The Impact of Withdrawal Penalties on Retirement Savings

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Allied Social Science Associations Annual Meeting

Recent Studies on Retirement Policies

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Disclaimer

Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the Internal Revenue Service. All results have been reviewed by the Internal Revenue Service to ensure that no confidential information is disclosed. All errors are our own.

Introduction

One way the U.S. government encourages saving for retirement: tax-benefited savings accounts such as 401(k)s and Individual Retirement Accounts (IRAs)

IRAs have become an increasingly important vehicle for retirement savings

Introduction

Traditional IRAs have associated tax penalties:

- Early withdrawal penalty
  - Additional 10% if withdraw before age $59\frac{1}{2}$
  - Exceptions for, e.g., certain medical expenses, first time home-buyers
- Excess accumulation penalty
  - Additional 50% if fail to withdraw at ages $\geq 70\frac{1}{2}$ (pre-2020)

Research questions

Research question 1: To what extent do these penalties change the timing of withdrawals from IRAs?

- How many taxpayers change the timing of their withdrawals?
- How much money is shifted?

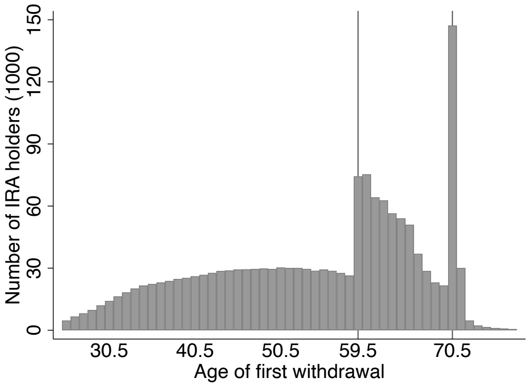
Methodology: Reduced-form bunching analysis

Data

- Administrative tax data
  - Sources of income (wages, self-employment, Social Security, etc.)
  - IRA accounts (contributions, withdrawals, balances)
- 17-year panel (1999-2015)
- 5% random sample of population 18 or older in 1999
  - 32.7% of our sample are IRA holders
  - Traditional IRA holders: $N = 2{,}790{,}313$ (72% of IRA holders)

Bunching analysis: age of first withdrawal

Number of trad. IRA holders (1,000)

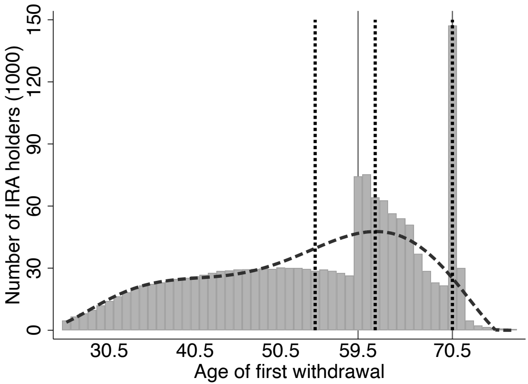


Notes: N = 1,536,392 unique taxpayers.

Diagnostics | Roth IRAs | Ave. first dstr amt | Results table

Bunching analysis: age of first withdrawal

Number of trad. IRA holders (1,000)



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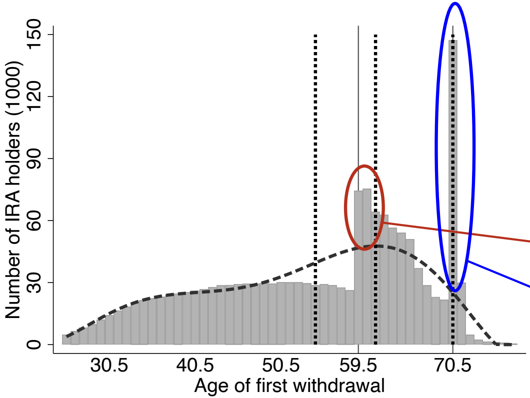


$\widehat{B}_{59.5}$ = 72k taxpayers

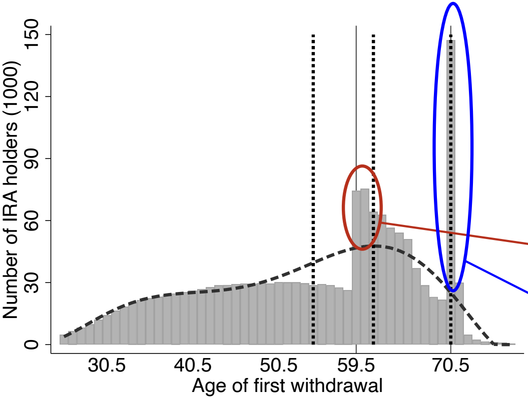
$\widehat{B}_{70.5}$ = 122k taxpayers

Notes: N = 1,536,392 unique taxpayers.

Diagnostics | Roth IRAs | Ave. first dstr amt | Results table

Bunching analysis: age of first withdrawal

Number of trad. IRA holders (1,000)



$mag_{59.5} = 72\text{k}/1{,}536\text{k} = 4.7\%$

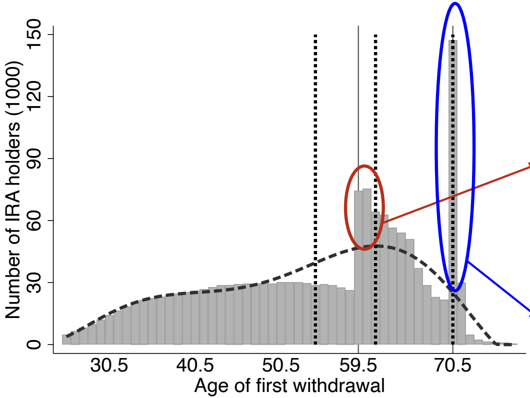
$mag_{70.5} = 122\text{k}/1{,}536\text{k} = 7.9\%$

Notes: $N = 1{,}536{,}392$ unique taxpayers.

Diagnostics | Roth IRAs | Ave. first dstr amt | Results table

Bunching analysis: age of first withdrawal

Number of trad. IRA holders (1,000)



Notes: $N = 1{,}536{,}392$ unique taxpayers.

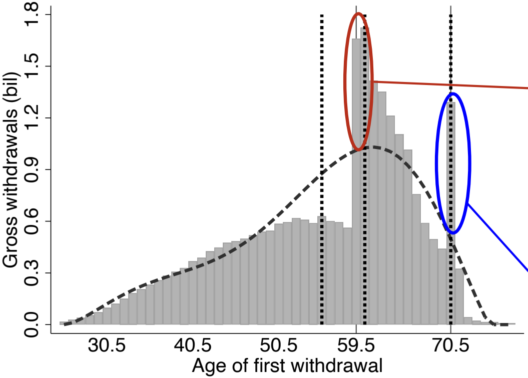
Scaled: **100k taxpayers** per year change timing of first withdrawal in response to early withdrawal penalty

Scaled: **169k taxpayers** per year change timing of first withdrawal in response to excess accumulation penalty

Diagnostics | Roth IRAs | Ave. first dstr amt | Results table

Bunching analysis: age of first withdrawal

Gross withdrawal amount ($bil)



Notes: N = $25,967,606,263.

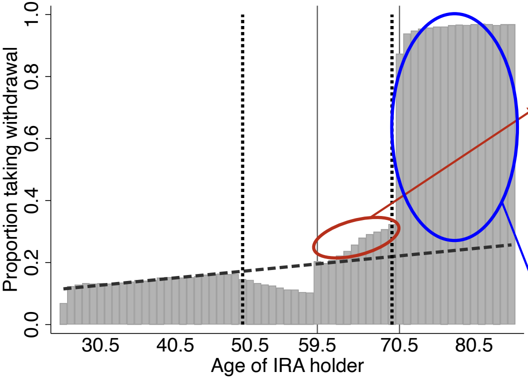
Scaled: **$4.9 bil in first withdrawals** shifted per year in response to early withdrawal penalty (5.2%)

Scaled: **$2.9 bil in first withdrawals** shifted per year in response to excess accumulation penalty (3.1%)

Diagnostics | Roth IRAs | Ave. first dstr amt | Results table

Bunching analysis: cross-sectional (2005)

Proportion of trad. IRA holders



Notes: $N = 1{,}449{,}868$ unique taxpayers.

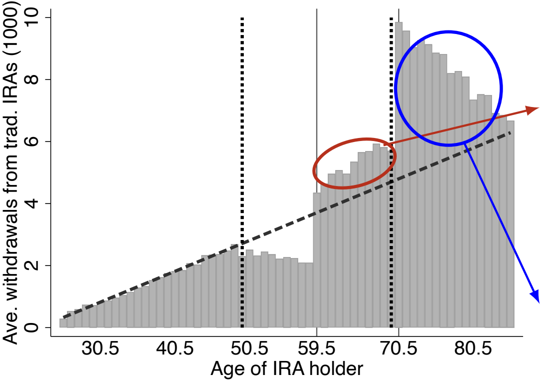
Scaled: **648k taxpayers** per year change timing of a withdrawal in response to early withdrawal penalty (1.4%)

Scaled: **7.7 mil taxpayers** per year change timing of a withdrawal in response to excess accumulation penalty (16.2%)

Diagnostics | Roth IRAs | Results table

Bunching analysis: cross-sectional (2005)

Average withdrawal amount ($1,000)



Notes: Based on $6,483,125,796 total withdrawals.

Scaled: **$12.6 bil** in withdrawals shifted per year in response to early withdrawal penalty (4.6%)

Scaled: **$45.3 bil** in withdrawals shifted per year in response to excess accumulation penalty (16.4%)

Discussion

We find that both penalties have a large effect on withdrawal timing

Policy makers are actively changing these penalties with little empirical evidence about the possible impact on taxpayer behavior

$\longrightarrow$ **Research question 2:** What would happen to retirement savings, welfare, and tax revenue if we changed either penalty?

Methodology: Dynamic life-cycle model

Dynamic life-cycle model: set-up

Primary features of the model:

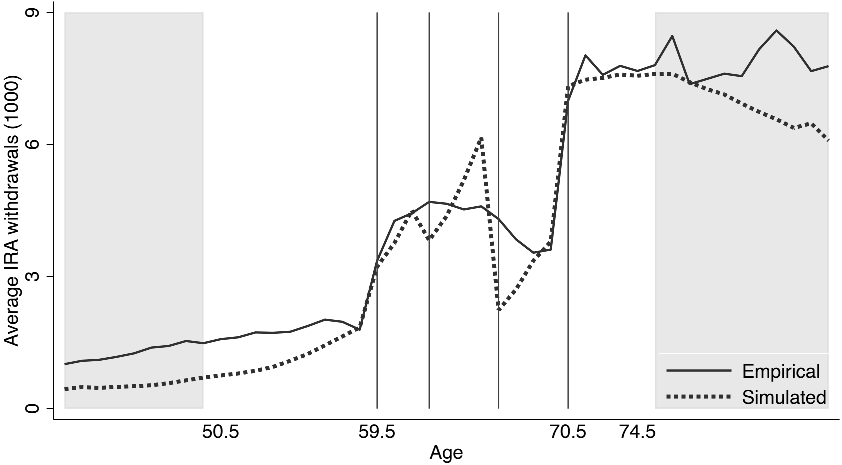
- Model individuals from age 40 until $T = 85$
- State variables:
    - Current age, claiming age, income, stocks of regular and IRA savings
- Choice variables:
    - Next age stocks of regular and IRA savings ($\Rightarrow$ consumption, taxes)

Dynamic life-cycle model: estimation

- Estimation method: Simulated Method of Moments
- Match on 25 moments: average withdrawal value at each age between 50 and 74
- Identification is driven by exogenous budget set discontinuities generated by the two tax penalties

Dynamic life-cycle model: results

Model fit: matched moments

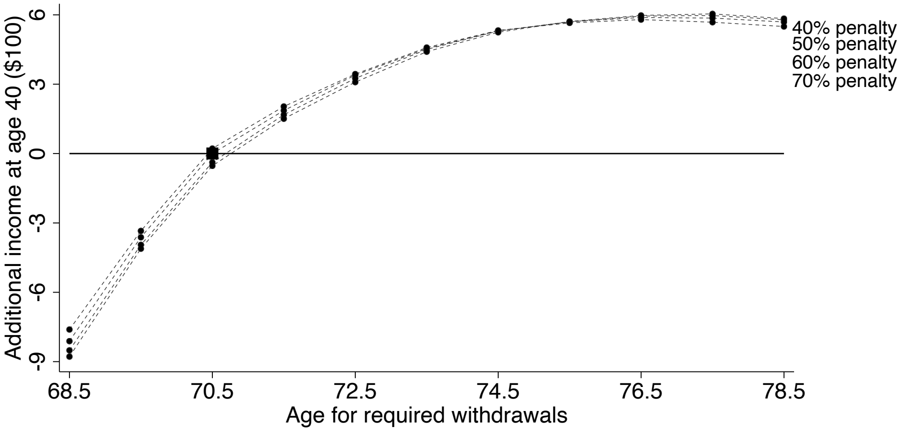


Notes: Simulated $N = 10{,}000$. Empirical $N = 60{,}615$ unique taxpayers.

Param. est. Unmatched

Changing the excess accumulation penalty

Change in age $40\frac{1}{2}$ income under base policy to get PDV lifetime utility in counterfactual policy



Table

Changing the excess accumulation penalty

Difference in lifetime income taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

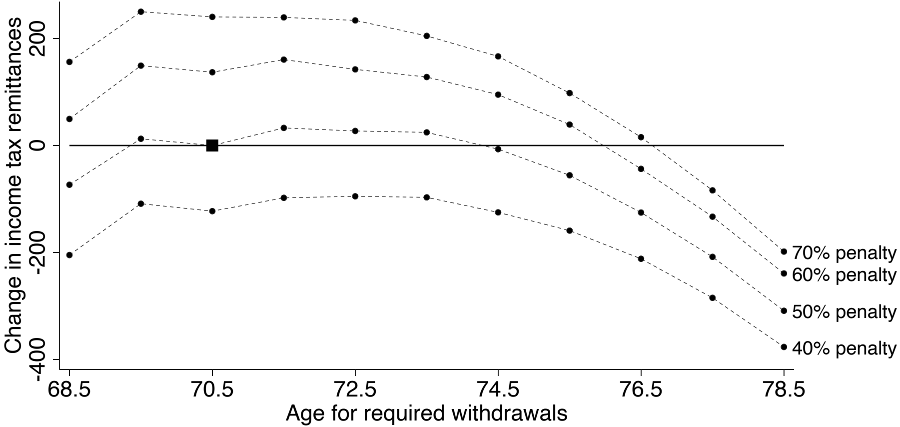


Table Total taxes

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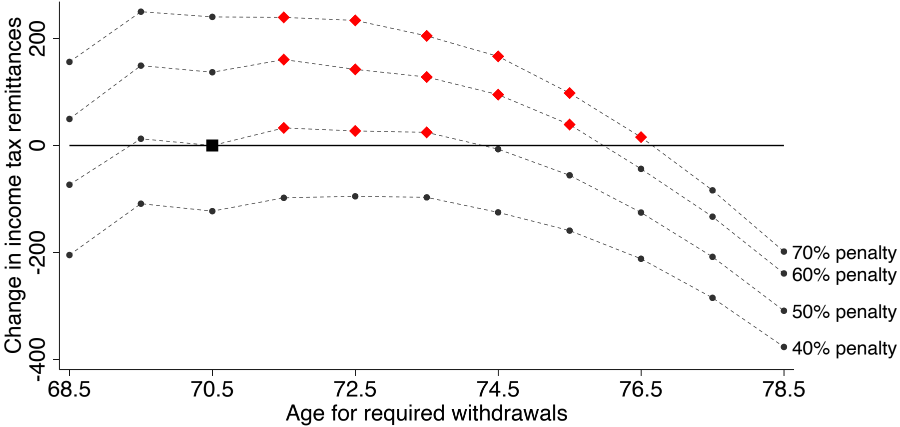

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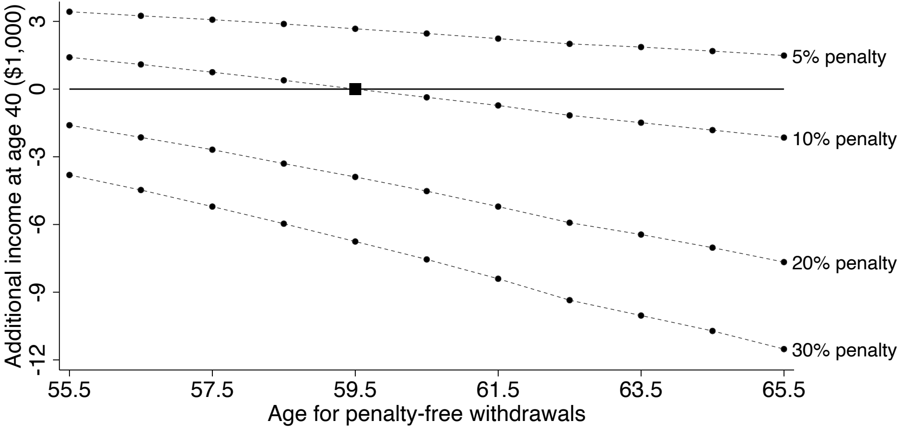

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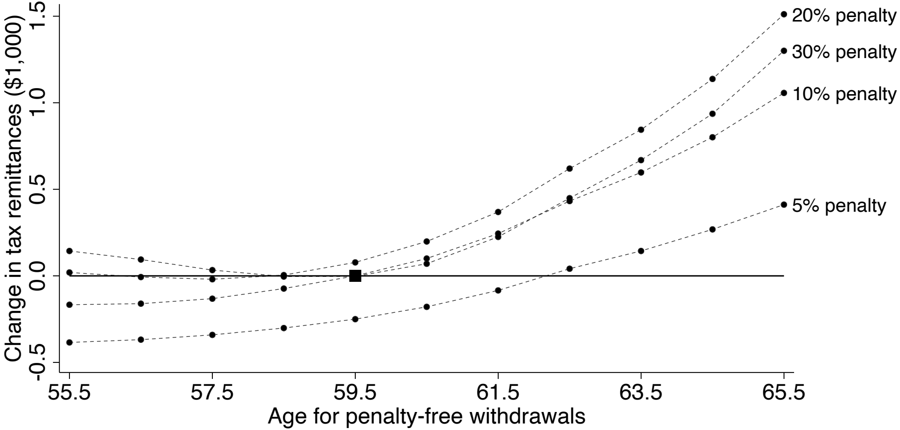


Table Income taxes

Changing the early withdrawal penalty

Difference in lifetime total taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

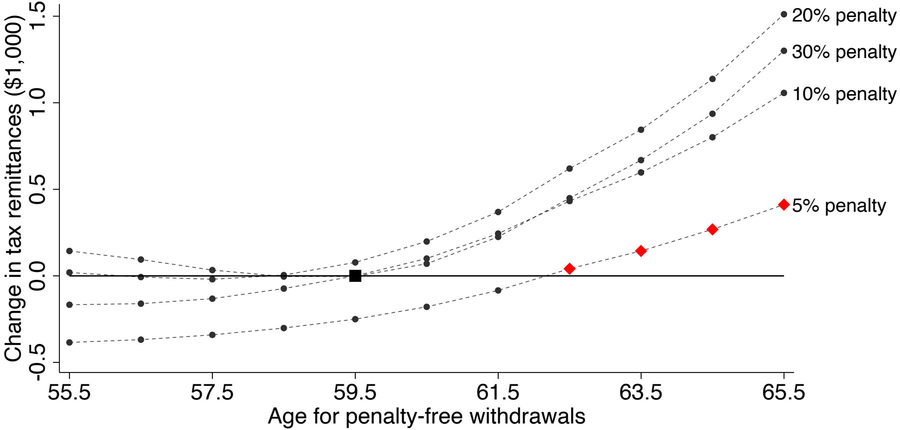


Table Income taxes

Conclusion

The existence of the withdrawal penalties has a large impact: Millions of people withdraw (or do not withdraw) from IRAs in response to these penalties every year. This changes the timing of almost $60 billion in withdrawals.

Changing the penalties does not have a large impact: There are alternative penalty rate and age threshold combinations for both penalties that result in increased welfare and tax remittances, but the increases are small.

Thank you!

Please send comments to stuartem@umich.edu

Motivation

- Benefits to the taxpayer:
    1. Reduced tax bill
        - No additional tax on returns (assuming no change in tax rate)
        - Potentially face lower marginal tax rate when tax payment is due
    2. Delay in when tax payment is due
- Cost to the federal government:
    1. Reduced tax revenue
    2. Delay in when tax revenue received

Motivation

Example of tax benefits in a traditional account:

- At period 0, taxpayer can invest a in a regular savings account or a tax-benefited account
- If the taxpayer invests in the regular savings account:
  - Taxpayer owes income tax t_i in period 0
  - Taxpayer owes tax on the return in each period (t_r)
- If the taxpayer invests in the tax-benefited account:
  - Taxpayer owes income tax t_i upon withdrawal in period k

Introduction

Motivation

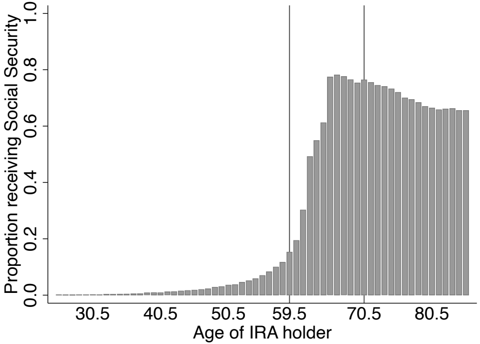
Period	Tax-benefited account		Regular account: No tax on return		Regular account: With tax on return
0	a		$a(1-t_i)$		$a(1-t_i)$
1	$a(1+r)$		$a(1-t_i)(1+r)$		$a(1-t_i)(1+r-rt_r)$
2	$a(1+r)^2$		$a(1-t_i)(1+r)^2$		$a(1-t_i)(1+r-rt_r)^2$
3	$a(1+r)^3$		$a(1-t_i)(1+r)^3$		$a(1-t_i)(1+r-rt_r)^3$
...					
Account balance in period before withdrawing					
$k-1$	$a(1+r)^{k-1}$		$a(1-t_i)(1+r)^{k-1}$		$a(1-t_i)(1+r-rt_r)^{k-1}$
Amount after withdrawal					
k	$a(1-t_i)(1+r)^k$	$=$	$a(1-t_i)(1+r)^k$	$>$	$a(1-t_i)(1+r-rt_r)^k$

If taxpayers face a lower marginal income tax rate in period k than in period 0, the tax benefits are even greater

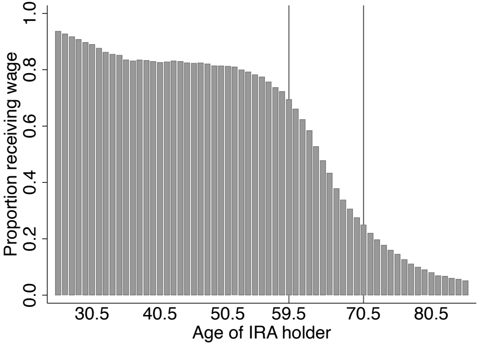
Bunching analysis: diagnostics

Placebo outcomes: Proportion of traditional IRA holders receiving...

Social Security benefits



Wages

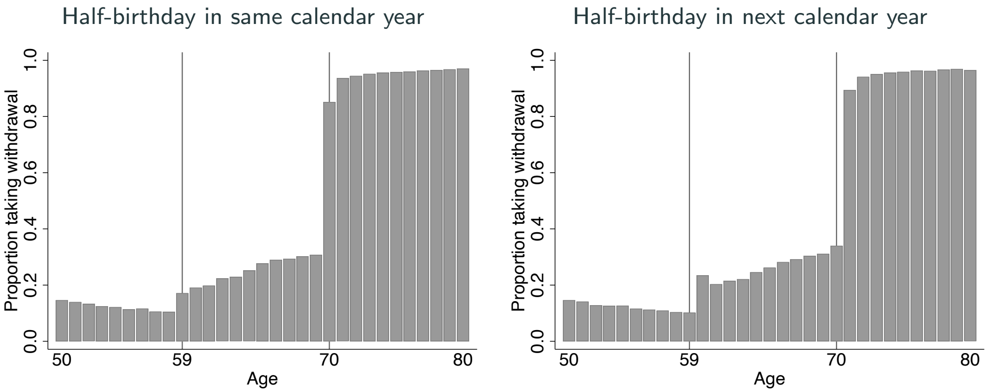


Notes: N = 1,449,868 taxpayers. Limited to taxpayers with a positive traditional IRA balance in 2004 or 2005.

◂ First withdrawals ◂ Cross-section

Bunching analysis: diagnostics

Fraction of traditional IRA holders taking a withdrawal in 2005, by timing of half-birthday



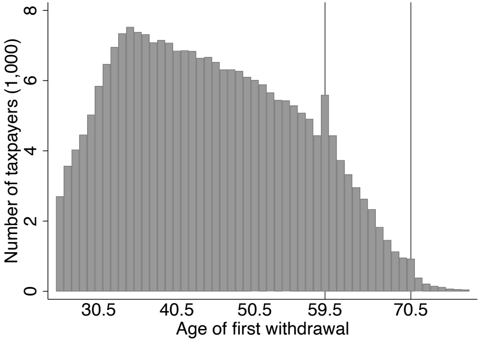
Notes: $N = 490{,}904$ taxpayers for panel (a), $N = 517{,}808$ taxpayers for panel (b). Limited to taxpayers with a positive traditional IRA balance in 2004 or 2005.

First withdrawals
Cross-section

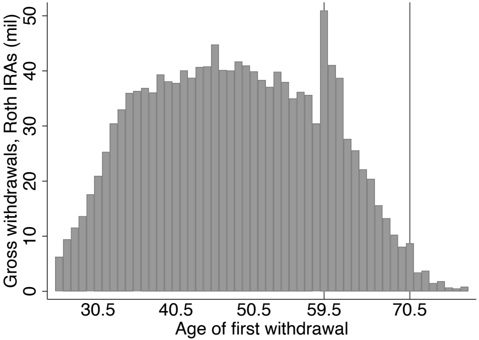
Bunching analysis: Roth IRAs

Age of first withdrawal from a Roth IRA

Number of Roth IRA holders (1,000)



Gross withdrawal amount ($mil)

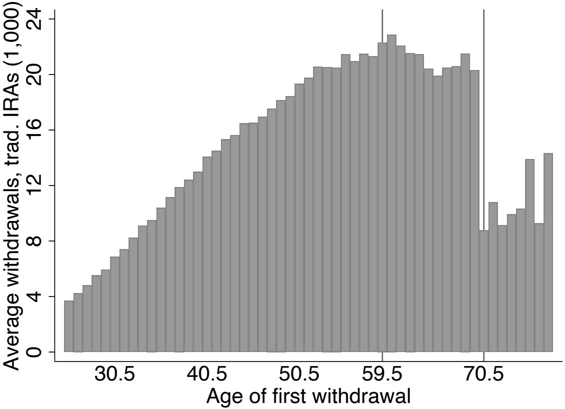


Notes: N = 236,062 unique taxpayers. Excludes taxpayers older than age 65 at the beginning of our sample period, and all data from 2009. Excludes early withdrawals with a known, qualifying exception.

◂ Traditional IRAs

Bunching analysis: average value of first withdrawal

Average value of first withdrawal from traditional IRAs ($1,000)



Notes: $N = 1{,}536{,}392$ unique taxpayers. Excludes taxpayers older than age 65 at the beginning of our sample period, and all data from 2009. Excludes early withdrawals with a known, qualifying exception.

Bunching analysis

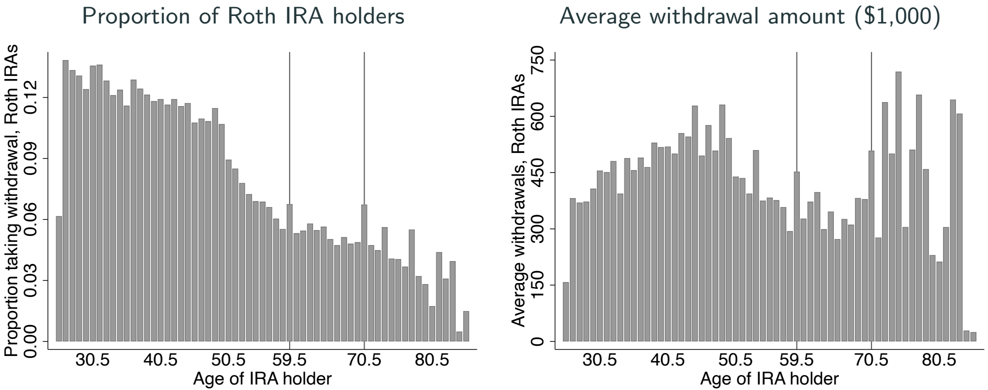
Bunching analysis: age of first withdrawal

	Number of taxpayers	Gross withdrawals
Parameter estimates		
N	1,536,392	\$25,967,606,263
$a_{59.5,-}$	54.5	55.5
	(6.2)	(6.1)
$a_{59.5,+}$	61.5	60.5
	(2.8)	(2.8)
$\widehat{B}_{59.5}$	71,962	\$1,345,804,160
	(20,904)	(467,059,441)
$\widehat{B}_{70.5}$	122,088	\$794,694,208
	(5,674)	(139,377,942)
Magnitude estimates		
U.S. total in 2015	201 million	\$277 billion
Proportion holding a traditional IRA	23.6%	n/a
First withdrawal proportion	4.5%	34.7%
Relevant population for scaling	2.1 million	\$94.5 billion
In response to early withdrawal penalty:		
$mag_{59.5}$	4.7%	5.2%
Scaled to U.S., annual	99,566	\$4.9 billion
In response to excess accumulation penalty:		
$mag_{70.5}$	7.9%	3.1%
Scaled to U.S., annual	168,920	\$2.9 billion

◂ Count ◂ Amount

Bunching analysis

Withdrawal behavior in 2005 (Roth IRAs)

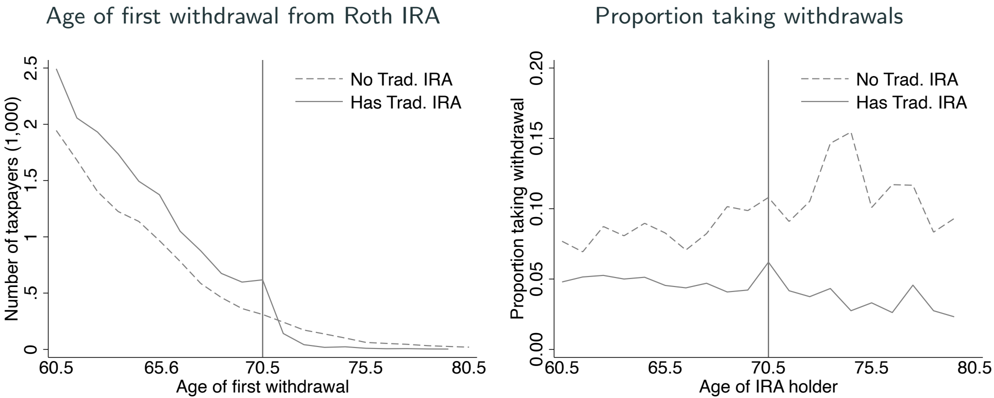


Notes: $N = 269{,}353$ unique taxpayers. Excludes early withdrawals (before age $59\frac{1}{2}$) with a known, qualifying exception. Limited to taxpayers with a positive traditional IRA balance in 2004 or 2005.

Count Amount Roth increase at 70.5

Bunching analysis

Roth IRA account holders by whether or not they also hold a traditional IRA



Notes: Left panel: N = 26,904 unique taxpayers; excludes taxpayers older than age 65 at the beginning of our sample period. Right panel: N = 50,756 unique taxpayers; limited to taxpayers with a positive Roth IRA balance in 2004 or 2005.

◂ Count ◂ Amount

Bunching analysis: cross-sectional

	Number of taxpayers	Gross withdrawals
Parameter estimates		
N	1,449,868	\$6,483,125,796
$a_{59.5,-}$	49.5	49.5
$a_{59.5,+}$	69.5	69.5
	(0.1)	(0.4)
$\widehat{B}_{59.5}$ (scaled by N)	19,746	\$295,103,584
	(2,035)	(29,284,054)
$\widehat{B}_{70.5}$ (scaled by N)	234,677	\$1,060,085,440
	(4,080)	(66,206,502)
Magnitude estimates		
U.S. total in 2015	201 million	\$277 billion
Proportion holding a traditional IRA	23.6%	n/a
Relevant population for scaling	47.6 million	\$277 billion
In response to early withdrawal penalty:		
$mag_{59.5}$	1.4%	4.6%
Scaled to U.S., annual	648,385	\$12.6 billion
In response to excess accumulation penalty:		
$mag_{70.5}$	16.2%	16.4%
Scaled to U.S., annual	7,706,011	\$45.3 billion

◂ Count ◂ Amount

Dynamic life-cycle model: income process

(Log) labor income is estimated using a random effects model:

$$\ln y_{it} = \rho_0 + \rho_1 t + \rho_2 t^2 + \rho_3 t^3 + f_i + YOB_i + \varepsilon^y_{it}$$

The income innovations, ε^y_{it}, follow an AR(1) process:

$$\varepsilon^y_{it} = \eta \varepsilon^y_{i,t-1} + \zeta_{it}$$

$$\zeta_{it} \sim \mathcal{N}\left(0, \sigma^2_\zeta\right)$$

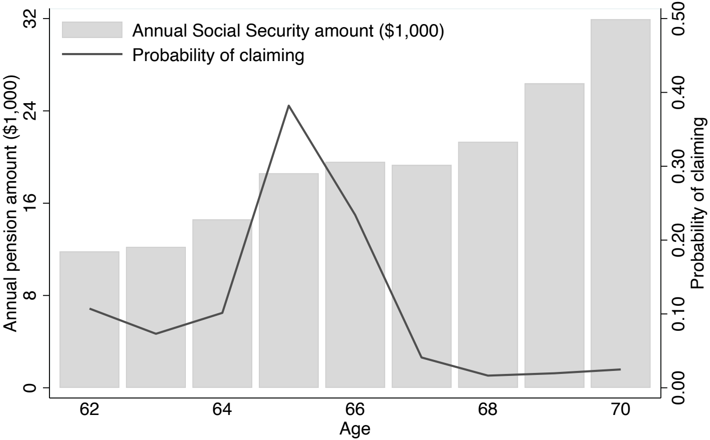
Income process parameter estimates:

Deterministic component				AR(1) Parameters	
$\hat{\rho}_0$	$\hat{\rho}_1$	$\hat{\rho}_2 * 100$	$\hat{\rho}_3 * 1000$	$\hat{\eta}$	$\hat{\sigma}^2_\zeta$
7.682	0.143	-0.185	0.0036	0.829	0.267

Notes: $N = 60{,}615$.

Dynamic life-cycle model: annual pension

Value of annual pension and probability of claiming



Notes: $N = 3{,}460$ unique taxpayers.

Income process · Model overview · Value function

Dynamic life-cycle model: numerical solution

State space:

- Periods: 46 (ages 40 to 85)
- AR(1) states: 5
- Claiming ages: 3 (62, 66, 70)
- Gridpoints for both types of assets: 90

Code written in Python

Functions are JIT-compiled in "nopython" mode using Numba v0.49.1 with parallel $=$ True and all object types defined

Dynamic life-cycle model: results

Preference parameter estimates

Parameter	Estimate
σ: EIS	1.061
	(0.157)
β: Discount factor	0.920
	(0.00857)
θ: Bequest weight	2.660
	(0.461)
α: Bequest elasticity	1.069
	(0.157)
χ^2	307
(d.f.)	21

T-statistics AGI by IRA ◂ Model fit ◂ Unmatched

Dynamic life-cycle model: results

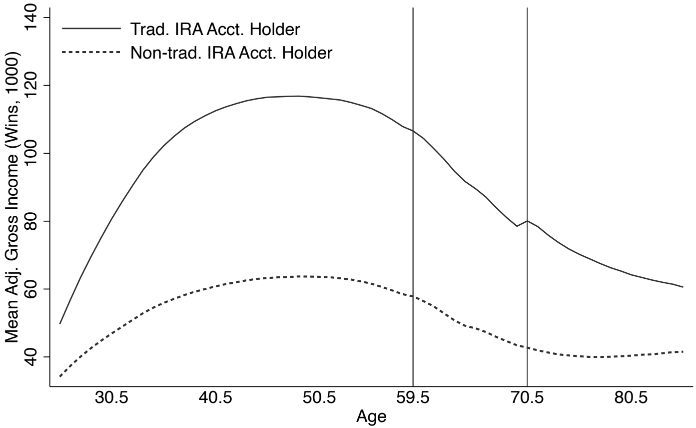
Empirical moments, simulated moments, and t-statistics

Age	Empirical moment	Simulated moment	t-stat	Age	Empirical moment	Simulated moment	t-stat
50	1,578	860	13.97	63	4,654	4,502	1.75
51	1,620	937	13.00	64	4,525	5,325	-4.11
52	1,731	1,031	13.37	65	4,595	6,293	-8.90
53	1,721	1,161	11.18	66	4,306	2,393	10.27
54	1,747	1,316	8.93	67	3,847	2,873	6.92
55	1,876	1,508	9.09	68	3,542	3,461	0.96
56	2,022	1,725	6.41	69	3,613	3,992	-0.95
57	1,972	1,976	3.81	70	6,994	7,436	-1.34
58	1,794	2,287	-0.56	71	8,025	7,489	2.13
59	3,356	3,297	1.03	72	7,583	7,562	0.26
60	4,265	3,919	5.10	73	7,787	7,500	0.40
61	4,438	4,673	-0.40	74	7,670	7,454	0.32
62	4,697	3,888	5.72				

Param. est. T-statistics ◂ Model fit ◂ Unmatched

Dynamic life-cycle model: IRA vs. non-IRA holders

Average adjusted gross income, by age



Notes: $N = 60{,}615$ unique taxpayers.

Param. est. | AGI by IRA | Model fit | Unmatched

The SECURE Act

Change in tax revenue from raising the age for required withdrawals from $70\frac{1}{2}$ to $72\frac{1}{2}$

	Average total tax revenue remitted between ages $41\frac{1}{2}$-$85\frac{1}{2}$
Original policy	317,800.75
RMD age $= 72\frac{1}{2}$	317,720.09
Total change	-80.66
Change in income taxes	27.25
Change in early withdrawal penalties	-0.26
Change in excess accumulation penalties	-107.61

Notes: Each iteration includes 10,000 unique simulated individuals.

The SECURE Act

The SECURE Act

To calculate equivalent variation:

$$u_{PDV} = \frac{1}{N} \sum_{i=1}^{N} \sum_{t=41.5}^{85.5} \beta^{t-41.5} u_{it}$$

u_{it} : utility for individual i in period t under base policy
β : estimated discount factor
N: total number of simulated individuals

EV $\equiv$ the amount needed to increase the simulated individuals income so average u_{PDV} under the base policy is equal to that (with the original income) in the counterfactual policy.

The calculation for tax remittances is the same, but instead of discounting by β we discount by $\frac{1}{1+r_S}$, where $1 + r_S = 1.01$

◂ The SECURE Act

Estimating the EIS: intuition from stylized model

Stylized model set-up:

- Assets in an account earning rate of return $R = 1 + r$
- Must withdraw all of the assets at once
- Lifetime consumption equal to value of account at withdrawal
- Taxpayer chooses when to withdraw the assets to maximize lifetime utility

$$\max_{\{c_t\},t^*} \sum_{t=0}^{T} \beta^t u(c_t)$$

subject to

$$\sum_{t=t^*}^{T} c_t = R^{t^*} A$$

◂ Dynamic model

Estimating the EIS: intuition from stylized model

Introduce a penalty ρ on withdrawing before $t = t_p$

The taxpayer's new problem:

$$\max_{\{c_t\},t^*} \sum_{t=0}^{T} \beta^t u(c_t)$$

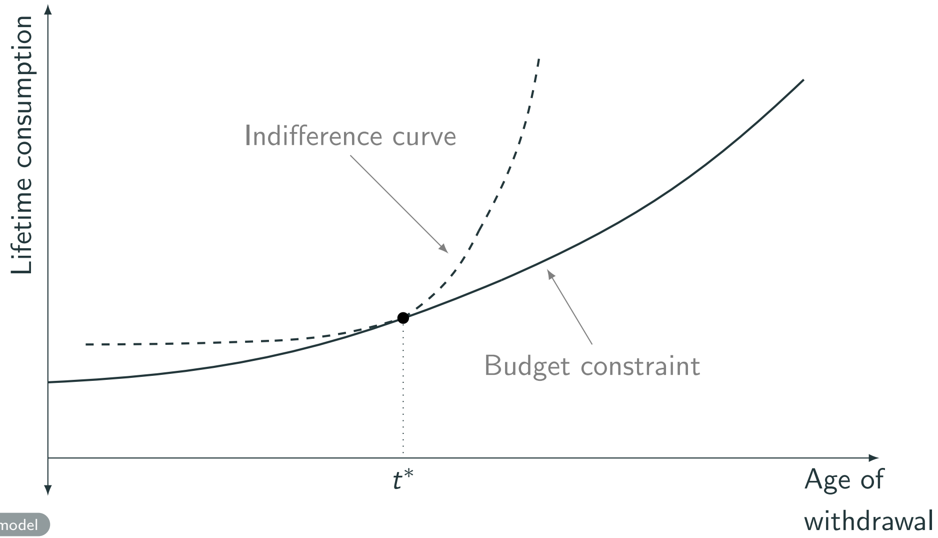
subject to

$$\sum_{t=t^*}^{T} c_t = R^{t^*} A - \rho R^{t^*} A \mathbb{I}(t^* < t_p)$$

Some taxpayers who otherwise would have chosen $t^* < t_p$ will wait until $t >= t_p$ to withdraw

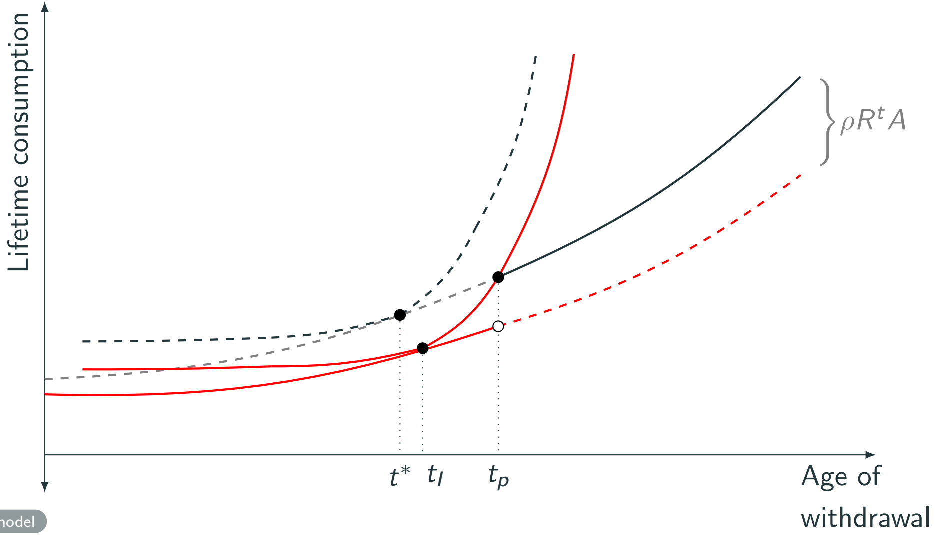
◂ Dynamic model

Estimating the EIS: intuition from stylized model



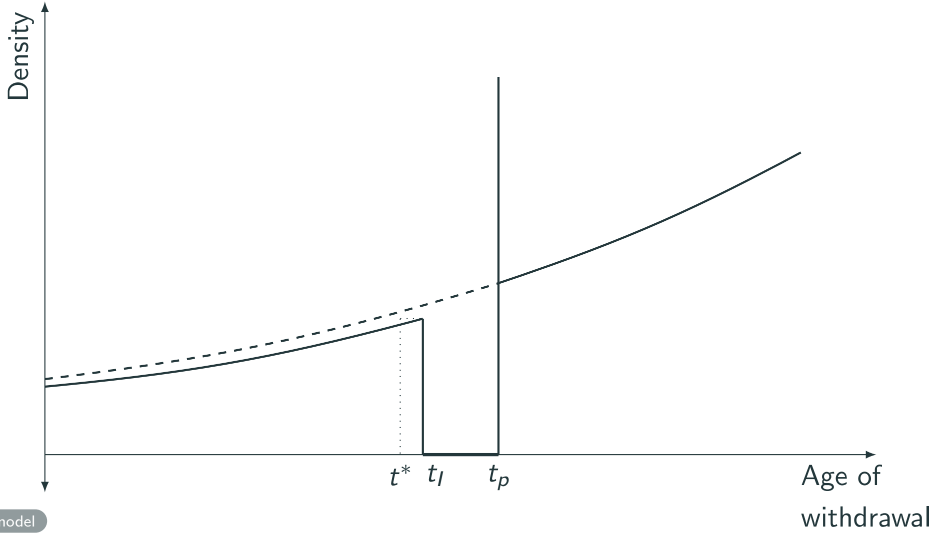
Dynamic model

Estimating the EIS: intuition from stylized model



Dynamic model

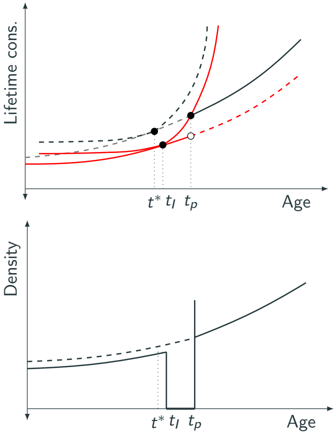
Estimating the EIS: intuition from stylized model



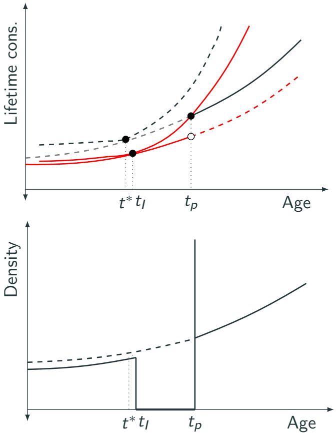
Dynamic model

Estimating the EIS: intuition from stylized model

Lower EIS



Higher EIS



◂ Dynamic model

Changing the excess accumulation penalty

Change in age $40\frac{1}{2}$ income under base policy to get PDV lifetime utility in counterfactual policy

Age	40% penalty		50% penalty		60% penalty		70% penalty	
threshold	Levels (\$)	Percent	Levels (\$)	Percent	Levels (\$)	Percent	Levels (\$)	Percent
$68\frac{1}{2}$	-761	-0.0037%	-811	-0.0040%	-851	-0.0042%	-878	-0.0043%
$69\frac{1}{2}$	-335	-0.0016%	-362	-0.0018%	-395	-0.0019%	-411	-0.0020%
$70\frac{1}{2}$	22	0.0001%	0	0.0000%	-38	-0.0002%	-53	-0.0003%
$71\frac{1}{2}$	204	0.0010%	186	0.0009%	168	0.0008%	151	0.0007%
$72\frac{1}{2}$	344	0.0017%	339	0.0017%	325	0.0016%	309	0.0015%
$73\frac{1}{2}$	459	0.0023%	454	0.0022%	451	0.0022%	441	0.0022%
$74\frac{1}{2}$	533	0.0026%	531	0.0026%	530	0.0026%	525	0.0026%
$75\frac{1}{2}$	565	0.0028%	570	0.0028%	570	0.0028%	571	0.0028%
$76\frac{1}{2}$	579	0.0029%	588	0.0029%	595	0.0029%	597	0.0029%
$77\frac{1}{2}$	568	0.0028%	586	0.0029%	597	0.0029%	604	0.0030%
$78\frac{1}{2}$	550	0.0027%	569	0.0028%	579	0.0028%	584	0.0029%

◂ Figure

Changing the excess accumulation penalty

Difference in lifetime income taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

Age threshold	40% penalty		50% penalty		60% penalty		70% penalty	
	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$68\frac{1}{2}$	-205	-0.0648%	-73	-0.0232%	50	0.0157%	156	0.0495%
$69\frac{1}{2}$	-109	-0.0344%	13	0.0040%	149	0.0473%	250	0.0792%
$70\frac{1}{2}$	-123	-0.0388%	0	0.0000%	137	0.0434%	240	0.0761%
$71\frac{1}{2}$	-98	-0.0310%	33	0.0104%	161	0.0509%	240	0.0758%
$72\frac{1}{2}$	-95	-0.0300%	27	0.0086%	142	0.0451%	234	0.0740%
$73\frac{1}{2}$	-97	-0.0307%	25	0.0078%	128	0.0405%	205	0.0649%
$74\frac{1}{2}$	-125	-0.0395%	-7	-0.0021%	95	0.0301%	167	0.0528%
$75\frac{1}{2}$	-159	-0.0504%	-56	-0.0176%	39	0.0124%	98	0.0311%
$76\frac{1}{2}$	-212	-0.0670%	-125	-0.0396%	-44	-0.0138%	16	0.0050%
$77\frac{1}{2}$	-285	-0.0901%	-208	-0.0659%	-133	-0.0421%	-84	-0.0265%
$78\frac{1}{2}$	-377	-0.1192%	-309	-0.0978%	-239	-0.0757%	-198	-0.0627%

Figure

Changing the excess accumulation penalty

Difference in lifetime total taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

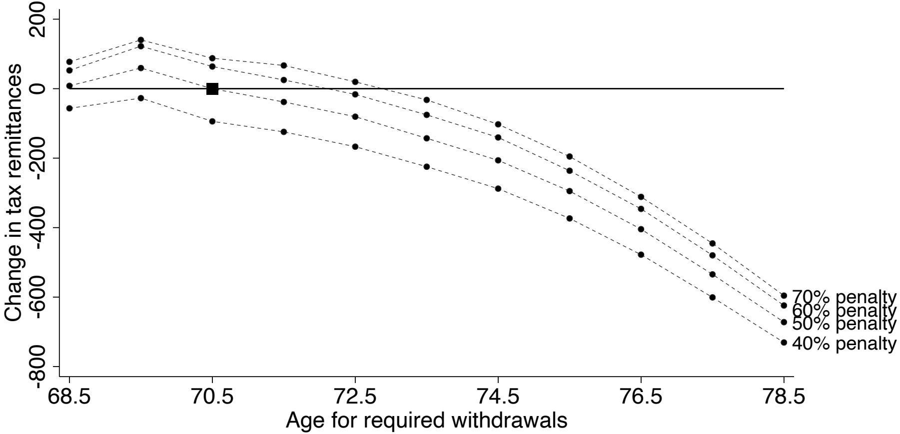


Table ◂ Income taxes

Changing the excess accumulation penalty

Difference in lifetime total taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

Age	40% penalty		50% penalty		60% penalty		70% penalty	
threshold	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$68\frac{1}{2}$	-57	-0.0178%	8	0.0026%	53	0.0165%	77	0.0243%
$69\frac{1}{2}$	-27	-0.0086%	59	0.0187%	122	0.0385%	140	0.0442%
$70\frac{1}{2}$	-94	-0.0296%	0	0.0000%	64	0.0201%	88	0.0276%
$71\frac{1}{2}$	-124	-0.0391%	-38	-0.0120%	25	0.0079%	67	0.0211%
$72\frac{1}{2}$	-167	-0.0526%	-81	-0.0254%	-16	-0.0052%	20	0.0062%
$73\frac{1}{2}$	-225	-0.0707%	-143	-0.0449%	-75	-0.0237%	-32	-0.0102%
$74\frac{1}{2}$	-288	-0.0905%	-206	-0.0649%	-140	-0.0442%	-103	-0.0323%
$75\frac{1}{2}$	-373	-0.1175%	-295	-0.0928%	-236	-0.0743%	-195	-0.0614%
$76\frac{1}{2}$	-478	-0.1504%	-404	-0.1273%	-346	-0.1089%	-311	-0.0980%
$77\frac{1}{2}$	-601	-0.1890%	-534	-0.1682%	-480	-0.1509%	-445	-0.1402%
$78\frac{1}{2}$	-731	-0.2299%	-672	-0.2115%	-624	-0.1964%	-596	-0.1875%

◂ Figure ◂ Income taxes

Changing the excess accumulation penalty

Difference in bequeathed IRA balance relative to base policy

Age	40% penalty		50% penalty		60% penalty		70% penalty	
threshold	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$68\frac{1}{2}$	-5,580	-8.6%	-7,286	-11.3%	-8,910	-13.8%	-10,176	-15.8%
$69\frac{1}{2}$	-1,937	-3.0%	-3,527	-5.5%	-5,159	-8.0%	-6,462	-10.0%
$70\frac{1}{2}$	1,441	2.2%	0	0.0%	-1,539	-2.4%	-2,863	-4.4%
$71\frac{1}{2}$	3,554	5.5%	1,992	3.1%	516	0.8%	-352	-0.5%
$72\frac{1}{2}$	5,724	8.9%	4,283	6.6%	2,946	4.6%	1,976	3.1%
$73\frac{1}{2}$	7,504	11.6%	6,198	9.6%	5,045	7.8%	4,297	6.7%
$74\frac{1}{2}$	9,360	14.5%	8,130	12.6%	7,041	10.9%	6,330	9.8%
$75\frac{1}{2}$	11,053	17.1%	10,004	15.5%	9,022	14.0%	8,397	13.0%
$76\frac{1}{2}$	12,642	19.6%	11,782	18.3%	10,926	16.9%	10,309	16.0%
$77\frac{1}{2}$	14,246	22.1%	13,454	20.9%	12,657	19.6%	12,142	18.8%
$78\frac{1}{2}$	15,788	24.5%	15,106	23.4%	14,417	22.3%	14,033	21.7%

Figure

Changing the early withdrawal penalty

Change in age $40\frac{1}{2}$ income under base policy to get PDV lifetime utility in counterfactual policy

Age	5% penalty		10% penalty		20% penalty		30% penalty	
threshold	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$55\frac{1}{2}$	3,427	0.0169%	1,408	0.0069%	-1,600	-0.0079%	-3,806	-0.0187%
$56\frac{1}{2}$	3,246	0.0160%	1,092	0.0054%	-2,140	-0.0105%	-4,472	-0.0220%
$57\frac{1}{2}$	3,076	0.0151%	749	0.0037%	-2,685	-0.0132%	-5,205	-0.0256%
$58\frac{1}{2}$	2,884	0.0142%	390	0.0019%	-3,302	-0.0162%	-5,964	-0.0293%
$59\frac{1}{2}$	2,672	0.0131%	0	0.0000%	-3,892	-0.0191%	-6,753	-0.0332%
$60\frac{1}{2}$	2,462	0.0121%	-365	-0.0018%	-4,521	-0.0222%	-7,547	-0.0371%
$61\frac{1}{2}$	2,237	0.0110%	-724	-0.0036%	-5,205	-0.0256%	-8,404	-0.0413%
$62\frac{1}{2}$	2,004	0.0099%	-1,164	-0.0057%	-5,921	-0.0291%	-9,353	-0.0460%
$63\frac{1}{2}$	1,862	0.0092%	-1,488	-0.0073%	-6,445	-0.0317%	-10,034	-0.0494%
$64\frac{1}{2}$	1,684	0.0083%	-1,817	-0.0089%	-7,026	-0.0346%	-10,716	-0.0527%
$65\frac{1}{2}$	1,486	0.0073%	-2,148	-0.0106%	-7,665	-0.0377%	-11,519	-0.0567%

◂ Figure

Changing the early withdrawal penalty

Difference in lifetime total taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

Age	5% penalty		10% penalty		20% penalty		30% penalty	
threshold	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$55\frac{1}{2}$	-385	-0.1210%	-167	-0.0525%	20	0.0062%	144	0.0453%
$56\frac{1}{2}$	-368	-0.1159%	-160	-0.0505%	-7	-0.0021%	94	0.0297%
$57\frac{1}{2}$	-341	-0.1072%	-132	-0.0415%	-20	-0.0062%	33	0.0105%
$58\frac{1}{2}$	-301	-0.0948%	-73	-0.0231%	4	0.0014%	-4	-0.0012%
$59\frac{1}{2}$	-250	-0.0787%	0	0.0000%	78	0.0245%	-3	-0.0009%
$60\frac{1}{2}$	-179	-0.0563%	100	0.0316%	199	0.0625%	70	0.0221%
$61\frac{1}{2}$	-84	-0.0264%	244	0.0769%	369	0.1162%	225	0.0709%
$62\frac{1}{2}$	41	0.0130%	432	0.1360%	620	0.1951%	449	0.1413%
$63\frac{1}{2}$	144	0.0453%	597	0.1880%	844	0.2657%	669	0.2104%
$64\frac{1}{2}$	268	0.0845%	801	0.2520%	1,138	0.3580%	937	0.2948%
$65\frac{1}{2}$	412	0.1295%	1,057	0.3326%	1,512	0.4756%	1,300	0.4092%

Figure

Changing the early withdrawal penalty

Difference in lifetime income taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

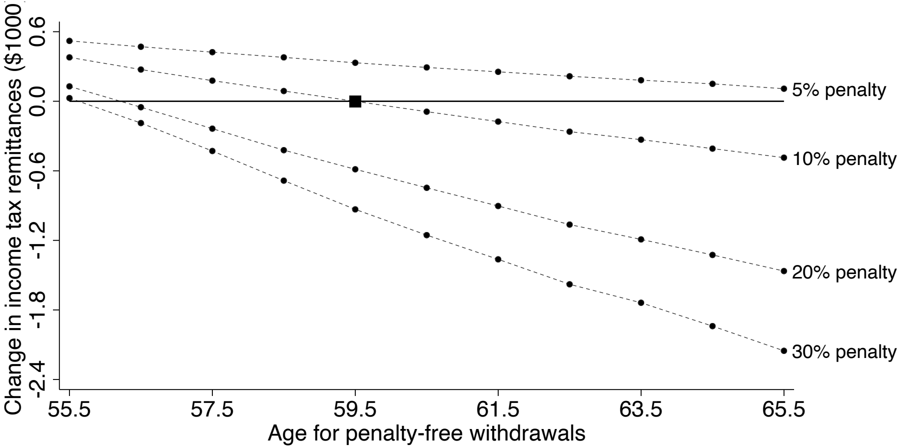


Table   Total taxes

Changing the early withdrawal penalty

Difference in lifetime income taxes remitted relative to base policy ($, PDV from age $41\frac{1}{2}$)

Age threshold	5% penalty		10% penalty		20% penalty		30% penalty	
	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$55\frac{1}{2}$	521	0.1649%	379	0.1199%	129	0.0407%	28	0.0088%
$56\frac{1}{2}$	470	0.1489%	274	0.0867%	-51	-0.0161%	-188	-0.0594%
$57\frac{1}{2}$	424	0.1342%	178	0.0564%	-236	-0.0747%	-429	-0.1358%
$58\frac{1}{2}$	379	0.1199%	89	0.0280%	-422	-0.1334%	-684	-0.2167%
$59\frac{1}{2}$	332	0.1052%	0	0.0000%	-586	-0.1856%	-933	-0.2952%
$60\frac{1}{2}$	292	0.0924%	-90	-0.0284%	-746	-0.2363%	-1,155	-0.3655%
$61\frac{1}{2}$	254	0.0804%	-175	-0.0554%	-903	-0.2859%	-1,363	-0.4316%
$62\frac{1}{2}$	216	0.0683%	-262	-0.0830%	-1,064	-0.3367%	-1,579	-0.4997%
$63\frac{1}{2}$	182	0.0576%	-331	-0.1048%	-1,192	-0.3772%	-1,738	-0.5501%
$64\frac{1}{2}$	150	0.0476%	-408	-0.1293%	-1,325	-0.4196%	-1,939	-0.6139%
$65\frac{1}{2}$	108	0.0343%	-486	-0.1539%	-1,464	-0.4635%	-2,153	-0.6814%

◂ Figure ◂ Total taxes

Changing the early withdrawal penalty

Difference in IRA balance at age $65\frac{1}{2}$ relative to base policy

Age	5% penalty		10% penalty		20% penalty		30% penalty	
threshold	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent	Levels ($)	Percent
$55\frac{1}{2}$	-186	-0.1912%	-40	-0.0413%	31	0.0322%	183	0.1875%
$56\frac{1}{2}$	-209	-0.2146%	-106	-0.1084%	-83	-0.0847%	68	0.0695%
$57\frac{1}{2}$	-221	-0.2271%	-121	-0.1247%	-177	-0.1816%	-41	-0.0426%
$58\frac{1}{2}$	-202	-0.2072%	-106	-0.1084%	-192	-0.1969%	-122	-0.1257%
$59\frac{1}{2}$	-138	-0.1421%	0	0.0000%	-121	-0.1246%	-104	-0.1071%
$60\frac{1}{2}$	-39	-0.0396%	143	0.1463%	106	0.1090%	161	0.1653%
$61\frac{1}{2}$	135	0.1386%	384	0.3942%	520	0.5335%	655	0.6722%
$62\frac{1}{2}$	322	0.3304%	748	0.7674%	1,148	1.1781%	1,498	1.5375%
$63\frac{1}{2}$	484	0.4969%	1,126	1.1561%	1,804	1.8519%	2,476	2.5419%
$64\frac{1}{2}$	712	0.7311%	1,572	1.6139%	2,666	2.7370%	3,646	3.7424%
$65\frac{1}{2}$	1,096	1.1249%	2,279	2.3391%	3,931	4.0346%	5,309	5.4494%

Figure

Dynamic life-cycle model: set-up

Features of traditional IRAs coded into the model:

- Early withdrawal penalty before age $59\frac{1}{2}$ (10%)
- Excess accumulation penalty starting at age $70\frac{1}{2}$ (50%)
- Contribution limits (\$5,500 before age 50, \$6,500 between 50 and $70\frac{1}{2}$)

Dynamic life-cycle model: individual's problem

Each period, the individual maximizes her value function:

$$\max V_t = \underbrace{\frac{\sigma}{\sigma-1} c_t^{\frac{\sigma-1}{\sigma}}}_{\text{Utility at age } t} + \beta\Bigg(\underbrace{\pi_{t+1}\mathbb{E}\left[V_{t+1}\right]}_{\substack{\text{Discounted expected} \\ \text{value at age } t+1 \\ * \text{ probability of surviving}}} + \underbrace{(1-\pi_{t+1})B(W_{t+1})}_{\substack{\text{Discounted utility of} \\ \text{leaving bequest} \\ * \text{ probability of not surviving}}} \Bigg)$$

subject to the following constraints:

Budget constraint:

$$\underbrace{y_t + P \cdot \mathbb{I}[t \geq t_P]}_{\substack{\text{Labor income +} \\ \text{pension for age } t}} + \underbrace{S_t + A_t}_{\substack{\text{Stocks in savings} \\ \text{accounts at} \\ \text{beginning of age } t}} = \underbrace{c_t + T(y_t, P, a_t, \tau_e, \tau_{rmd})}_{\substack{\text{Consumption + taxes} \\ \text{remitted at age } t}} + \underbrace{\frac{S_{t+1}}{1+r_S} + \frac{A_{t+1}}{1+r_A}}_{\substack{\text{Stocks of savings} \\ \text{for age } t+1}}$$

Borrowing constraint: Balance in both savings accounts must be ≥ 0 (no borrowing)

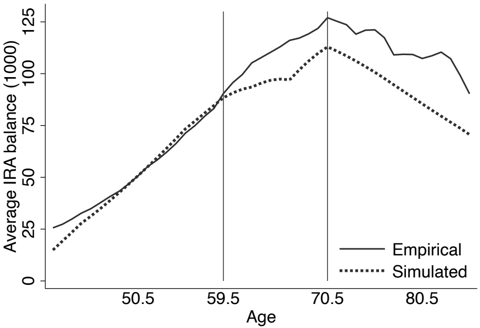
Laws of motion for both savings accounts

Income process | Annual pension | Numerical solution | IRA features | ◂ Model set-up

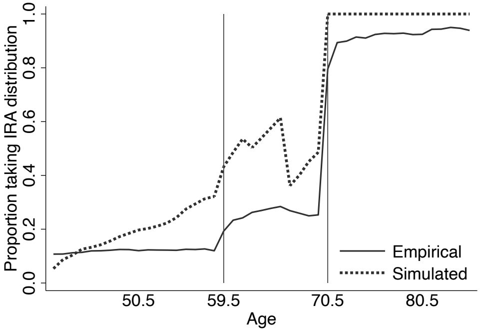
Dynamic life-cycle model: results

Model fit: unmatched moments

Average IRA balance ($1,000)



Proportion taking withdrawals



Notes: Simulated N = 10,000. Empirical N = 60,615 unique taxpayers.

Param. est. ◂ Matched