empirical section. The first row shows that, while the model overstates the fraction of young agents making a withdrawal, the model captures the steady increase in withdrawal activity during the middle ages, rising from about 1.3% at age 35–44 to 2.7% during ages 45–58, with a particularly pronounced increase to 6.7% after age 59, when withdrawals become penalty-free, consistent with the data. The second row reports the intensive margin: average withdrawal amounts conditional on withdrawing increase monotonically with age in both data and model, with a sizeable increase after age 59.

Finally, Figure 7 shows the distribution of withdrawals by age, conditional on making a withdrawal, in retirement. The median withdrawal share closely tracks the required minimum distribution schedule over the early retirement years (ages 72–82), indicating that the statutory constraint binds for the typical retiree in the model. At the same time, the mean withdrawal share lies well above the statutory minimum at all ages, reflecting the presence of households that optimally withdraw substantially more than required. As a result, the model reproduces the key empirical fact, documented in Figure 2 in the empirical section, that the constraint is binding at the median but not at the mean, capturing the coexistence of constrained retirees and households drawing down their retirement wealth more aggressively.

Table 5: Model fit of withdrawals from retirement accounts.

	Age group			
	25–34	35–44	45–58	59–65
Withdrawal incidence, %:				
– Data	2.53	3.23	4.66	8.99
– Model	7.90	2.02	4.61	15.37
Mean (normalized) withdrawal amount:				
– Data	0.25	0.44	1.11	1.23
– Model	0.41	0.95	1.31	1.10
Withdrawal as a share of retirement wealth, %:				
– Data	22.78	33.01	19.88	14.07
– Model	31.11	22.11	18.55	22.47
Withdrawal as a share of income, %:				
– Data	2.89	5.33	10.06	18.28
– Model	7.44	12.35	17.28	18.14

Notes: Withdrawal incidence shows the percent of workers who make a withdrawal from their retirement account, conditional on having a positive amount of private retirement wealth. *Mean normalized withdrawal amount* reports the average of withdrawal, conditional on a withdrawal occurring, normalized by the economy-wide average withdrawal during ages 25–65. *Withdrawal as a share of retirement wealth* expresses withdrawal as a share of accessible balances. In the data, this is the balance in the individually managed account (Table 3). In the model, this is total retirement wealth for workers without access to ESRP and $(1-q_j^{z,v})$ of total retirement wealth for workers without access to ESRP.

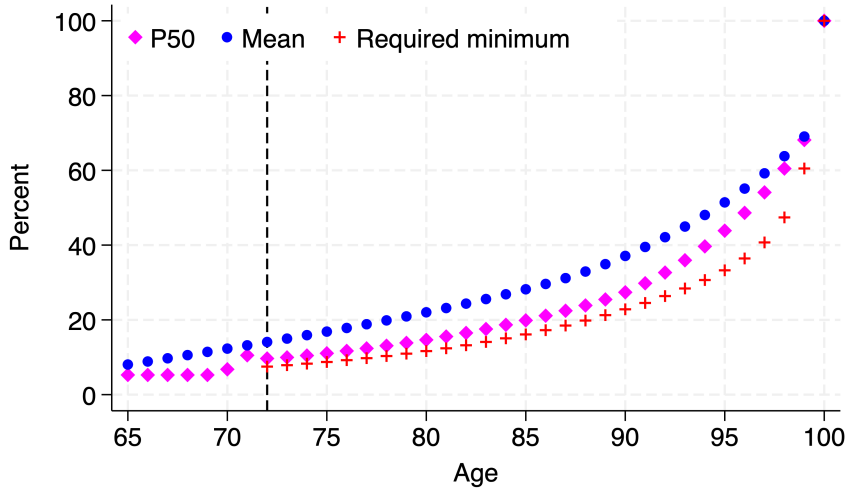


Figure 7: Model-implied distribution of withdrawals (by age) expressed as percent of retirement wealth.

Notes: At each age, the figure reports the mean and median withdrawal as a percentage of the total accumulated PRA balance, conditional on making a withdrawal. The vertical dashed line at age 72 marks the onset of mandatory withdrawals. The required minimum withdrawal shares are shown in Figure 4.

6.2 Results of the policy reform

This section presents the results of the policy reform that removes three frictions in accessing the private retirement wealth.

Table 6: Withdrawals in the baseline model and experiment.

	Age group			
	25–34	35–44	45–58	59–65
Withdrawal incidence, %:				
– Baseline	8.06	1.97	4.83	15.67
– Experiment	15.88	5.66	5.69	13.27
Mean (normalized) withdrawal amount:				
– Baseline	0.41	0.97	1.31	1.10
– Experiment	0.63	0.95	1.45	1.00
Withdrawal as a share of retirement wealth, %:				
– Baseline	74.13	62.98	36.89	27.82
– Experiment	27.51	8.28	6.92	3.13
Withdrawal as a share of income, %:				
– Baseline	7.44	12.35	17.28	18.14
– Experiment	13.71	15.74	21.78	18.41

Notes: The values in rows *Experiment* are computed based on the final steady state associated with the new policy. The values in rows *Baseline* are taken from Table 5.

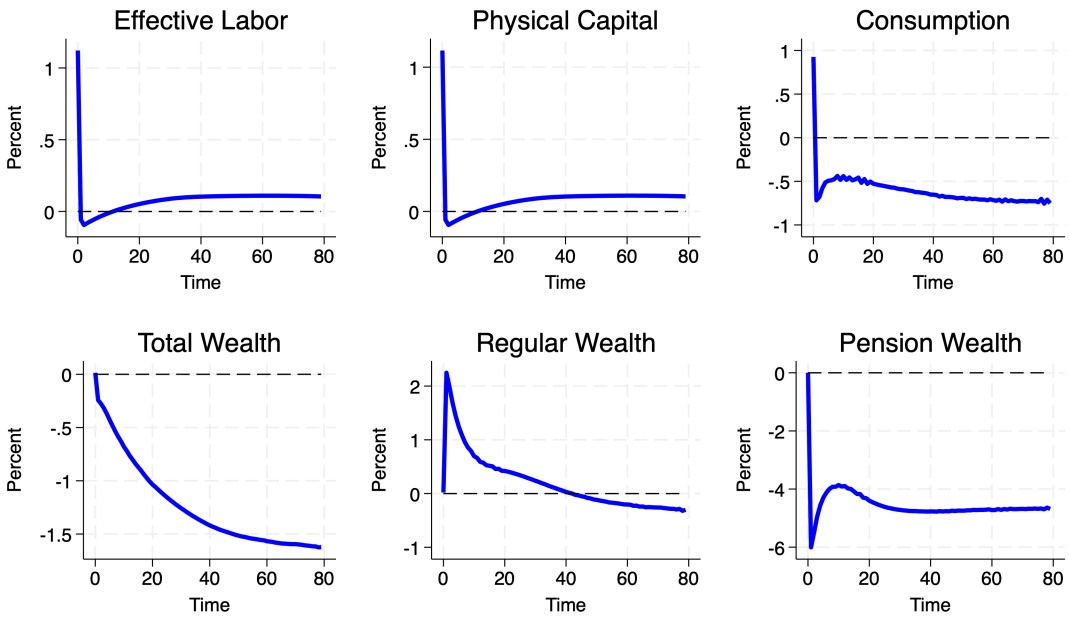


Figure 8: Deviations in key model variables along the transition in the policy experiment.

Notes: The figure shows percent deviations in key variables compared to the pre-reform steady state. The reform eliminates the penalty on early withdrawals during the working stage and constraints on mandatory withdrawals during retirement.

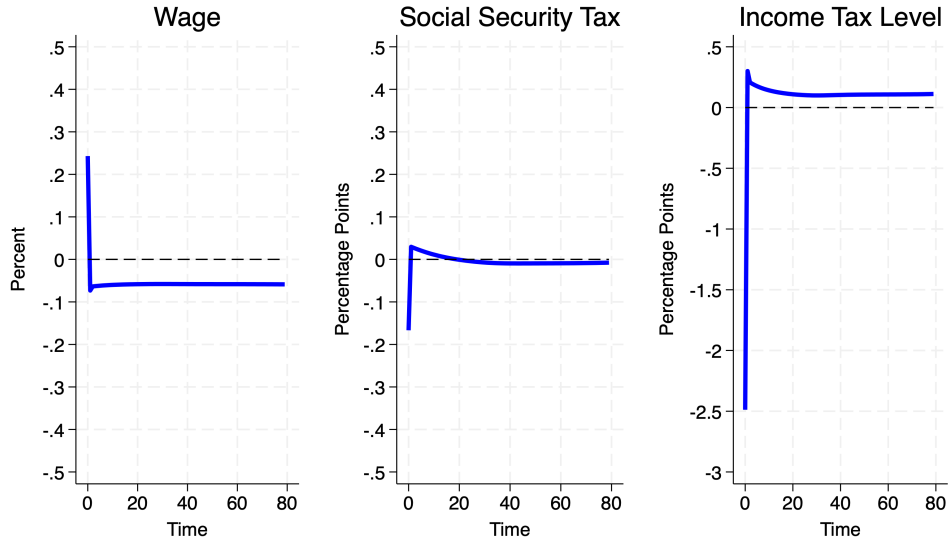


Figure 9: Deviations in key model variables along the transition in the policy experiment.

Notes: The figure shows percent deviations in key variables compared to the pre-reform steady state. The reform eliminates the penalty on early withdrawals during the working stage and constraints on mandatory withdrawals during retirement.

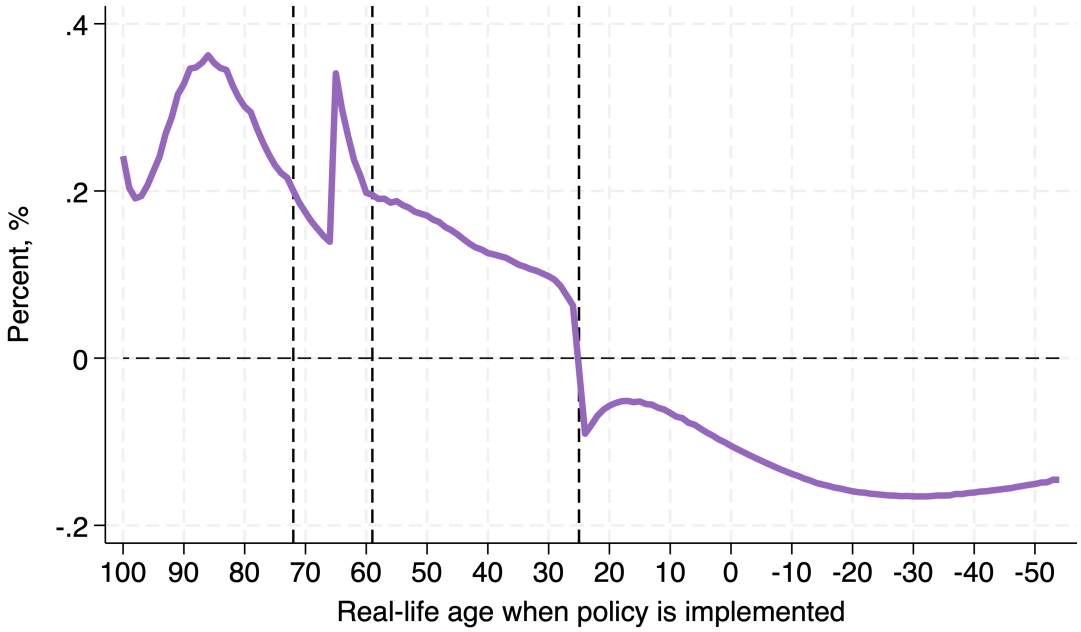


Figure 10: Welfare effects of the reform by age and education (CEV, %).

Notes: The welfare effects take transitional dynamics between the steady states into account. The left vertical line corresponds to age 72, which is a threshold for mandatory withdrawals. The central vertical line corresponds to age 59, which is a threshold for penalty-free withdrawals. The right vertical line denotes labor-market entrants at the time of reform implementation (real-life age 25).

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Supplemental online appendix

A Model

A.1 Definition of Equilibrium

Given the initial capital stock K_0, an initial measure of households $\{F_{0,j}\}_{j=1}^{J}$, initial regular wealth $A_{r,0}$, initial pension wealth $A_{p,0}$, constant debt and government spending $\{D_t, G_t\}_{t=0}^{\infty}$, with $D_t = \bar{D}$ and $G_t = \bar{G}$, a competitive equilibrium is a sequence of value functions, $\{V_t, V_t^R, V_t^W\}_{t=0}^{\infty}$, policy functions for the choice of consumption, regular wealth, retirement wealth, labor supply, contributions, withdrawals, and retirement $\{c_t, a'_{r,t}, a'_{p,t}, l_t, \kappa_t, \omega_t, \mathcal{R}_t\}_{t=0}^{\infty}$, production plans for firms $\{K_{t+1}, N_t, Y_t\}_{t=0}^{\infty}$, prices $\{w_t, r\}_{t=0}^{\infty}$, Social Security taxes $\{\tau_{SS,t}\}_{t=0}^{\infty}$, income tax variables $\{\bar{\lambda}_{I,t}, \mathcal{I}_t\}_{t=0}^{\infty}$, population measures $\{F_{t,j}\}_{t=1}^{\infty}$, aggregate consumption, aggregate accumulation of regular, housing and pension wealth, as well as aggregate accumulation of home equity and mortgages, $\{C_t, A_{r,t+1}, A_{h,t+1}, A_{p,t+1}, A_{e,t+1}, A_{m,t+1}\}_{t=0}^{\infty}$, such that the following statements hold for all $t \geq 0$:

1. The value functions $\{V_t, V_t^W, V_t^R\}$ solve the agent's optimization problem and the associated policy functions are $\{c_t, a'_{r,t}, a'_{p,t}, l_t, \kappa_t, \omega_t, \mathcal{R}_t\}$.

2. Wages $\{w_t\}$ are determined competitively from eq. (20).

3. The average taxable income $\{\mathcal{I}_t\}$, total accumulated regular wealth $\{A_{r,t+1}\}$, total accumulated private pension wealth $\{A_{p,t+1}\}$, total accumulated housing stock $\{A_{h,t+1}\}$, home equity $\{A_{e,t+1}\}$ and mortgages $\{A_{m,t+1}\}$, and total consumption $\{C_t\}$ follow

from the following conditions

$$\mathcal{I}_t \equiv \sum_j \int \iota_t(\boldsymbol{x}) dF_{t,j}, \tag{23}$$

$$A_{r,t+1} \equiv \sum_j \int a'_{r,t}(\boldsymbol{x}) dF_{t,j}, \tag{24}$$

$$A_{p,t+1} \equiv \sum_j \int a'_{p,t}(\boldsymbol{x}) dF_{t,j}, \tag{25}$$

$$A_{h,t+1} \equiv \sum_j \int a_h(a'_{r,t}(\boldsymbol{x})) dF_{t,j}, \tag{26}$$

$$A_{e,t+1} \equiv \sum_j \int a_e(a'_{r,t}(\boldsymbol{x})) dF_{t,j}, \tag{27}$$

$$A_{m,t+1} \equiv \sum_j \int a_m(a'_{r,t}(\boldsymbol{x})) dF_{t,j}, \tag{28}$$

$$C_t \equiv \sum_j \int c_t(\boldsymbol{x}) dF_{t,j}. \tag{29}$$

4. The income tax level $\{\bar{\lambda}_{I,t}\}$ balances the consolidated government budget in eq. (10).

5. The Social Security tax $\{\tau_{SS,t}\}$ balances the Social Security budget in eq. (11).

6. The lump-sum transfer is given by eq. (13).

7. Given the agent's policy functions, the next period's distribution of agents is given by $F_{t+1,j+1} = \mathcal{F}_{t,j}(F_{t,j})$, where $\mathcal{F}_{t,j}$ is the law of motion induced by the Markov process for labor productivity, the law of motion for the average lifetime earnings, the endogenous accumulation of regular assets and private pensions, early retirement decisions, and population growth.

8. The asset markets clear:

$$A_{r,t} + A_{p,t} = K_t + D_t + A_{h,t}. \tag{30}$$

This condition makes sure that the total amount of accumulated wealth is equal to the total available assets (i.e., capital, government debt, and housing). Using the fact that $A_{h,t} = A_{e,t} + A_{m,t}$, this condition also implies that the market for interest-bearing asset markets also clear, that is: $A_{r,t} - A_{e,t} + A_{p,t} = K_t + D_t + A_{m,t}$.

9. The labor market clears:

$$N_t = \sum_j \int_{\boldsymbol{x}: j^R = 0} yvhl_t(\boldsymbol{x}) dF_{t,j}. \tag{31}$$

10. The goods market clears:

$$Y_t = C_t + G_t + A_{h,t+1} - A_{h,t} + K_{t+1} - (1-\delta)K_t.$$