How Do Consumers Finance Increased Retirement Savings?

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Motivation

- Governments are heavily invested in promoting contributions to retirement plans.
  - Forced savings program: e.g., Australia's superannuation plans
  - Financial incentives: e.g., most OECD countries offer tax advantage for ret. savings
  - Non-financial instruments: e.g., auto-enrollment required for new 401(k) starting 2025

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- Yet we have limited understanding of the impact of ↑ saving **inside** retirement accounts on:
  - **net** wealth accumulation
    - → depends on the crowd-out of outside savings and debt
  - aggregate **welfare**
    - → little guidance on how to design tax-incentives, income caps, matching formulas

This paper

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Challenge: need retirement plan data $\times$ comprehensive personal finance data

This paper:

1. Introduce new dataset with merged bank and pension account data
2. Estimate how UK workers finance increase in minimum contribution rate
3. Explore long-run effects via quantitative life-cycle model
4. Use sufficient statistics approach to discuss welfare and policy implications

Literature: does retirement saving crowd-out private savings?

1. **Effect of Forced Saving**
   Feldstein '74; Attanasio-Brugiavinni '03; Attanasio-Rohwedder '03

- Some evidence of private saving crowd-out
- Chetty et al. '14: limited crowd-out but may not extrapolate to other programs
  - ↓ take-home pay is zero (↑ employer contrib.)
    or small (~\$50/*year* discontinuity in mandated saving)

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2. **Effect of Saving Nudges**
   Madrian Shea '01; Choi et al. '04 '06; Cribb and Emmerson '16

- No effect on unsecured debt from AE in the US (Beshears et al. '21)
  or text-message savings nudge in Mexico (Medina and Pagel, '23)
- Increase in unsecured debt and mortgages from AE in UK (Beshears et al. '24)

Outline

New Dataset on Saving, Spending, Borrowing

UK Bank customer data 2012-2019

- Monthly flows:
  - Spending in aggregate categories from checking account and credit cards
  - Employment earnings and other income receipts
- Month-end balances:
  - Checking accounts, savings accounts, credit card balances **with this bank**
  - Mortgage and non-mortgage debt balances **with this bank**
- Demographic characteristics (age, gender)

+ merged w/ large UK pension provider data

- Monthly pension contributions + balances

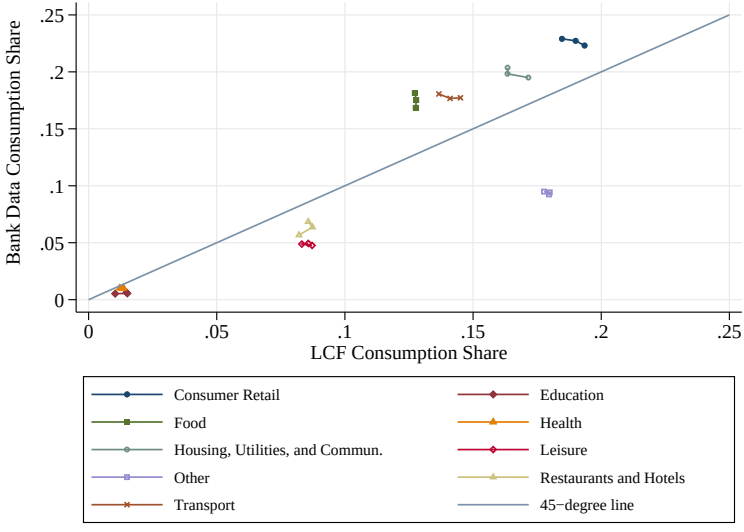
Data caveats

- Data only captures what is observed by our partner bank
  - Affects debt products especially (loans, CCs with other banks)
  - Restrict to those w/ paycheck deposited in their current account with partner bank
  - Can see outflows and transfers

- Usefully, debit card share of UK card spending is ~80% (UK Finance, '19)

Budget shares line up with representative survey data

Level of spending | Housing expdtr



(Simplified) Policy Variation

Context: National policy for all UK private sector employees

Variation: min. defaut contribution rate stepped up in April 2018 and April 2019

Effective date	Min. total contribution	Min. employer contrib.	Employee contrib.
Rollout btw. Oct '12 & April '17	**2%**	**1%**	**1%**

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$\Rightarrow$ Policy should lead to a **£0.66 drop in take-home pay per £1** of extra pension contrib.

Policy = change in default + large change in incentives

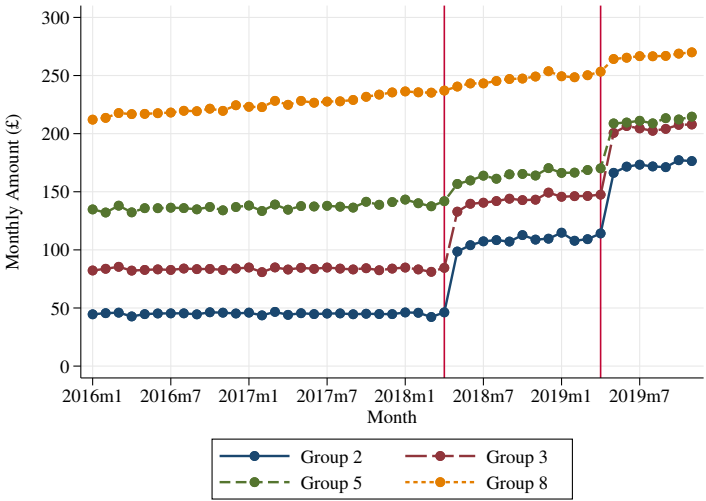
- Employees and firms can choose to contribute > minimum
- But opting out expensive: lose **all** employer contributions if contribute < min
- Policy increases financial returns to participating from 1% to 3% of salary

$\Rightarrow$ Stronger teeth than typical AE nudge:

$\uparrow$ default option + $\uparrow$ financial incentives

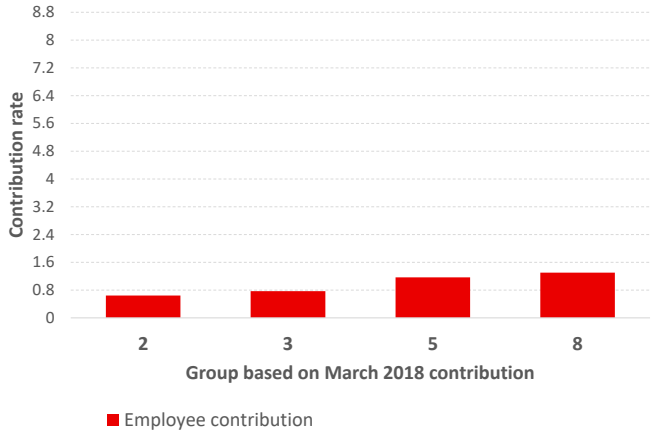
Treated groups' contributions show strong reaction

Average monthly total pension contributions by contribution rate group



Employer contributions determine group assignment

We have data on split between employee/employer contributions for ~20% of participants



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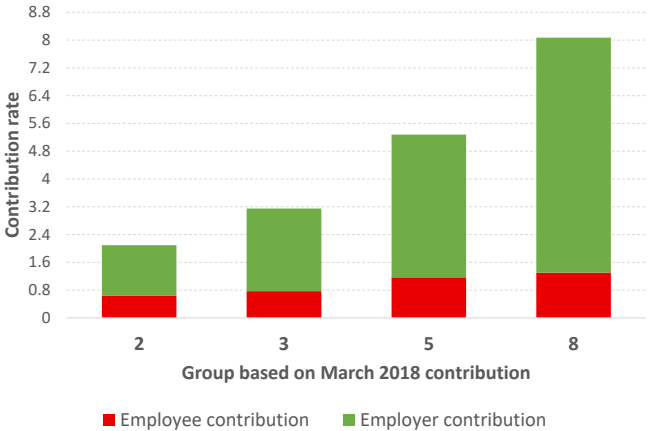

Caveat: employees can affect their employer contributions through a salary sacrifice scheme

Outline

Empirical Approach

Two dimensions of comparison:

1. **Pre- vs post- policy change:** control for time-invariant individual characteristics
2. **Affected vs not affected**: control for time trends

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Approach 1: Treatment effect from policy using Dynamic Event Study (Sun and Abraham, 2021) relative to AE date E_i

$$Outcome_{it} = \beta \cdot \sum_{\ell} \mu_\ell \mathbb{1}\{t - E_i = \ell\} + \alpha_i + \gamma_t + \varepsilon_{it}$$

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Approach 2: Elasticity to changes in contributions using 2SLS

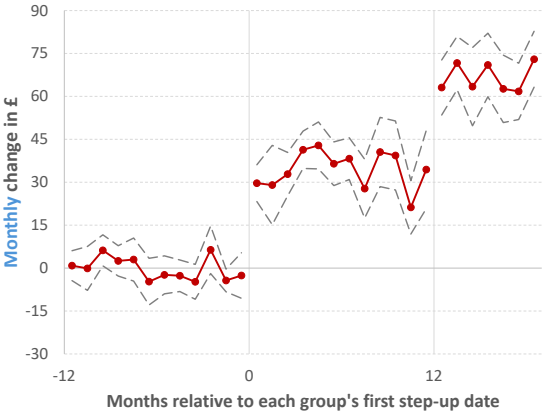
$$Outcome_{it} = \beta \cdot PensionContributions_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

$$PensionContributions_{it} = \sum_{s \in \{1,2\}} \sum_{k \in \{2,3,5\}} \pi_{ks} Group_i^k \times Post_t^s + \psi_i + \phi_t + v_{it}$$

Result I: ↓ in take-home pay and total spending

Opt out

In April 2018 and 2019: ↑ employee default by 2% and employer default by 1%



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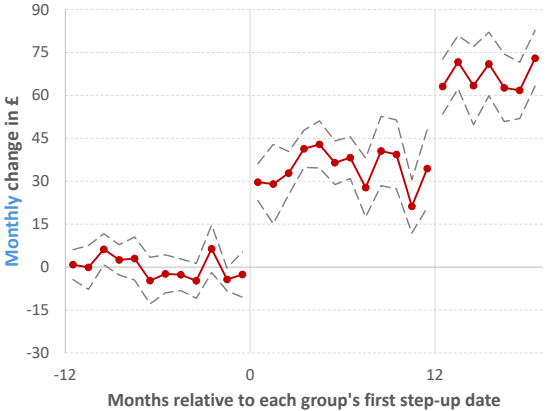
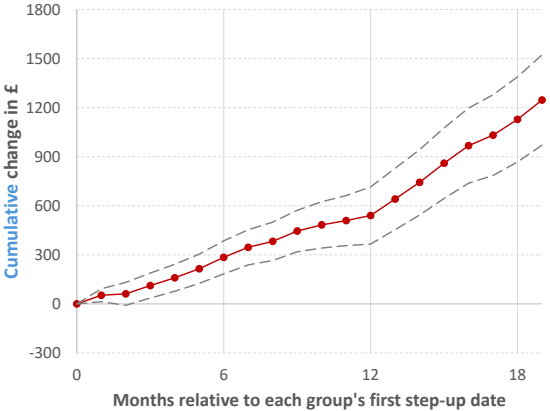
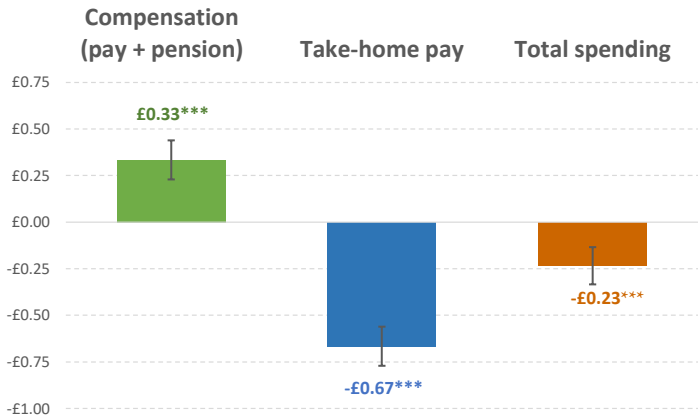




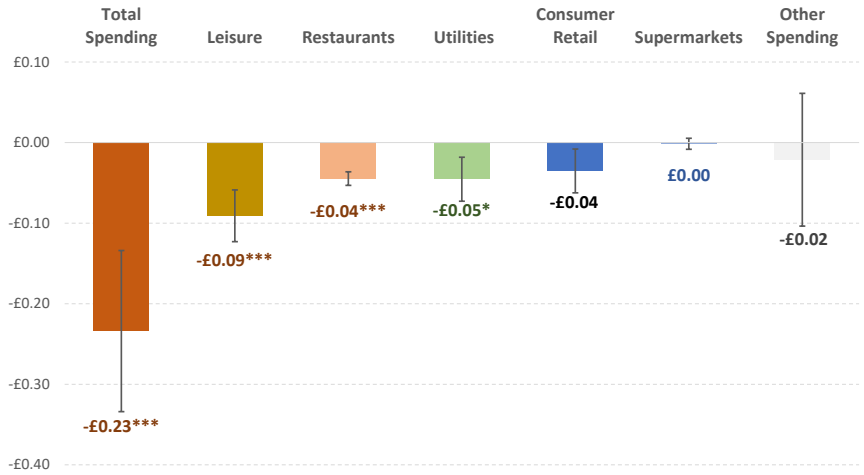
Result I: ↓ in take-home pay and total spending

- For every £1 increase in pension contribution:
  - 2/3 come from higher employee contrib. and lower take-home pay Incidence Event study
  - ~1/3 of this income reduction is financed with reduced spending Event study



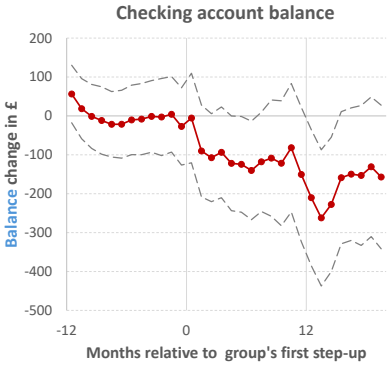
Result II: larger ↓ in discretionary spending

Pension contrib ↑ by £1 ⇒ take-home pay ↓ 67 cts ⇒ total spending ↓ 23 cts



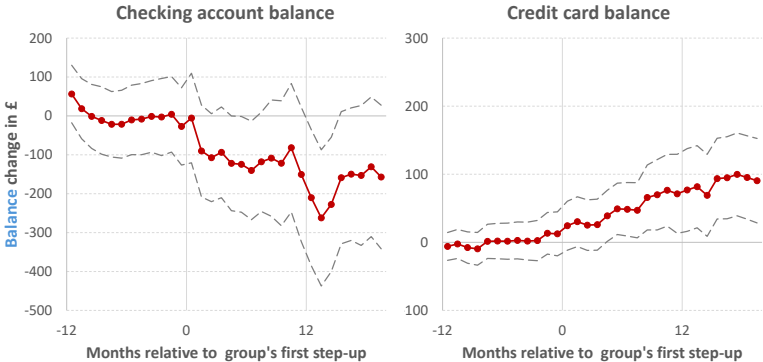
Result III: ↓ in checking account balances

Liquid checking account balances ↓



Result III: ↓ in checking account balances + ↑ borrowing

Small ↑ avg. credit card balance ($\neq$ Beshears et al, 21; Medina and Pagel '22)



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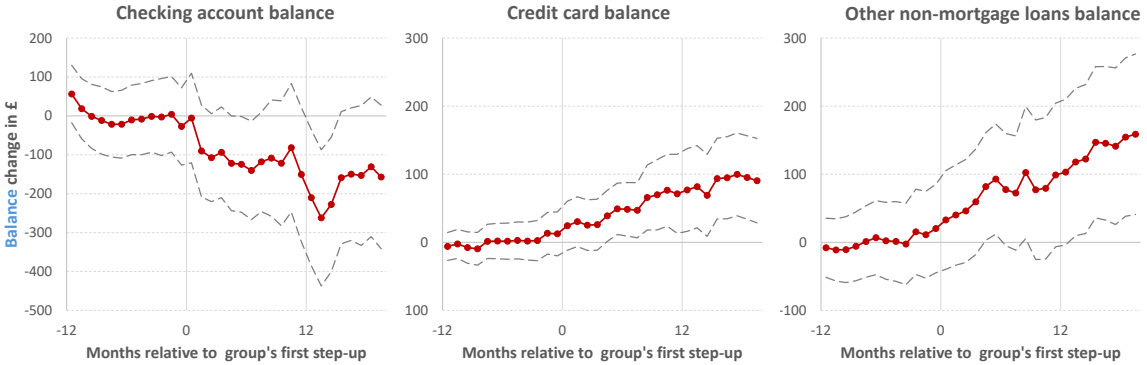
↑ other borrowing (consistent w/ Beshears et al, 24)



Taking stock: cumulative contributions after 19 months

Event study

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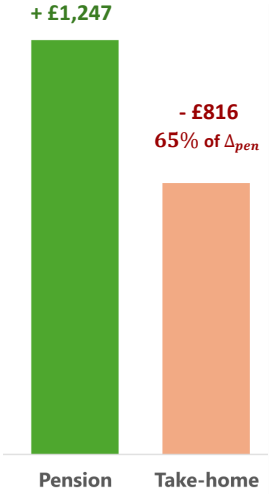

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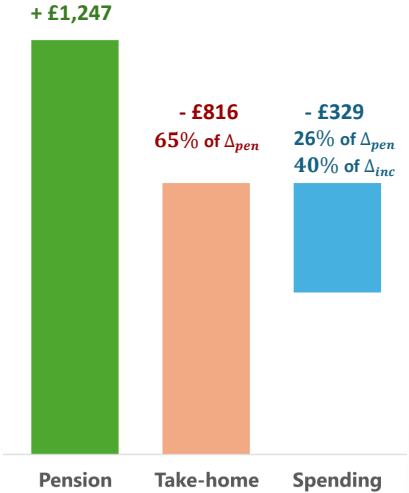

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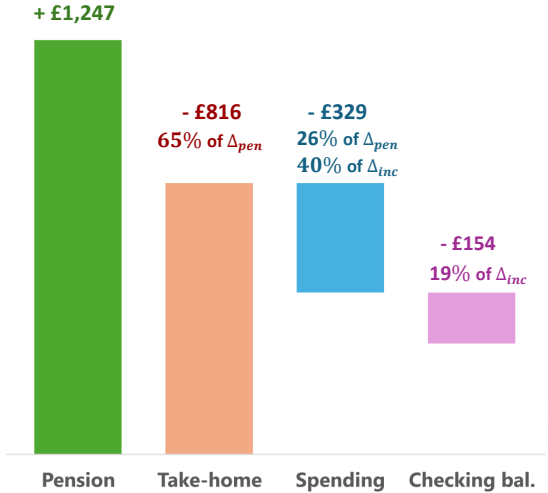

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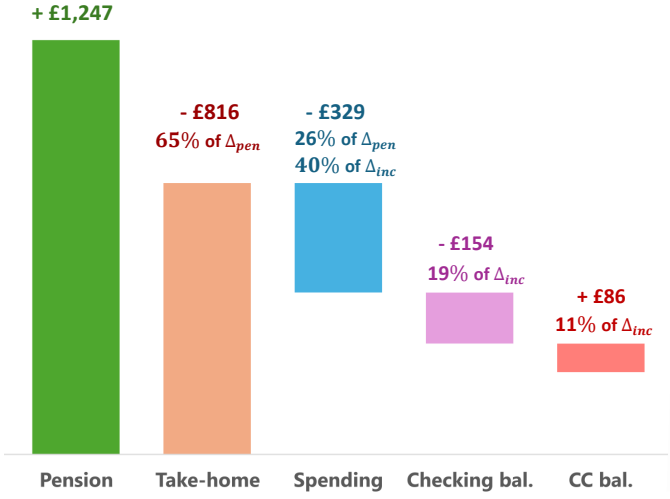

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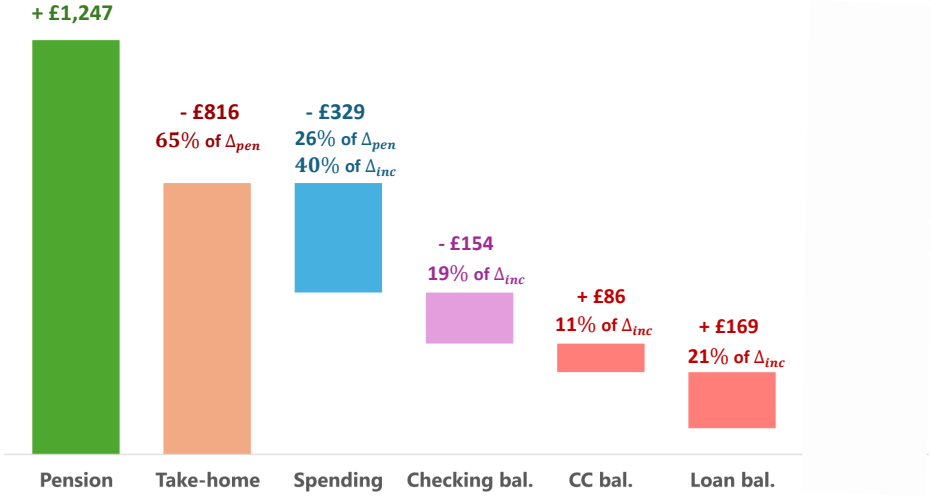

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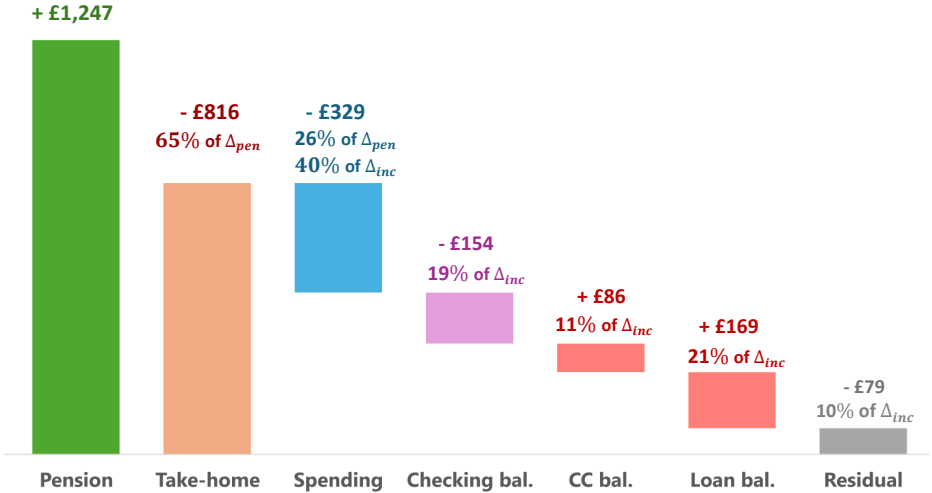
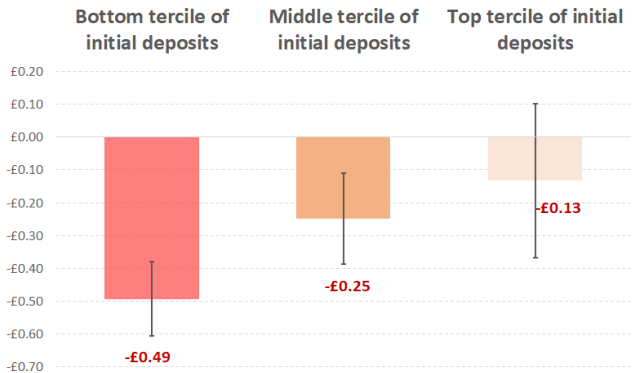


Result IV: Heterogeneity in Spending Responses

Pension ↑ by £1/month ⇒ take-home pay ↓ 67cts/month

Heterogeneity: ↓ 49cts for low initial deposits vs ↓ 13cts for high initial deposits



Outline

Life-cycle Model

- Simulate policy in quantitative lifecycle model building on Choukhmane (2024)

- Features rich economic environment: Model details
  1. **Assets:** realistic retirement account, liquid saving, and unsecured debt
  2. **Labor market:** income and employment risk varies with age and tenure
  3. **Government:** progressive tax and benefit system (Public Pension & UI)
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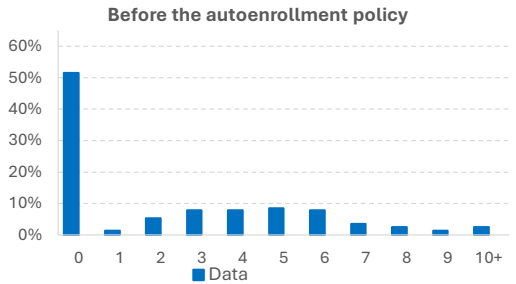
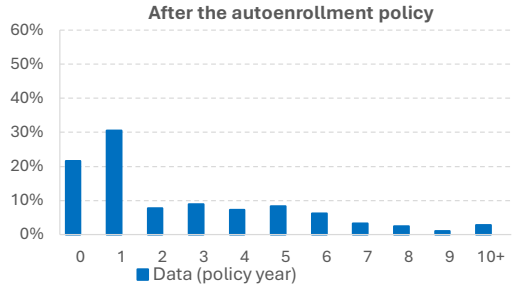
+ parsimonious specification of preferences:
  1. **Time preferences:** EIS ($\sigma = 0.52$) exponential discounting ($\delta = 0.96$)
     - extension with heterogenous naive present bias (β mean: 0.7; sd: 0.16)
  2. **Opt-out cost:** switching cost (£ 171) to make an active contribution change

Model Matches Data I

Mandatory Autoenrollement for all U.K. private employees at 1%





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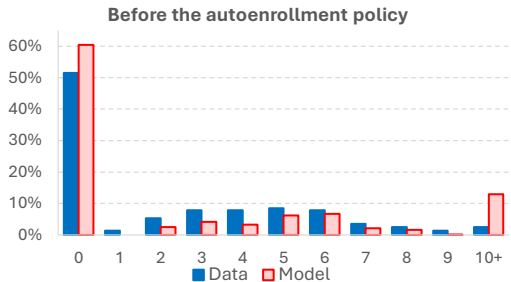
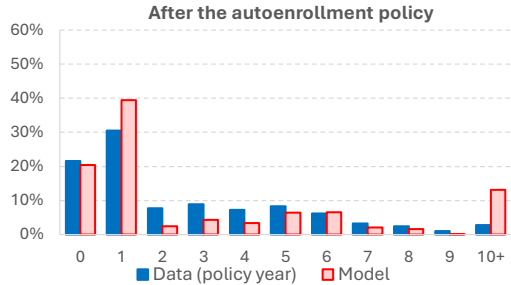
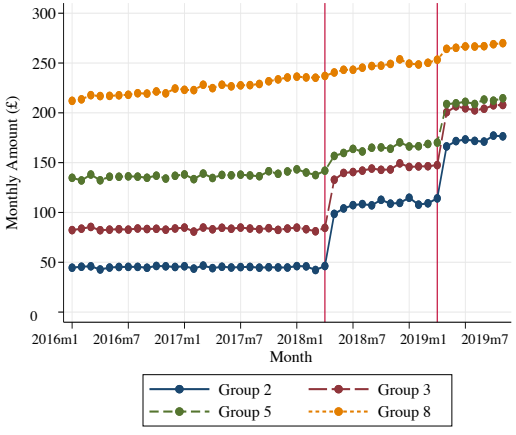
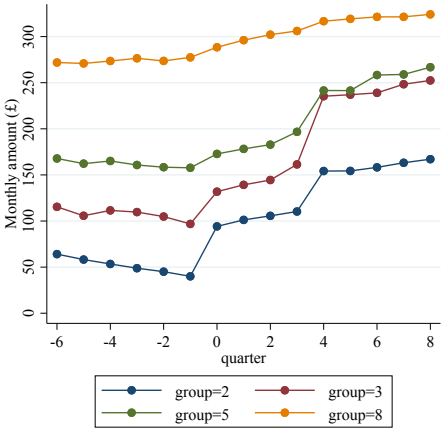




Model Matches Data II

Average monthly total pension contributions by contribution rate group





Purposes of the Model

1. Compare elasticities estimates using 2SLS to RCT (e.g. groups are endogeneous)
2. Examine effect of different assumptions about incidence (e.g. employers cut wages)
3. Examine different assumptions about anticipation (e.g., policy announced in 2012)
4. Examine long-run dynamics (fade out, savings buffer, etc.)
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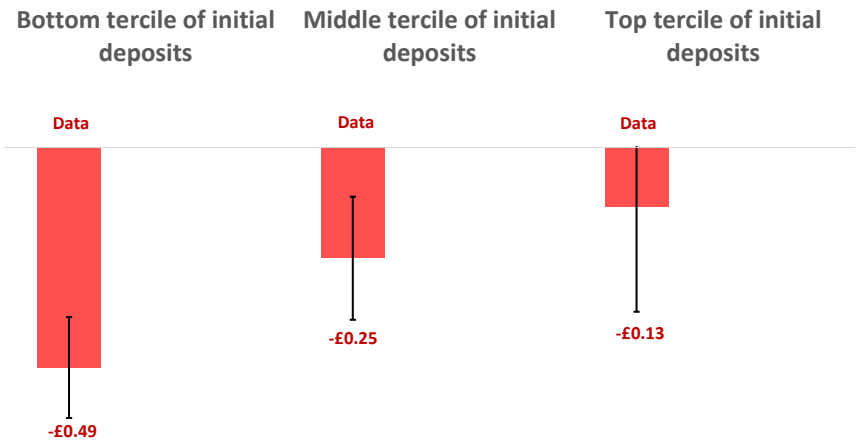
Model Matches Data III

Step-up of employee (employer) default contributions to 3% and 5% (2% and 3%)

calibration w/ exponential discounting PresentBias



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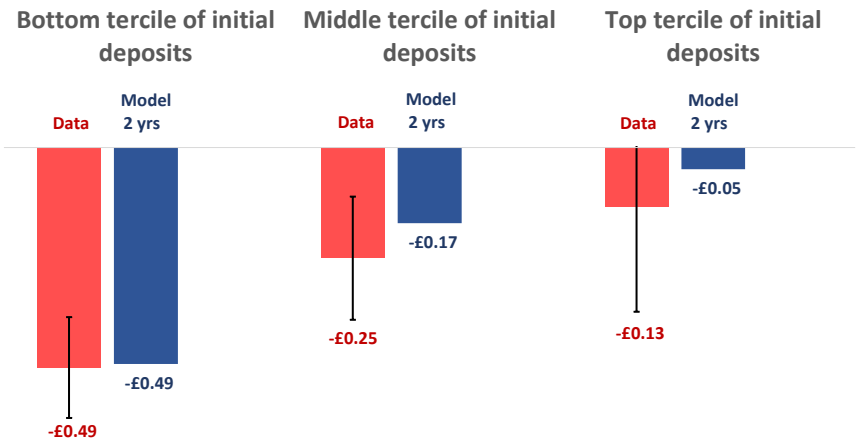

Model Matches Data II + Partial Fade-out

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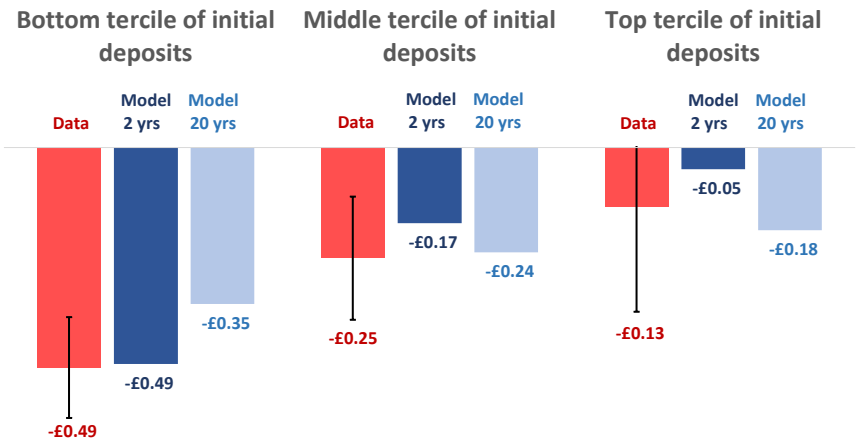

Outline

Conceptual framework

- Simple behavioral public finance framework Bernheim, Taubinsky '18; Alcott,Taubsinky '23
- Paternalistc social planner think individuals are too impatient due to either:

  Moser and Olea de Souza '19; Beshears et al. '23

  - behavioral biases (e.g. present bias) Laibson '97
  - externalities for social safety programs Sleet, Yeltekin '06
- Assume individuals are otherwise unbiased
  - no bias in intra-temporal consumption/portfolio choice! Skip to results

Decision utility vs Normative utility

- Individual i chooses consumption c_i, retirement contributions ret_i, and liquid savings/borrowing liq_i taking the generosity γ of retirement saving incentives $s(\cdot,\gamma)$, taxes $\tau(\cdot)$, and state variables π_i as given:

$$\max_{c_i, ret_i, liq_i} \quad u(c_i) + \beta_i V_i(ret_i, liq_i, \pi_i)$$

$$s.t. \quad c_i = y_i - liq_i - ret_i + s(ret_i, \gamma, \pi_i) - \tau_i(\gamma, \pi_i)$$

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- Social welfare when planner thinks each individual p_i% too impatient

$$W(\gamma) = \int_i \omega_i \left[u(c_i(\gamma)) + \beta_i (1 + p_i) V_i(ret_i(\gamma), liq_i(\gamma)) \right] di + \mu \int_i (\tau_i(\gamma) - s_i(ret_i(\gamma), \gamma)) \, di$$

where ω_i are welfare weights and μ is marginal value of gov't revenue

Welfare effect of a small reform

A small reform increasing the generosity γ of retirement saving incentives:

$$\frac{dW(\gamma)}{d\gamma} = \int_i \omega_i \left\{ \underbrace{\frac{dc_i}{d\gamma} u'(c_i)}_{\text{cons. response}} + \beta_i (1+p_i) \left[\underbrace{\frac{dret_i}{d\gamma} V_1'}_{\text{retirement sav. response}} + \underbrace{\frac{dliq_i}{d\gamma} V_2'}_{\text{crowd-out liquid sav.}} \right] \right\} di$$

$$+ \mu \int_i \left\{ \underbrace{\frac{d\tau_i(\gamma)}{d\gamma} - \frac{ds_i(\gamma)}{d\gamma}}_{\text{fiscal effect}} \right\} di$$

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$$+\mu \int_i \left\{ \underbrace{\frac{d\tau_i(\gamma)}{d\gamma} - \frac{ds_i(\gamma)}{d\gamma}}_{\text{fiscal effect}} \right\} di$$

If FOCs hold then **consumption** response is a **sufficient statistic** for welfare:

$$\frac{dW(\gamma)/d\gamma}{\mu} = \int_i \left\{ g_i p_i \left[\underbrace{\left(-\frac{dc_i}{d\gamma} \right)}_{\text{cons. response}} + \underbrace{\frac{ds_i}{d\gamma} - \frac{d\tau_i}{d\gamma}}_{\text{mechanical effect}} \right] \right\} di + \underbrace{\int_i (g_i - 1) \left[\frac{ds_i}{d\gamma} - \frac{d\tau_i}{d\gamma} \right] di}_{\text{redistribution effect}}$$

where $g_i = \frac{\omega_i u'(c_i)}{\mu}$ is the marginal social welfare weight on i

Welfare effect of a small reform

Abstracting from redistribution motive ($g_i = 1$):

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Targeting Retirement Interventions

- Average Treatment Effect on retirement saving $E(\Delta ret_i)$, is a poor guide for welfare: what matters are the **covariances !** Alcott et al., 2023

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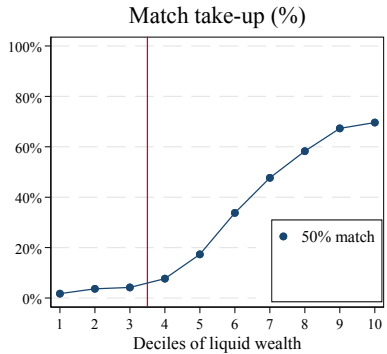
- We can assess these covariance for alternative policies in the model

Liquidity correlates w/ take-up ...

One-time subsidy to ↑ annual retirement contributions by 1 p.p.

calibration w/ 2/3 exponential discounter + 1/3 present biased No PB Only PB



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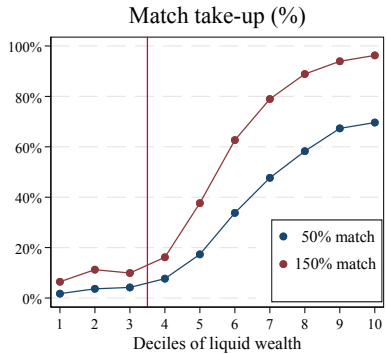

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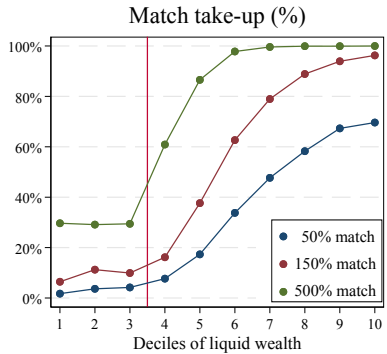

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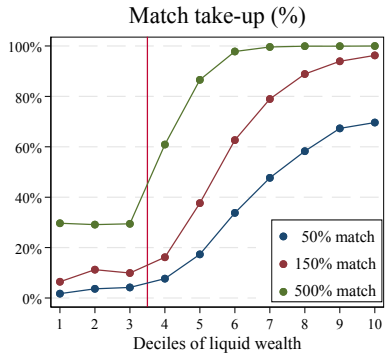

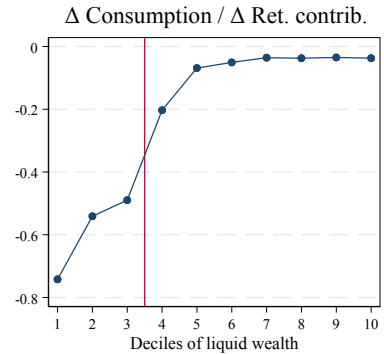

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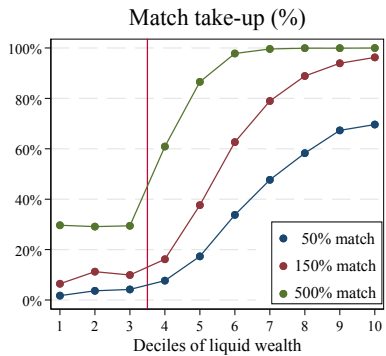

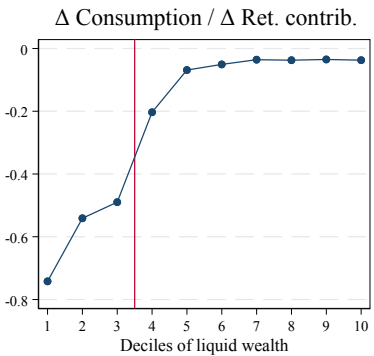

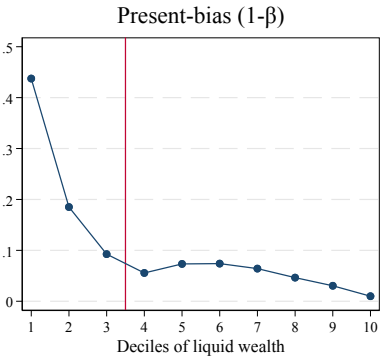

- High liquidity = most likely to take-up financial incentives ...
- ... have the smallest consumption response $cov(\Delta ret_i, -\Delta cons_i) < 0$
- ... are the least present biased $cov(\Delta ret_i, bias) < 0$

Policy implications

- **Tax & match incentives:** often poorly targeted:
  - Taken up by those with more liquidity (Choukhmane et al, '23) who have ...
  - ... smallest spending response $cov(\Delta ret_i, -\Delta cons_i) < 0$
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- **Asset caps:** can be desirable even absent a redistributive motive
  - At the top, liquidity constraints do not bind $\Rightarrow$ small spending response
  - Those with high wealth reveal their (low-bias) type
- **Illiquidity:** new argument against higher **withdrawal penalties**:
  - May $\uparrow$ savings but worsen targeting (i.e., less desirable for low-liquidity individuals) (Mitchell, Utkus, Yang, '07; Briere, Poterba, Szafraz, '22)

Outline

Conclusion

How do consumers finance increase retirement contributions?

- For every £1 $\downarrow$ in take-home pay, we see £0.40 reduction in spending
- The rest is financed out of liquid savings & borrowing
- Stronger spending response for those w/ low initial checking account balances

Conclusion

How do consumers finance increase retirement contributions?

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- Stronger spending response for those w/ low initial checking account balances

What is the welfare effect of an intervention promoting retirement savings?

- Covariance between contribution response, spending elasticity, and undersaving bias determines social welfare ($\neq$ Average Treatment Effect)
- Financial incentives (i.e., 1.5% of US GDP every year) often poorly targeted:
  - Taken-up by those least likely to cut spending and be (present-)biased
- Income/asset limits can be efficient (no trade-off btw. equity and efficiency)

Baseline differences across groups

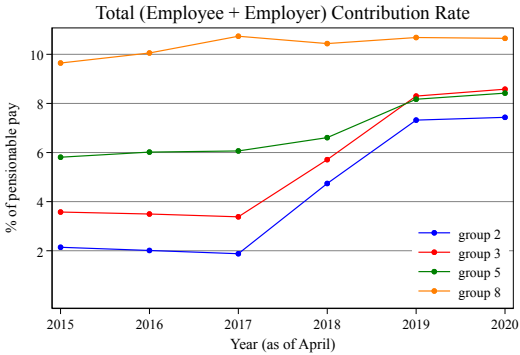
Back

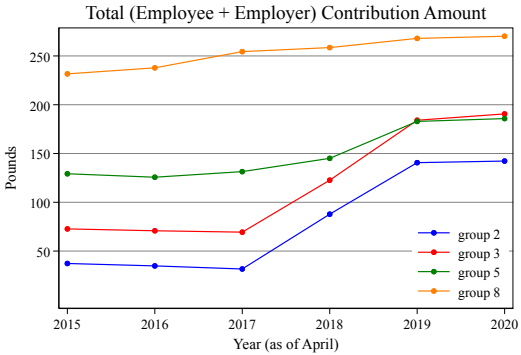
Summary Statistics in March 2018 by Contribution Rate Groups

Contribution Rate Group	2%	3%	5%	8%
Contribution Rate	2.0	3.4	6.0	11.0
	(0.28)	(0.57)	(0.88)	(2.24)
Net Wage Income	2101.1	2478.8	2567.8	2471.6
	(2322.2)	(3089.0)	(3000.6)	(1990.3)
Pension Contribution Amount	41.5	84.9	153.3	270.7
	(46.2)	(110.4)	(181.1)	(218.8)
Total Spending	1248.8	1387.6	1389.2	1447.4
	(1831.0)	(1767.4)	(2083.7)	(2215.6)
Number of Individuals	27,533	21,473	20,889	36,450

Comparison with nationally representative data

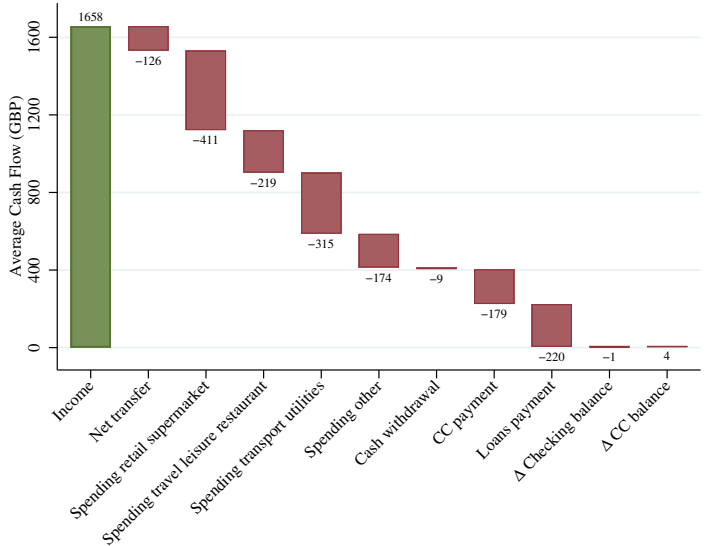
Back





Flows in/out of checking accounts - Middle income tercile

Back



Data: housing expenditures by residential status

Back

Residential status is available for half of the customers in the sample

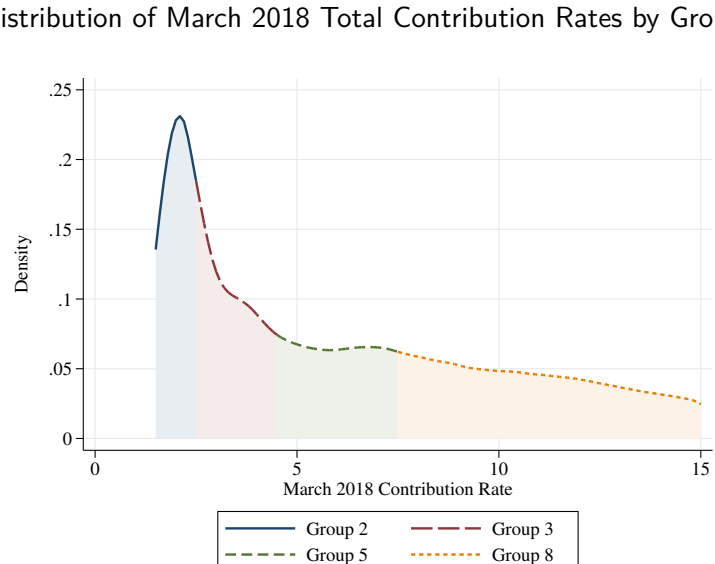
		Residential status			
	UK National avg. for '17 (ONS)	Renter	Mortgage	Own outright	Live with parent
Freq. (%)	---	29.4%	49.0%	7.2%	14.4%
Avg. Rent expense	£403*	£182	£22	£20	£185
Avg. mortgage	£620**	£56	£471	£108	£68

* Weekly net rent by renter x 4

** Weekly mortgage by mortgage holders x 4

Empirical Strategy: below vs above the new default

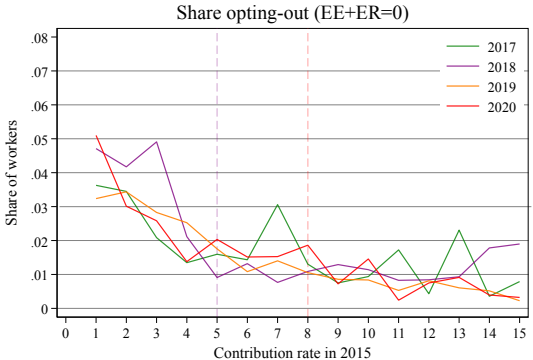
Back

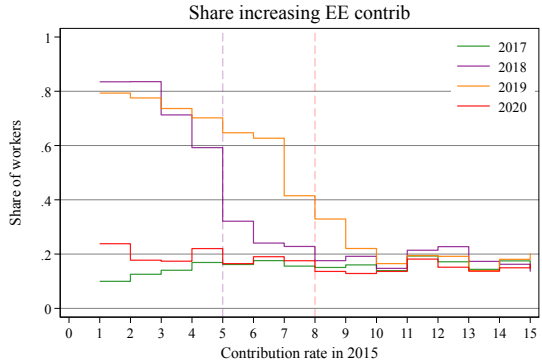


Opt-out rate vs. contributrion

Back

No significant change in opt-out among treated groups (ASHE data)





Result I: ↓ in take-home pay and total spending

Back

ASHE data from 2012 to 2020: 158,304 worker-year observations

s.e. clustered at the employer level

	Employee contrib.	Total paid hours	Paid overtime dummy	Monthly gross pay	Overpay earnings	Incentive pay
Total contrib.	0.593***					
	(0.0317)					
Employer contrib.		-0.00858	-0.000845	-0.317	0.488	-0.509
		(0.00646)	(0.000436)	(1.901)	(0.428)	(0.402)
Kleibergen-Paap F-stat	24.2	8.419	8.419	5.242	5.242	5.242
Cragg-Donald F-stat	75.65	26.96	26.96	13.66	13.66	13.66
R2	0.325	-0.0347	-0.0783	-0.0145	-0.0484	-0.0823

Result I: ↓ in take-home pay and total spending

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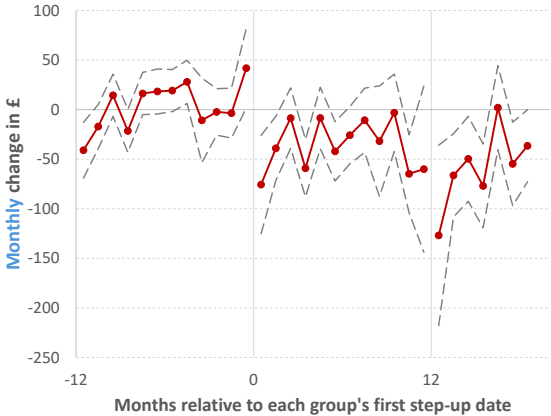
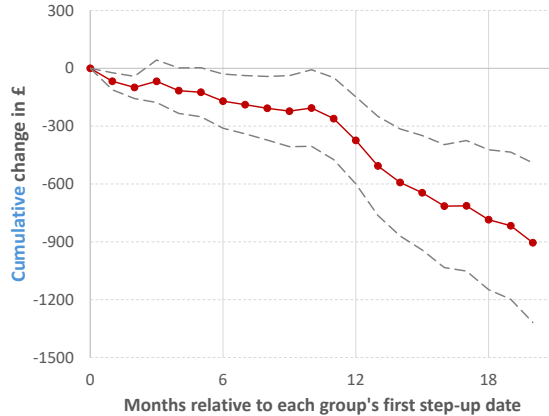
In April 2018 and 2019: ↑ employee default by 2% and employer default by 1%





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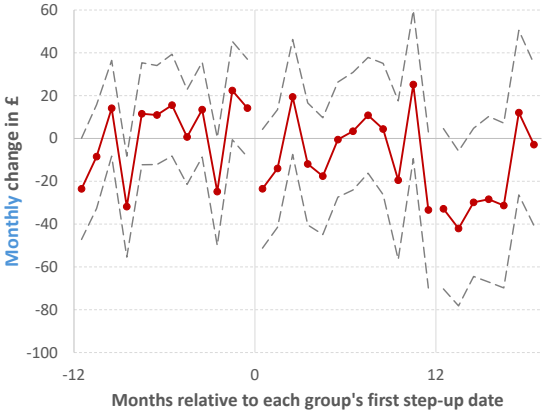
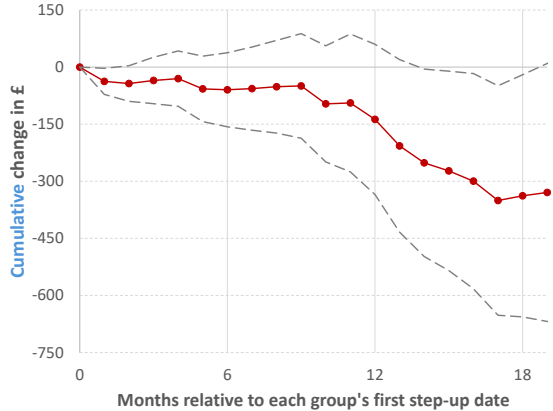
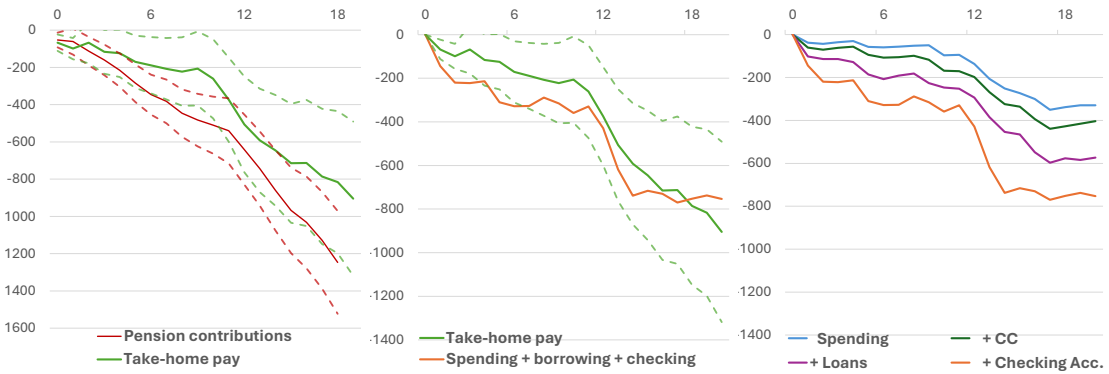




Taking stock: dynamic of cumulative effects

Back



Model Environment

Back

- Lifecycle consumption model at quarterly frequency btw ages of $22y$ and $90y$
- Two assets :
  - Retirement asset dc_t with return R^{DC}
  - Liquid asset l_t :
    - $l_t > 0$: liquid wealth with interest rate $R^{liq} < R^{DC}$
    - $l_t < 0$: unsecured debt w/ interest rate $R^{cc} > R^{liq}$
    - Borrowing limit: $l_t \geq \lambda_t \overline{y}$
- 4 employment states:

$$\left[V_t^{Emp}, V_t^{J2J}, V_t^{Unemp}, V_t^{Ret}\right]$$

Environment (I): Employment

$$\left[\boldsymbol{V_t^{Emp}}, V_t^{J2J}, V_t^{Unemp}, V_t^{Ret} \right]$$

- Labor income:
  - Deterministic component: cubic in age a_t
  - Stochastic component: labor productivity θ_t follows an AR(1)
  - Progressive income tax
- Contribute a percentage s_t of income to a DC plan:
  - Contributions are tax-deferred up to a limit
  - Employers contribute according to a formula that varies across jobs

Environment (II): Job-to-job Transitions

$$\left[V_t^{Emp}, \boldsymbol{V_t^{J2J}}, V_t^{Unemp}, V_t^{Ret}\right]$$

- With probability $\pi^{J2J}(a, ten, \theta)$ transition to a new job:
  - New wage on average higher than in previous job
  - Face a new employer contribution formula and new default contribution rate

  - 1st period in a job: $d_t = \bar{d}^e \sim E(.)$
    $\bar{d}^e$ is exogenous and $= 0$ if Opt-in, > 0 if AE

  - Later periods: $d_t = s_{t-1}$
    equals to previous period contribution rate

Environment (III): Unemployment

$$\left[V_t^{Emp}, V_t^{J2J}, \boldsymbol{V_t^{Unemp}}, V_t^{Ret}\right]$$

- With probability $\pi^{EU}(a, ten, \theta)$ transition to unemployment:
  - Receive unemployment insurance (= percentage of last wage)
  - Early withdrawals from DC wealth are not permitted in the UK
- With probability $\pi^{UE}(a)$ transition back to a employment with on avg. lower wage than last job

Environment (IV): Retirement

$$\left[V_t^{Emp}, V_t^{J2J}, V_t^{Unemp}, \boldsymbol{V_t^{Ret}}\right]$$

- Deterministic retirement at age $A^{ret} = 65y$:
  - Flat State Pension based on UK benefit level post-2016
  - Can access DC wealth subject to income taxation

Agent's Problem

$$V_t^{PB}(X_t) = \max_{s_t, I_{t+1}} \boldsymbol{u_a}\left(c_t - \mathbb{1}_{(s_t \neq d_t)} k\right) + \beta..\delta.(\mathbf{1} - \boldsymbol{m(a)}).\mathbb{E}_t\left[V_{t+1}(X_{t+1})\right]$$

- Discount factor δ and (naive) quasi-hyperbolic discount factor $\beta \sim Beta(\alpha_1, \alpha_2)$
- Mortality risk: $m(a)$
- CES utility with equivalence scale n_a (i.e., cons. more valuable when middle age w/ dependents)

$$u_a(\cdot) = n_a . \frac{\left(\frac{\cdot}{n_a}\right)^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}$$

σ	δ[4]	k	β
0.52	0.96	£171	$\sim beta(5,2)$

Calibration

Back

Labor market parameters:

- **Earning process:** 2-steps Minimum Distance estimator (ASHE)

ρ	$\sigma^2_{\xi_1}$	σ^2_{ξ}	σ^2_m
0.974	0.184	0.0125	0.10

- **Labor-market transition:** EU, JJ and UE

$$Pr\left(emp_{t+1}|emp_t\right) = \sum_{k=0}^{5} \beta_k . a_i^k + \sum_{j=1}^{9} \iota_j . \mathbb{1}_{\left(ten_{i,t}=j\right)} + \varepsilon_{i,t}$$

- **Other labor market parameters:**

Initial unemp.	22%	J2J premium	4.8%	EU penalty	7.8%

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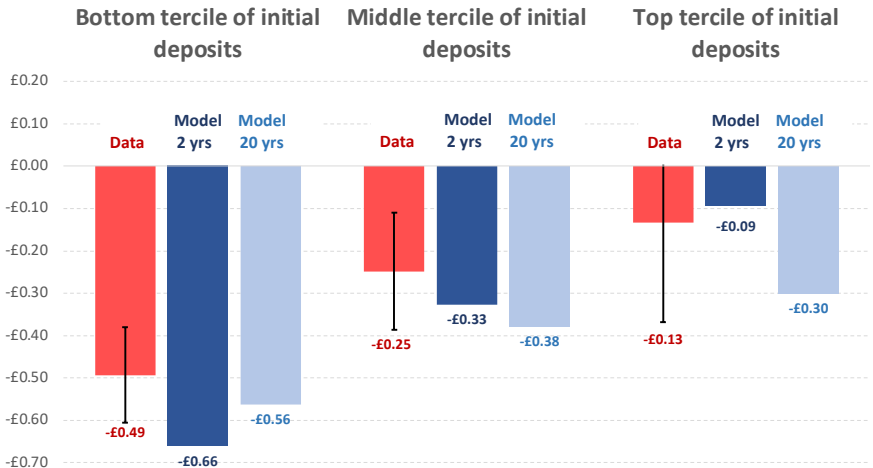
Preference parameters:

Model Matches Data II + Partial Fade-out

Back

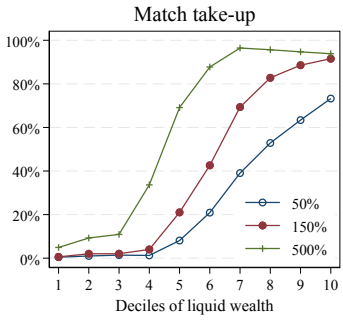
Step-up of employee (employer) default contributions to 3% and 5% (2% and 3%)

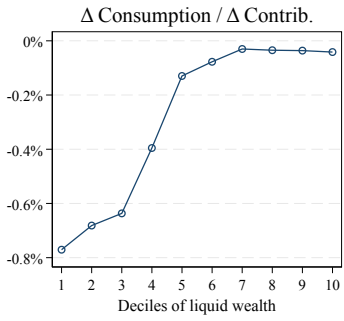


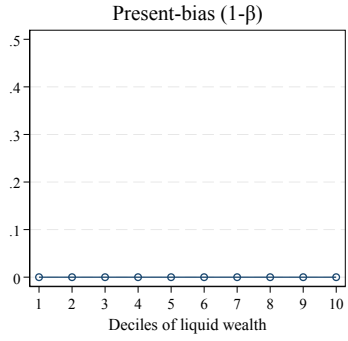
Liquidity correlates w/ take-up, smaller consumption drop & small bias

One-time subsidy to ↑ annual retirement contributions by 1 p.p.

calibration w/ everyone exponential discounter Back







Liquidity correlates w/ take-up, smaller consumption drop & small bias

One-time subsidy to ↑ annual retirement contributions by 1 p.p.

calibration w/ everyone (heterogeneously) present biased Back