Default Options and Retirement Saving Dynamics

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NBER (2019-2020), MIT Sloan (2020-)

September 2019

Motivation

- Key insight from behavioral economics: default options matter

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- High stakes setting: retirement savings plans

Default = non-participation	**Default = participation**
Call provider to enroll	Call provider to opt-out
~50% participate after 1yr	>90% participate after 1yr
"Opt-in regime"	"Autoenrollment"

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- Autoenrollment (AE) is affecting ~100 million people worldwide:
  - **NZ ('07), UK ('12), Turkey ('17):** all private sector workers
  - **US:** the majority of 401(k) plans already implements AE
    5 states are extending AE to workers without a 401(k)

This Project

Many studies on AE short-run impact but long-run effect unknown:

Q: What is the effect of autoenrollment on **lifetime** savings and **welfare**?

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Challenge: no long-run data because AE is a recent policy

This paper:

1. Identify the ***mechanism*** through which AE affects behavior
2. Build and estimate a ***lifecycle model*** to study AE long-run effect

Outline

Two Datasets

U.S. 401(k) Data:

- New proprietary dataset I obtained from a large US pension provider
- Monthly contributions, balances, and asset allocation for 4m workers btw. 2006-17

U.K. Nationally Representative Data:

- ASHE 2006-16 : nationally representative 1% panel
- Follows workers across successive jobs

Three Facts about Autoenrollment

Two **new** facts**:**

Fact I: AE in current job $\downarrow$ saving in next job

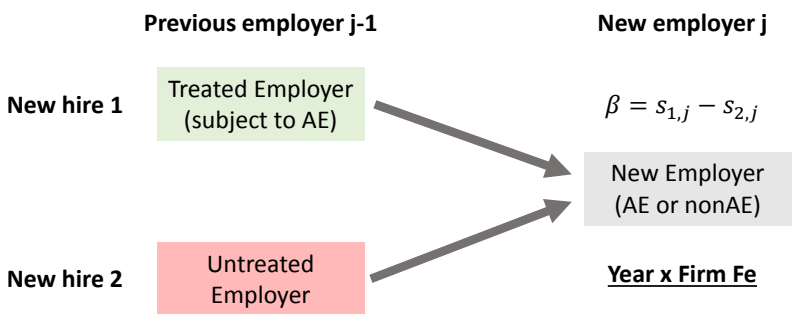
Fact I: AE Reduced Saving in Next Job

Mandatory Autoenrollement for all U.K. private sector employees

Policy roll-out by employer size between 2012-2017

Policy rollout

Identification:



Fact I: AE Reduced Saving in Next Job

AE reduced participation by 11% in next **opt-in** job!

Existing within-job estimates may overstate AE effect on lifetime savings

Policy start date	**Actual 2012**							
				Panel A - Participation rate				
AE to non-AE	**-0.109****							
	(0.052)							
AE to AE	0.013							
	(0.017)							
				Panel B - Contribution in (% of pensionable pay)				
AE to non-AE	**-0.472****							
	(0.185)							
AE to AE	-0.048							
	(0.066)							
Observations	35,651	35,651	35,651	35,651	35,651	35,651	35,651	35,651
Size$_{j-1}$ X Size$_j$	✓	✓	✓	✓	✓	✓	✓	✓
Employere$_j$ X Year	✓	✓	✓	✓	✓	✓	✓	✓

Robust standard errors clustered by current employer ; *** p<0.01, ** p<0.05, * p<0.1

Sample: 22-60y &≤1y tenure in ASHE 2006-17. Additional controls: total pay, previous total pay, tenure, previous

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Policy start date	**Actual 2012**	2005	2006	2007	2008	2009	2010	2011
				Panel A - Participation rate				
AE to non-AE	**-0.109****	0.073	0.022	-0.003	0.022	0.046	0.008	-0.056
	(0.052)	(0.062)	(0.041)	(0.055)	(0.054)	(0.066)	(0.055)	(0.073)
AE to AE	0.013							
	(0.017)							
				Panel B - Contribution in (% of pensionable pay)				
AE to non-AE	**-0.472****	0.023	-0.092	0.161	-0.123	0.021	-0.234	-0.137
	(0.185)	(0.219)	(0.173)	(0.489)	(0.214)	(0.224)	(0.213)	(0.300)
AE to AE	-0.048							
	(0.066)							
Observations	35,651	35,651	35,651	35,651	35,651	35,651	35,651	35,651
$Size_{j-1}$ X $Size_j$	✓	✓	✓	✓	✓	✓	✓	✓
$Employee_j$ X Year	✓	✓	✓	✓	✓	✓	✓	✓

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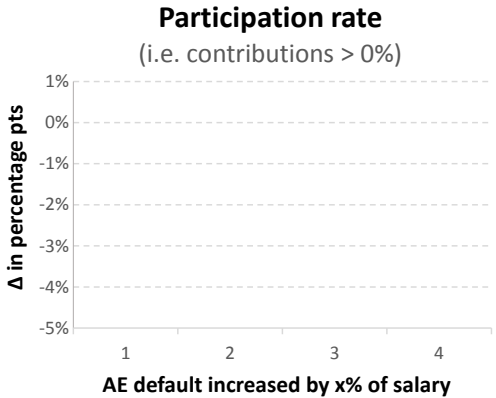
Fact II: Increasing Default ↓ Participation

Compare workers hired before/after 86 U.S. firms increased their default

Example: 3% → 6%



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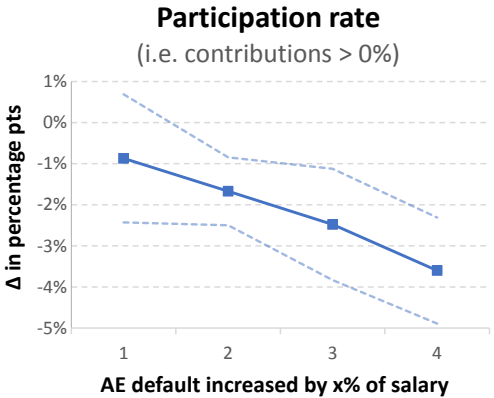

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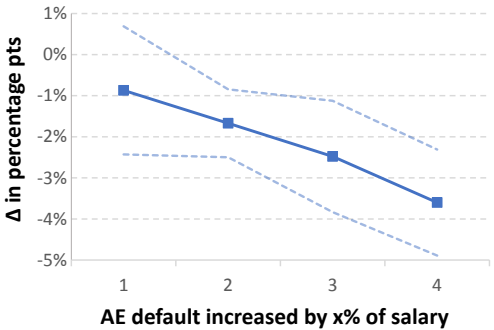
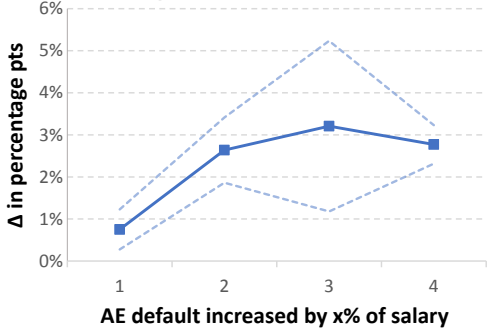
Participation rate

(i.e. contributions > 0%)



Positive contrib < initial default

(e.g. contributions at 1% or 2%)



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Fact II: Increasing Default ↓ Participation

Nudging workers to contribute more w/ higher default ....

... led more to drop-out and contribute at the lowest rates!

Opt-out cost: fits this evidence

- Ex. worker prefered contirbution rate 1%
- 3% default: stay at 3% (not worth bearing opt-out cost)
- 6% default: drop to 1% (far enough from prefered rate)

Other theories (loss aversion, anchoring): opposite prediction

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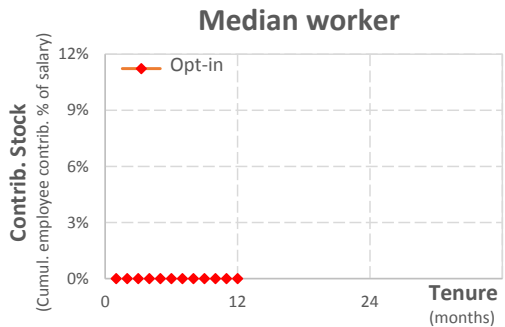
Fact III: Median non-AE catch-up to AE over 3yrs ...

Fact III: Median non-AE Catch-up to AE

Workers hired in the 12 months before/after AE at 3% in 34 firms



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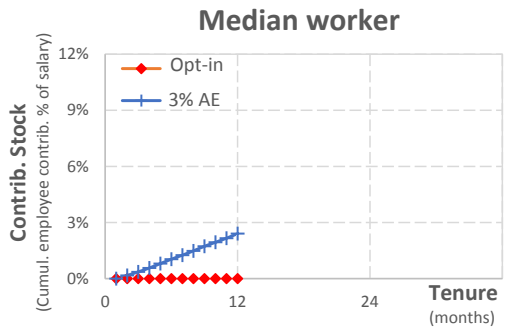

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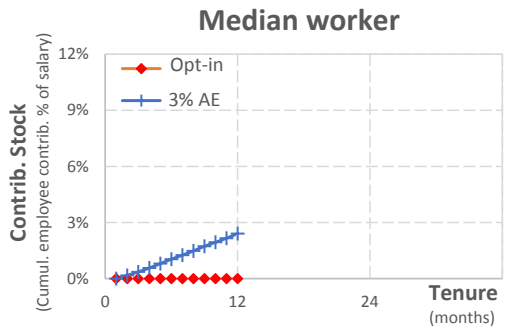

Static setting

Gains from switching:
- Tax benefit
- Generous employer match

$\Rightarrow$

Large opt-out cost:

DellaVigna ('06,'18): min. **$1,200**

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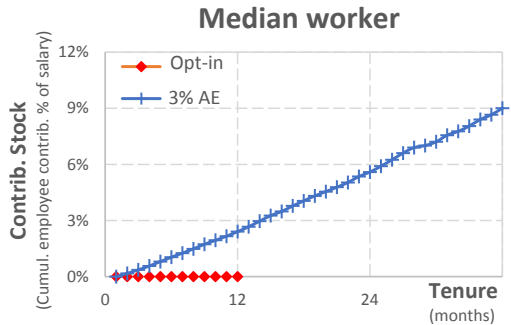

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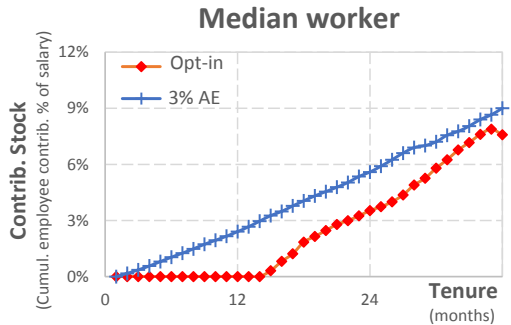

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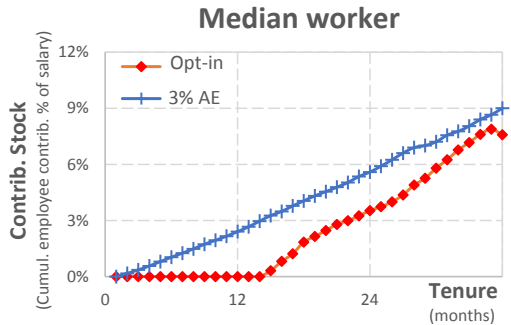

Dynamic setting

Gains from switching:

- ~~Tax benefit~~
- ~~Generous employer match~~

$\Rightarrow$

Smaller opt-out cost:

In a lifecycle model I estimate an opt-out cost of $\sim$ **\$250**

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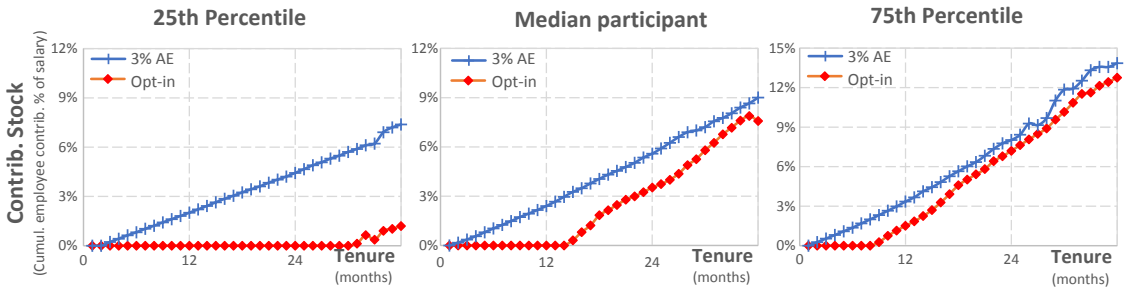
... but heterogeneity matters

Heterogeneity Matters

Firm A - Choi et al '04

In **the short run**: large treatment effects only at the bottom ...



... will these savings increase persist in **the long run** ?

Outline

The Model

I build and estimate a detailled lifecycle model with default effects

- Features rich economic environment (8 state variables) ...
  1. **Assets:** realistic retirement account, liquid saving, and unsecured debt
  2. **Labor market:** income and employment risk varies with age and tenure (SIPP data)
  3. **Government:** progressive tax and benefit system (Social Security & UI)
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  3. **Government:** progressive tax and benefit system (Social Security & UI)
  4. **Demography:** mortality risk, and changing household composition over lifecycle
- ... parsimonious specification of preferences (3 parameters):
  1. **Time preferences:** standard (E.I.S. & exponential discount factor)
  2. **Opt-out cost:** utility cost every time agent deviates from the default

Data and Estimation

Estimation Sample:

- 34 plans w/ a 50% match up to 6% and no autoescalation
- Workers hired in the 12 months before/after AE at 3%

Simulated Method of Moments results:

Estimates (quarterly freq.)

EIS	disct. fact.	opt-out cost
σ	δ	k
0.455	0.987	\$254
(0.013)	(0.001)	(11)

χ^2 stat. (41 df): 586

Robustness: Weighting Matrix | Opt-in only | AE only

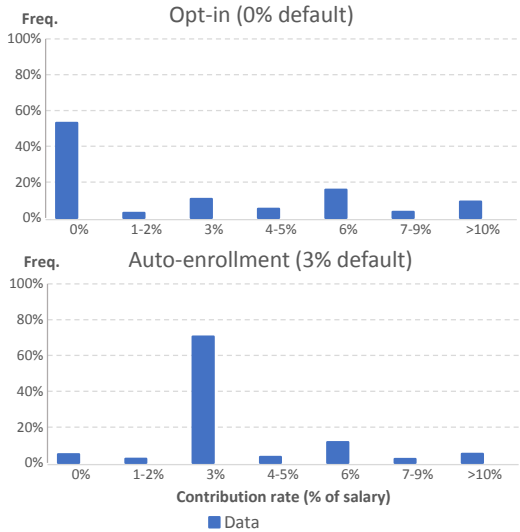
Extensions: Present Bias | Proportional Cost

Sensitivity: Andrews, Gentzkow, Shapiro '17

Estimation Moments

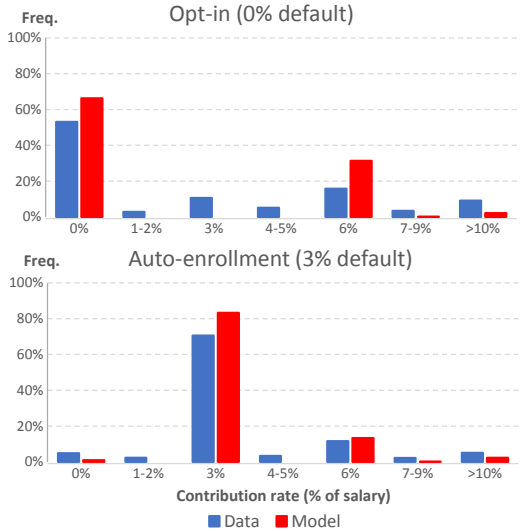
Distribution of Contribution Rates

Employees in their 1st year of tenure

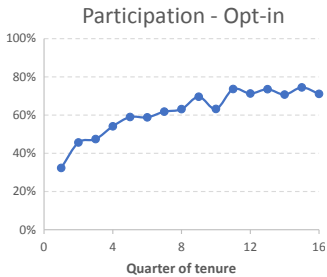


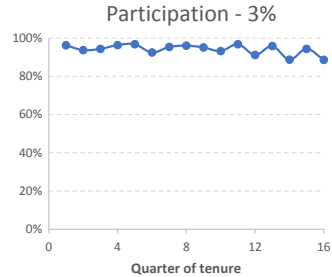
Distribution of Contribution Rates

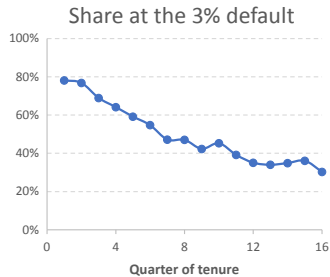
Employees in their 1st year of tenure



Evolution over Tenure







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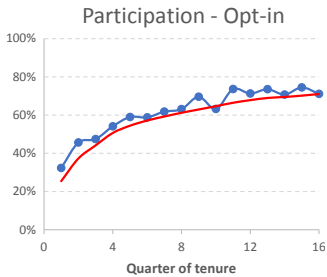

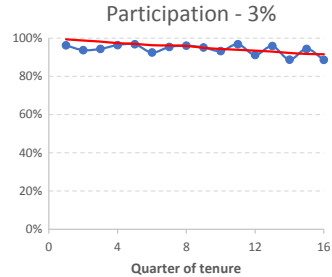

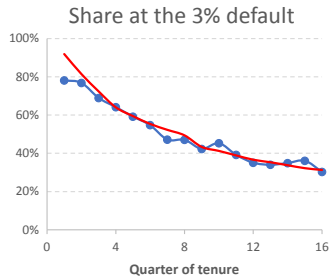

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External validity

Why should we believe the model long-run predictions?

Advantage of structural estimation:

extrapolate to another policy, population, institutional setting, time-frame

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Out-of-Sample validation I: results

Model estimated using the introduction of AE at 3% ...

... predicts response to increasing the default

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Out-of-Sample validation I: results

Model estimated using the introduction of AE at 3% ...

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Out-of-Sample validation II: results

Preference estimates from U.S. 401(k) plans ...

... predict the response to a national policy in the U.K.

AE ↑ Lifetime Savings at the Bottom

Typical AE policy at 3% adopted by all employers

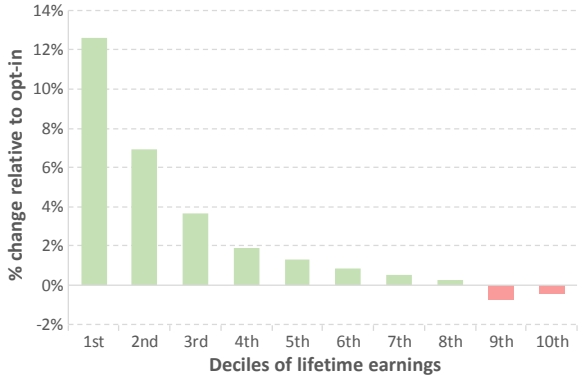
Incidence on workers | AE 6pct | AE 10pct | High Present Bias | Low Present Bias | Proportional Cost

AE ↑ Lifetime Savings at the Bottom

Typical AE policy at 3% adopted by all employers

For most people: ↑ saving early-on ↓ saving later in life

BUT large effects at the bottom of the lifetime earnings distrib.



Incidence on workers | AE 6pct | AE 10pct | High Present Bias | Low Present Bias | Proportional Cost

Optimal Policy

Planner selects default to **maximize social welfare**:

(selected default adopted by all employers over a lifetime)

- can be more patient than individuals (**paternalistic**)
- can put more weight on low-income (**inequality-averse**) Saez '02
- treat only a fraction of opt-out cost as welfare relevant Goldin, Reck '18

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Subject to employers' **budget constraint**:

$$\text{Total profits} + \text{Wages} + \text{Matching costs} = \text{Constant}$$

Utilitarian Policymaker

Utilitarian policymaker prefers the **opt-in regime ...**

Match and tax incentives $\Rightarrow$ save more than implied by preference

AE shift cons. even more toward retirement $\Rightarrow \downarrow$ welfare

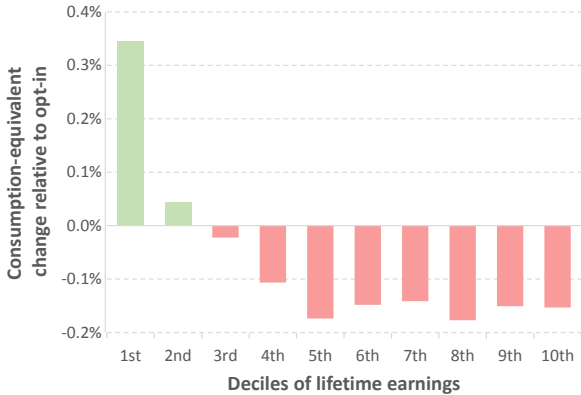
Levels	Employers profits	Matching rate	Wages adjustment
Utilitarian	Opt-in	Opt-in	Opt-in

Proportional Cost | High Present Bias | Low Present Bias

Utilitarian Policymaker

Utilitarian lifetime utility decreases for most ...

... but **increases at the bottom** (ex. 6% AE)



Inequality-Averse/Paternalistic Policymaker

Inequality-averse or **paternalistic** policymaker

sets default near **match threshold**

Levels	Employers profits	Matching rate	Wages adjustment
Utilitarian	Opt-in	Opt-in	Opt-in
Inequality averse	AE 6%	AE 5%	AE 5%
Paternalistic	AE 6%	AE 6%	AE 6%

Proportional Cost | High Present Bias | Low Present Bias

Outline

Summary of my Findings

People catch up over time ...

- workers undo much of AE positive effect by saving less later on
- AE in **current** job causes workers to save less at their **next** opt-in job

... therefore, a $250 opt-out cost can explain default effect

- Not so costly to remain at default because can compensate late

AE increases lifetime welfare/savings only at the bottom

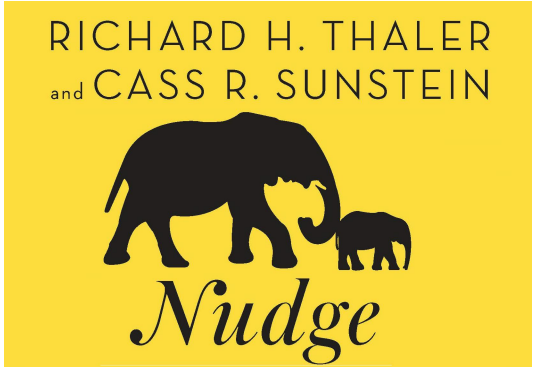
- optimal default is either 0% or employer match threshold (depends on social planner's preferences)

What have we learned I

- Life Cycle Hypothesis (LCH):
  - AE effect seen as a major challenge to the LCH
  - I show that w/ small friction LCH performs remarkably well

What have we learned II

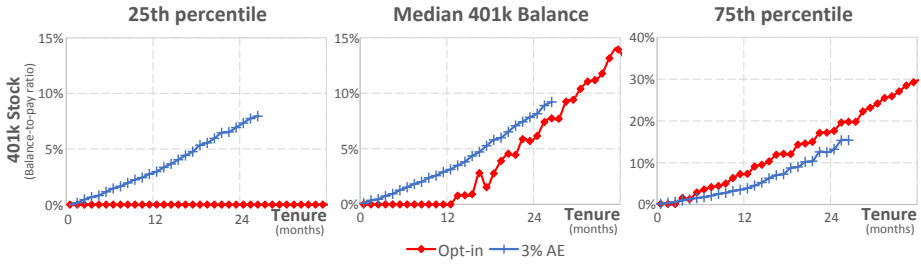
- Nudges:
  - in a dynamic setting savings nudges are less effective ...
  - ... but can still have important distributional effects



Supplementary Material I

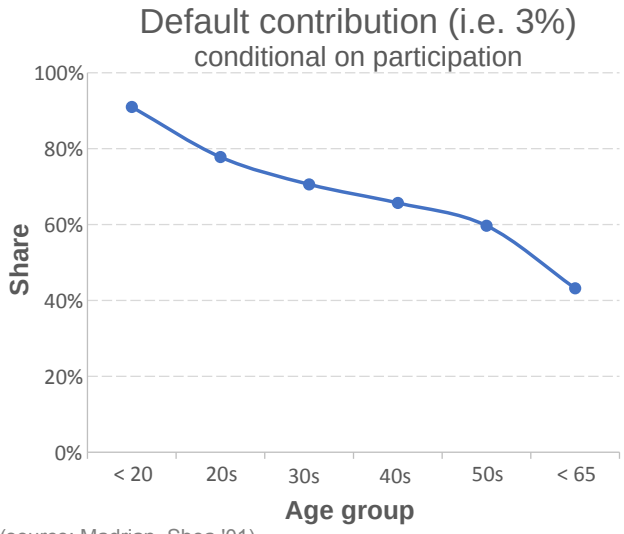
Choi et al '04 - Firm A

Back



Default Propensity by Age

Back



(source: Madrian, Shea '01)

Robustness

Back

	(1) Baseline model	(2) Full var-cov weighting matrix	(3) Opt-in workers only	(4) Autoenrolled workers only
k	\$254	\$268	\$340	\$258
	(11)	(17)	(29)	(11)
δ	0.987	0.987	0.988	0.987
	(0.000)	(0.001)	(0.001)	(0.001)
σ	0.455	0.444	0.454	0.426
	(0.013)	(0.015)	(0.027)	(0.012)
χ^2 stat.	586	583	414	131
(df)	41	41	13	25

Sensitivity - Andrews, Gentzkow, Shapiro (2017)

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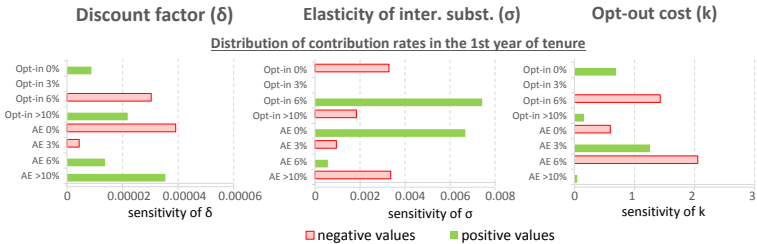

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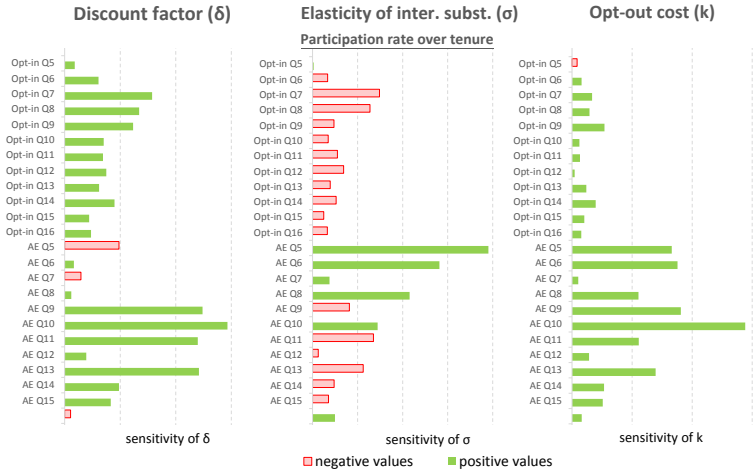
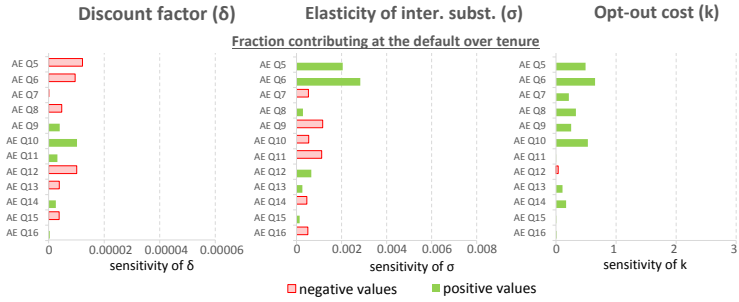


Sensitivity - Andrews, Gentzkow, Shapiro (2017)

Back



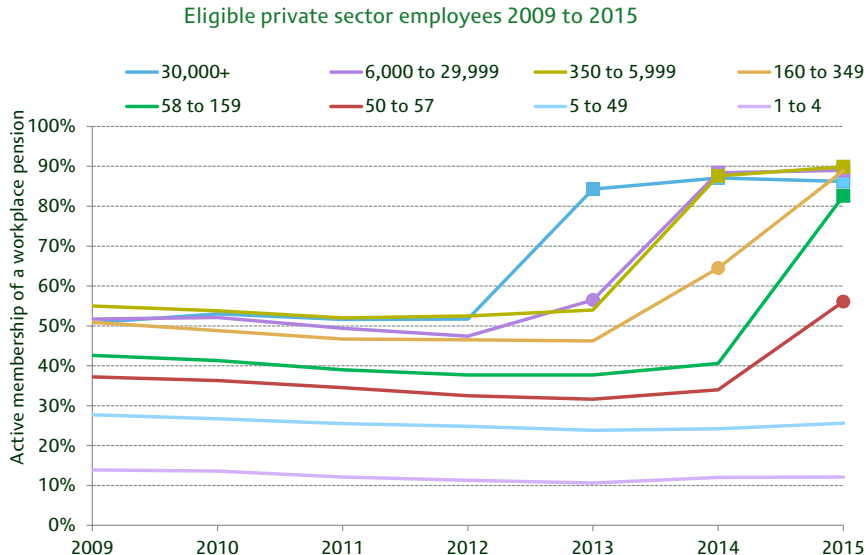
Roll-out of Autoenrollment in the UK

Back

Employer size	Policy staging date	Employer size	Policy staging date	Employer size	Policy staging date
120,000+	October, 2012	2,000+	August, 2013	61+	August, 2014
50,000+	November, 2012	1,250+	September, 2013	60+	October, 2014
30,000+	January, 2013	800+	October, 2013	59+	November, 2014
20,000+	February, 2013	500+	November, 2013	58+	January, 2015
10,000+	March, 2013	350+	January, 2014	54+	March, 2015
6,000+	April, 2013	250+	February, 2014	50+	April, 2015
4,100+	May, 2013	160+	April, 2014	40+	August, 2015
4,000+	June, 2013	90+	May, 2014	30+	October, 2015
3,000+	July, 2013	62+	July, 2014		

Roll-out of Autoenrollment in the UK

Back



Default Mechanism

Other Mechanisms: back

1. Convex Adjustment cost: button
   - One-sided: Temptation (Gul, Pesendorfer, '01) Loss aversion (Prelec, Loewenstein et al, '92)

$$U\left(c_\gamma|\bar{\tau}_\gamma^{def}\right)=\begin{cases}u_\gamma(c_t) & \text{if } \tau_\gamma \le \bar{\tau}_\gamma^{def}\\ u_\gamma(c_t)-\alpha\left[\boldsymbol{u}\left(\boldsymbol{c}_\gamma\left(\bar{\tau}_\gamma^{\boldsymbol{def}}\right)\right)-\boldsymbol{u}\left(\boldsymbol{c}_\gamma\right)\right] & \text{if } \tau_\gamma > \bar{\tau}_\gamma^{def}\end{cases}$$

   - Two-sided: anchoring (Bernheim et al, '15)
     - ⋆ counterfactual prediction: ↑ default ⇒ ↑ paritcipation
2. Endorsement effects/ Default as advice:
   - Large effects despite public randomization into AE (Blumenstock et al, '17)
3. Unawareness: employees may not be aware of AE
   - Text reminders have no effect on default effect (Blumenstock et al, '17)
   - No effect from a financial education intervention (Choi et al, '11)

Opt-out Cost

Opt-out cost model: back

$$V^S(d) = u\left((1-s)\,w - \mathbb{1}_{(s \neq d)}.\boldsymbol{k}\right) + \delta V(sw)$$

Assume $u' > 0$, $u'' < 0$ and $V' > 0$, $V'' < 0$

Proposition. With an opt-out cost, increasing the default contribution rate from $\underline{d}$ to $\overline{d}$ (weakly) increases contributions strictly below $\underline{d}$:

Loss Aversion

Loss aversion model: back

$$U(s,d) = \begin{cases} u_a(c_t(s)) + \eta\left(u_a(c_t(s)) - u_a(c_t(d))\right) & \text{if } s < d \\ u_a(c_t(s)) + \eta\lambda\left(u_a(c_t(s)) - u_a(c_t(d))\right) & \text{if } s \geq d \end{cases}$$

where $c(s)$ is the optimized consumption policy:

$$c_t(s) = \operatorname{argmax}\,(1+\eta)\,u_a(c_t) + \beta\,(1-m_a)\,\mathbb{E}_t\left(V_{t+1}(s)\right)$$

Proposition. Under loss-averse preferences, increasing the default contribution rate from $\underline{d}$ to $\overline{d}$ (weakly) decreases contributions strictly below $\underline{d}$:

$$Pr\left(s^* < \underline{d} \,|\, d = \underline{d}\right) \leq Pr\left(s^* < \underline{d} \,|\, d = \overline{d}\right)$$

Psychological Anchoring

Anchoring model: back

Following Bernheim et al (2015), I assume that the anchoring parameter χ shifts the participants preferences toward the value that would rationalize the default as an optimal choice:

$$V_t^S(d) = \begin{cases} u_a(c_t(s)) + (\beta + \chi)(1 - m_a)\mathbb{E}_t(V_{t+1}(d)) & \text{if } s < d \\ u_a(c_t(s)) + \beta(1 - m_a)\mathbb{E}_t(V_{t+1}(d)) & \text{if } s = d \\ u_a(c_t(s)) + (\beta - \chi)(1 - m_a)\mathbb{E}_t(V_{t+1}(d)) & \text{if } s > d \end{cases}$$

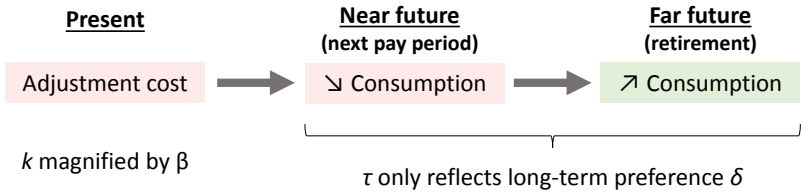
Proposition. When the default serves as a psychological anchor, increasing the default contribution rate from $\underline{d}$ to $\overline{d}$ (weakly) decreases contributions strictly below $\underline{d}$:

$$Pr(s^* < \underline{d} \,|\, d = \underline{d}) \leq Pr\left(s^* < \underline{d} \,|\, d = \overline{d}\right)$$

The Role of Present Bias

Specification I

back Mech back SMM



- Present bias ↗ inertia ...
- ... but does not affect contribution conditional on acting

Present bias ⇔ higher adj. cost

The Role of Present Bias

Specification I

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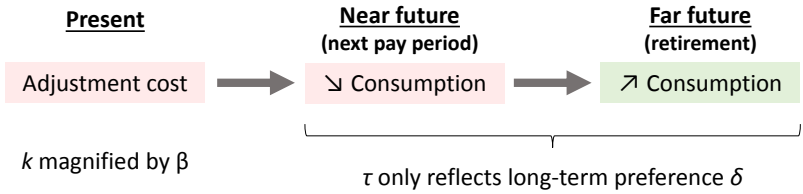

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The Role of Present Bias

Specification II

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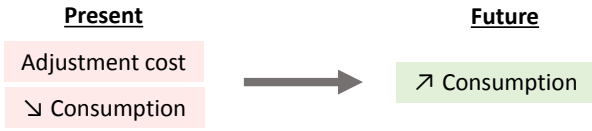


τ reflects present biased preference β δ

Estimation:

- I fix the short-term discount factor at (β) and re-estimate the model:

  $\{\beta = 0.5\,;\, \delta = 0.999\,;\, \sigma = 0.625\,;\, k = \$430\}$ and

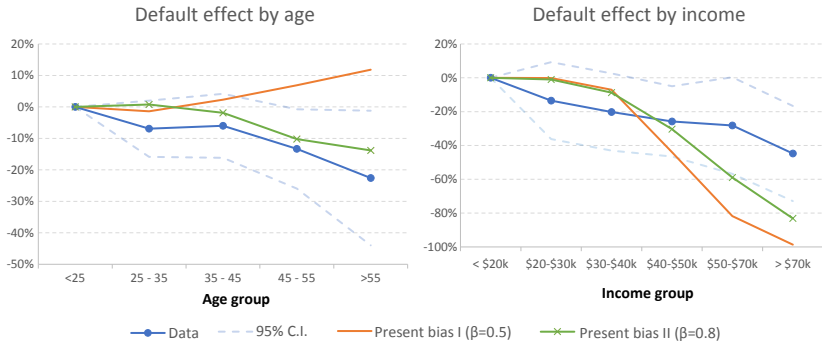
  $\{\beta = 0.8\,;\, \delta = 0.989\,;\, \sigma = 0.454\,;\, k = \$269\}$

With a higher long-term discount factor the model no longer fits the age-heterogeneity

The Role of Present Bias

Model Fit: back SMM

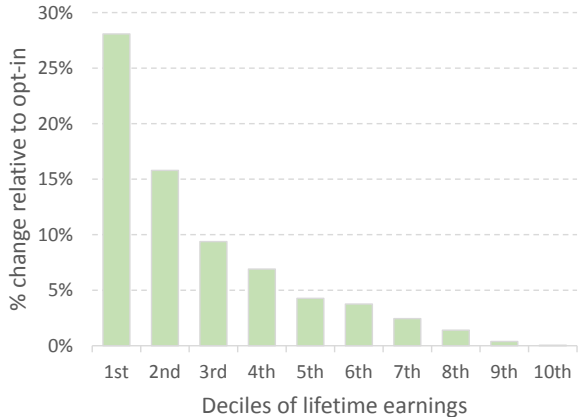
With a higher long-term discount factor the model no longer fits the age-heterogeneity



Long-Term Effect - Present bias $\beta = 0.5$

$$\{\beta = 0.5\,;\, \delta = 0.999\,;\, \sigma = 0.625\,;\, k = \$430\}$$

AE policy at 3% adopted by all employers: back



Long-Term Effect - Present bias $\beta = 0.8$

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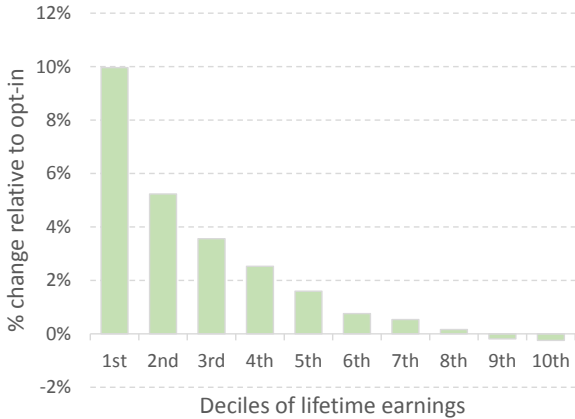
AE policy at 3% adopted by all employers: back



Optimal policies - Present bias $\beta = 0.5$

back

$$\{\beta = 0.5\,;\, \delta = 0.999\,;\, \sigma = 0.625\,;\, k = \$430\}$$

		Employers profits	Matching rate	Wages adjustment
Utilitarian	$\pi = 1$	AE 9%	AE 9%	AE 9%
	$\pi = 0$	AE 10%	AE 10%	AE 10%
Inequality averse	$\pi = 1$	AE 10%	AE 10%	AE 10%
	$\pi = 0$	AE 11%	AE 10%	AE 11%

Optimal policies - Present bias $\beta = 0.8$

back

$$\{\beta = 0.8\,;\, \delta = 0.989\,;\, \sigma = 0.454\,;\, k = \$269\}$$

		Employers profits	Matching rate	Wages adjustment
Utilitarian	$\pi = 1$	Opt-in	Opt-in	Opt-in
	$\pi = 0$	AE 15%	Opt-in	Opt-in
Inequality averse	$\pi = 1$	AE 6%	AE 5%	AE 5%
	$\pi = 0$	AE 6%	AE 5%	AE 6%

Extension: Proportional Opt-out Cost

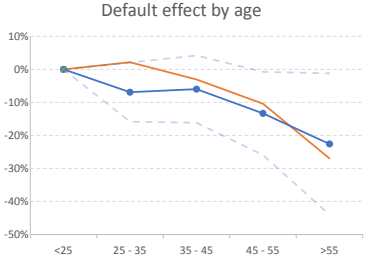
Model: back SMM back Heter

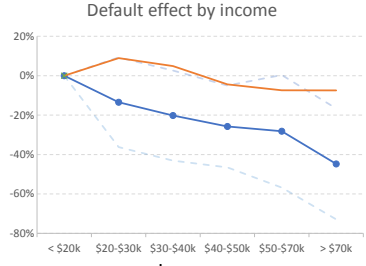
I introduce an opt-out cost $\tilde{k}$ that is proportional to earnings:

$$u_a\left(c_t - \mathbb{1}_{(s_t \neq d_t)}\tilde{k}.w_t\right)$$

Estimate:

I estimate $\tilde{k}$ to be equal to 3.16% of quarterly income (i.e. \$292 for average earner) - $\{\beta = 0.985; \sigma = 0.334; k = 3.2\%\}$

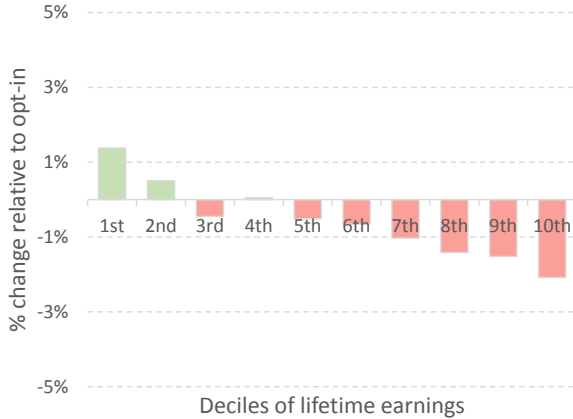




Long-Term Effect - Proportional Cost

$$\{\beta = 0.985\,;\, \sigma = 0.334\,;\, k = 3.2\%\}$$

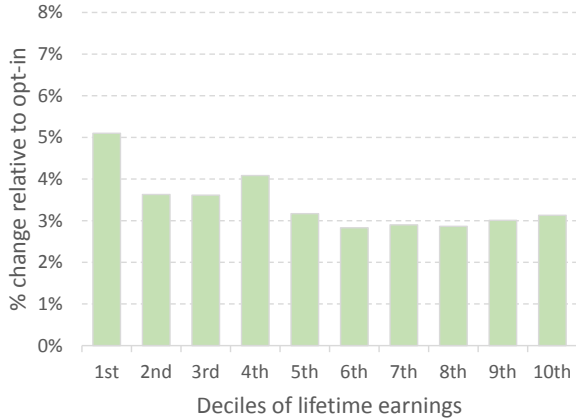
AE policy at 3% adopted by all employers: back



Long-Term Effect - Proportional Cost

$$\{\beta = 0.985\,;\, \sigma = 0.334\,;\, k = 3.2\%\}$$

AE policy at 6% adopted by all employers: back



Optimal policies - Present bias $\beta = 0.5$

back

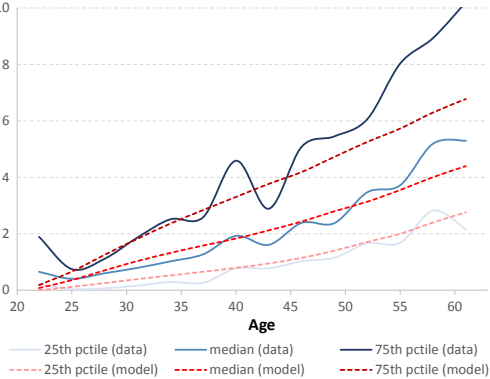
$$\{\beta = 0.985\,;\, \sigma = 0.334\,;\, k = 3.2\%\}$$

		Employers profits	Matching rate	Wages adjustment
Utilitarian	$\pi = 1$	AE 6%	AE 4%	AE 4%
	$\pi = 0$	Opt-in	Opt-in	AE 4%
Paternalistic	$\pi = 1$	AE 6%	AE 5%	AE 5%
	$\pi = 0$	AE 6%	AE 5%	AE 5%

Wealth to earnings ratio over the lifecycle

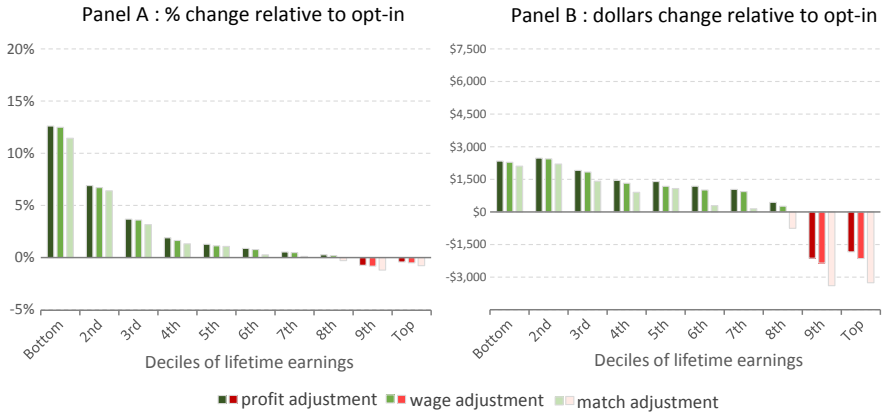
Ratio of net wealth to earnings by age: back

- Data: Survey of Consumer Finances 2016
- Sample: households where head or spouse has any type of account-based pension plan on current job
- Total wealth: all assets net of all outstanding debt



AE Adoption by all Employers

AE policy at 3% adopted by all employers: back



AE Adoption by all Employers

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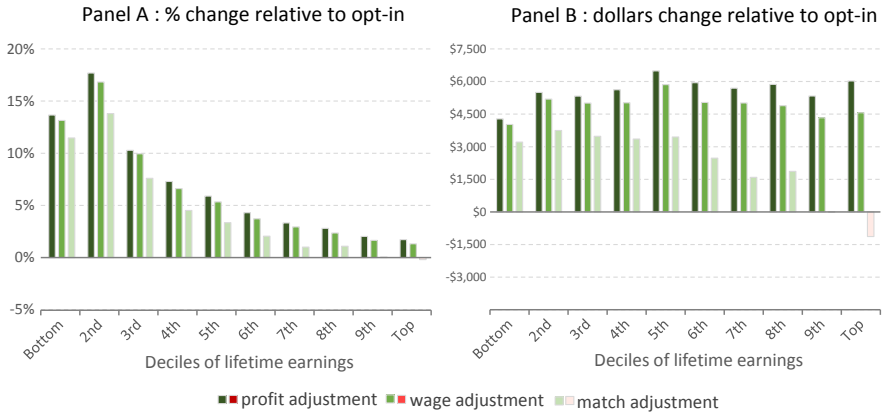
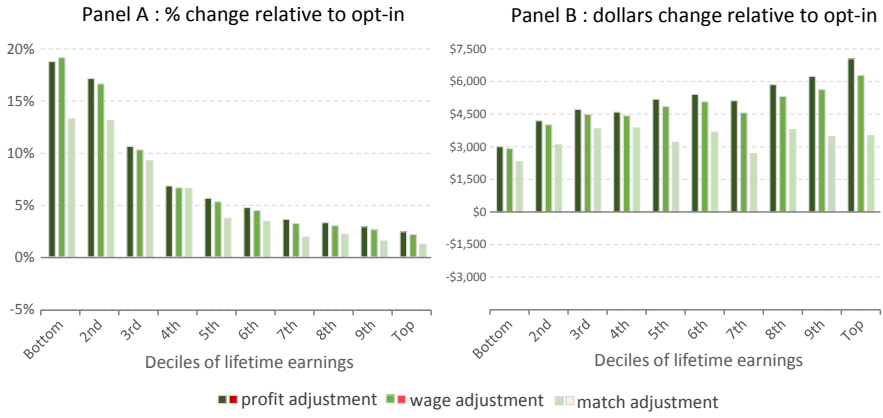


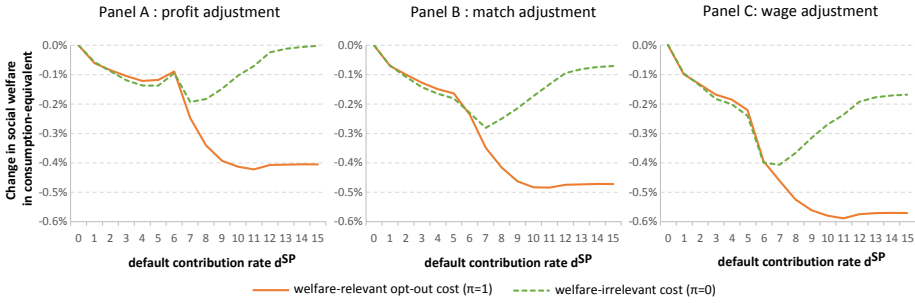
AE Adoption by all Employers

AE policy at 10% adopted by all employers: back



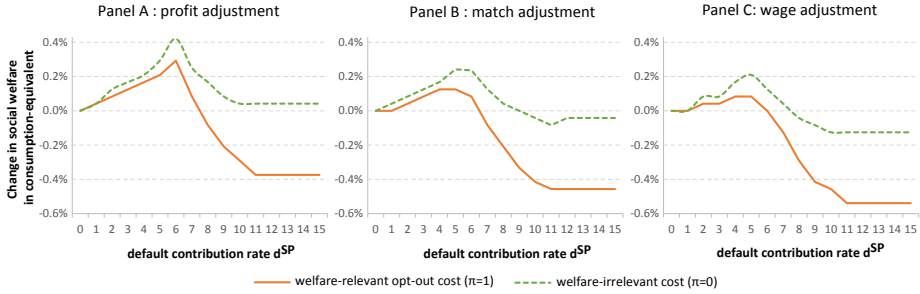
Utilitarian Policymaker

back



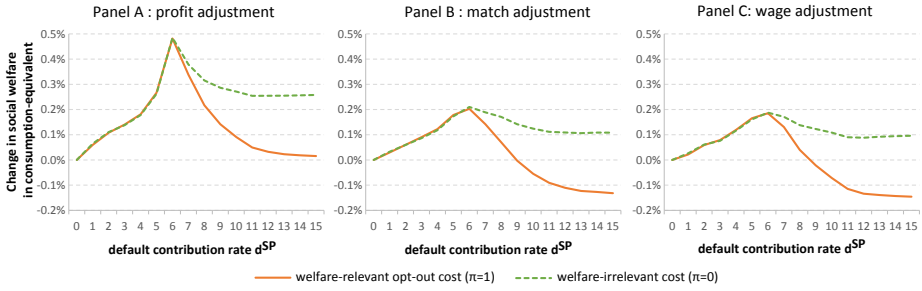
Inequality-Averse Policymaker

back



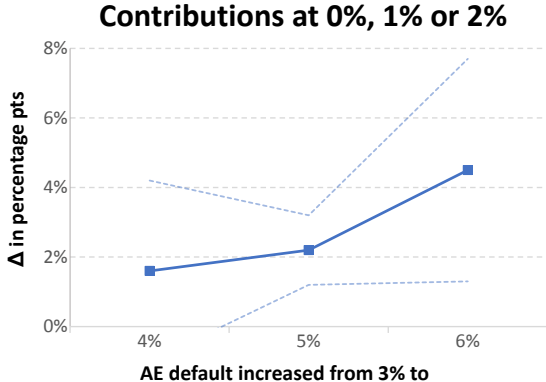
Paternalistic Policymaker

back



Out-of-Sample Validation I

Compare workers hired before/after AE default increased



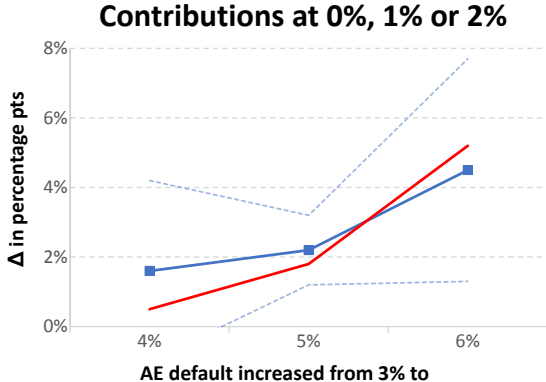
Controls: plan, year, and age FEs, log tenure

Sample: 50 US 401k plans.97,714 workers w/ $\leq$1y of tenure post grace-period

All cases: 85% success rate at the 10% level back

Out-of-Sample Validation I

Compare workers hired before/after AE default increased



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All cases: 85% success rate at the 10% level back

Out-of-Sample Validation I

back

	Contrib<initial default		Sample size		
	(1)	(2)	(3)	(4)	(5)
	Data	Model	Nbr. of	Nbr. of	P-value
	86 plans	prediction	plans	worker	difference
Default increased by 1%					
Default 2% → 3%	0.017	0.007	11	31,364	**[0.483]**
	(0.014)				
Default 3% → 4%	0.016	0.005	10	13,116	**[0.430]**
	(0.013)				
Default 4% → 5%	-0.003	0.013	3	1,821	**[0.513]**
	(0.020)				
Default 5% → 6%	-0.016	0.034	5	3,970	[0.005]
	(0.009)				
Individual's characteristics	✓				
Plan FE	✓				

Out-of-Sample Validation I

back

	Contrib<initial default		**Sample size**		
	(1)	(2)	(3)	(4)	(5)
	Data	Model	Nbr. of	Nbr. of	P-value
	86 plans	prediction	plans	worker	difference
Default increased by 2%					
Default 1% → 3%	0.023	0.020	1	1,067	**[0.917]**
	(0.025)				
Default 2% → 4%	-0.005	0.012	4	1,793	**[0.231]**
	(0.011)				
Default 3% → 5%	0.022***	0.018	14	56,011	**[0.456]**
	(0.005)				
Default 4% → 6%	0.031***	0.047	9	17,989	[0.048]
	(0.007)				
Default 6% → 8%	0.067***	0.148	1	673	[0.000]
	(0.021)				

Out-of-Sample Validation I

back

	Contrib<initial default		Sample size		
	(1)	(2)	(3)	(4)	(5)
	Data	Model	Nbr. of	Nbr. of	P-value
	86 plans	prediction	plans	worker	difference
Default increased by 3 or 4%					
Default 3% → 6%	0.045***	0.052	26	27,190	**[0.648]**
	(0.016)				
Default 3% → 7%	0.060	0.132	2	4,219	**[0.146]**
	(0.017)				
Individual's characteristics	✓				
Plan FE	✓				

* p<0.10, ** p<0.05, *** p<0.01

Out-of-Sample Validation II

back

Preference estimates from U.S. 401(k) plans ...

... predict the response to a national policy in the U.K.

Out-of-Sample Validation II

back

Preference estimates from U.S. 401(k) plans ...

... predict the response to a national policy in the U.K.

US pref. estimates...

Opt-out cost at £160 (avg. exch. rate over 06-17)

Time pref. $\delta = 0.987$ and $\sigma = 0.455$

... w/ UK calibration:

Estimate the UK Income process using AShE

Estimate heterogeneity in employers contribution formulas (5 types)

Calibrate the UK tax and public pensions system

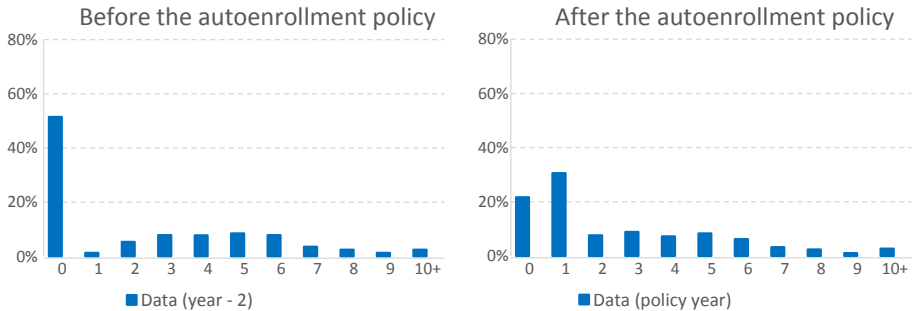
Out-of-Sample Validation II

back

Mandatory Autoenrollement for all U.K. private employees

Policy roll-out by employer size between 2012-2017

Within-job effect:



Out-of-Sample Validation II

back

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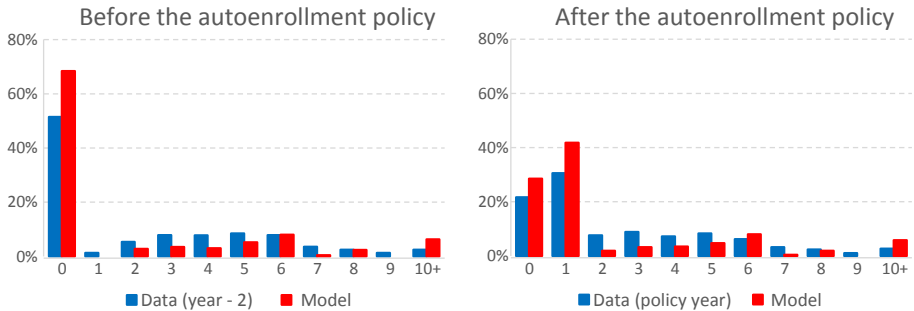

Out-of-Sample Validation II

back

Mandatory Autoenrollement for all U.K. private employees

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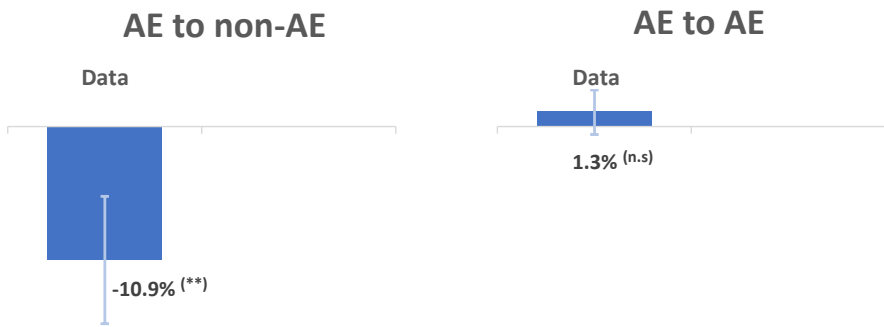
Participation after a job-switch:



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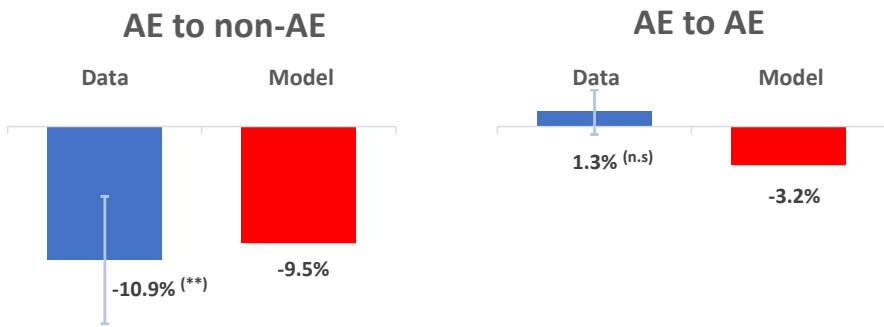
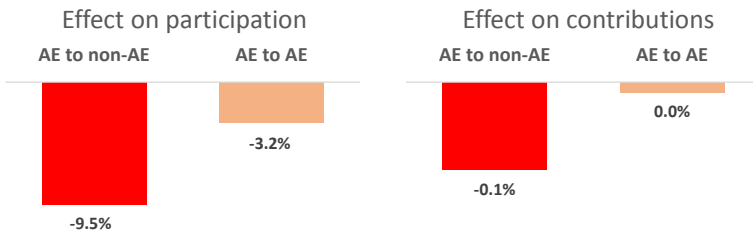


Out-of-Sample Validation II

back

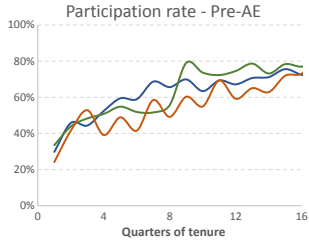
back

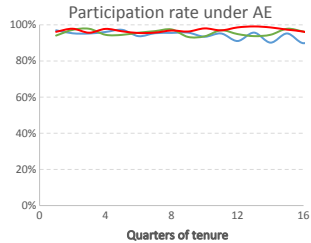
After job-switch (from AE to AE):

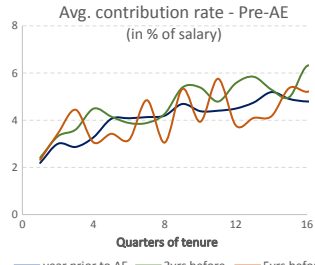


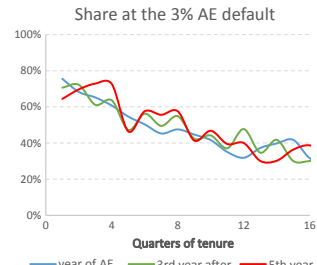
Peer Effects?

No difference in saving behavior btw. those hired in the 12 months prior to AE and those hired earlier back









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