Who is a Passive Saver Under Opt-In and Auto Enrollment?

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Defaults are influential

- ▶ Madrian and Shea, 2001 (participation)

- ▶ Choi et al. 2004 (contribution rates)

- ▶ Choi, Laibson and Madrian, 2005 (asset allocation)

- ▶ Mitchell et al. 2009 (distributions)

- ▶ Goda and Manchester, 2013 (plan choice).

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Pension Protection Act of 2006 paved the way for more widespread use of automatic enrollment

What are the mechanisms that underlie the default effect?

▶ Transaction costs

▶ Procrastination induced by present-biased preferences

▶ Misperceptions of returns to saving
  ▶ Low levels of financial literacy
  ▶ Exponential-growth bias

▶ Anchoring

▶ Endorsement from employer

▶ Limited attention

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Mechanism may inform how defaults influence the selection into default (and optimal policy)

What do we do?

1. What is the role of behavioral and cognitive factors in retirement savings choices?

2. How does the role change with default regime?

Summary of findings

In an opt-in environment, cognitive factors (i.e., financial literacy) predict contribution behavior.

One s.d. increase in financial literacy $\rightarrow$

- ▶ 1/3 lower likelihood of being at the default contribution rate (0%)
- ▶ 1/5 higher likelihood of being at the annual maximum ($18,000)
- ▶ Eight percent higher annual contributions

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In auto enrollment regime, behavioral factors (i.e., present bias) predict contribution behavior.

One s.d. increase in present bias $\rightarrow$
- ▶ 1/3 higher likelihood of being at the default contribution rate (3%)
- ▶ 1/4 lower likelihood of being at the annual maximum ($18,000)
- ▶ Nine percent lower annual contributions

Summary of findings

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Statistically insignificant effects of behavioral factors.

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Statistically insignificant effects of cognitive factors.

Existing literature and contributions

Most similar studies:

▶ Brown and Previtero (2014) use last-minute enrollment in employer's health plan to classify procrastinators. They find that this classifcation predicts retirement savings participation, contribution and asset allocation.

▶ Blumenstock et al. (2017) conduct RCT of employer-sponsored defaults for a short-term savings account for an Afghan firm. They elicit time preference and find that present bias predicts default behavior.

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Our contributions:

▶ Combine direct elicitations of cognitive and behavioral factors known to influence saving decisions with administrative data on savings in a U.S. context

▶ Examine importance of biases in driving saving outcomes in two distinct default regimes

How should we expect cognitive and behavioral biases to affect default behavior?

Making an active decision is a benefit-cost analysis (Carroll et al., 2009).

- ▶ Benefit: utility gain from optimal saving rate relative to default saving rate
- ▶ Costs:
    - ▶ Transaction costs (filling out forms)
    - ▶ Cognitive costs (computing optimal savings rate)

How should we expect cognitive and behavioral biases to affect default behavior?

Under opt-in enrollment:

▶ Because default is far from optimum, benefits of changing from default $>>$ costs, limiting the role for procrastination to inhibit active choice

▶ Only those with high cognitive or transaction costs remain at the default

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Under automatic enrollment:

▶ Difference between optimum and default is smaller, reducing benefits of changing from default $\Rightarrow$ procrastination may play a larger role in explaining likelihood of remaining at default

▶ Effect of high cognitive/transaction costs is mitigated

Cognitive and behavioral factors that influence active decision-making

We focus on three factors that have been well-studied in the retirement savings literature:

- ▶ Financial literacy $\longrightarrow$ influences cognitive costs (Ameriks et al., 2003; Lusardi and Mitchell, 2007, 2011, 2014; Hung, Parker and Yoong, 2009; van Rooij, Lusardi and Alessi, 2012)
- ▶ Exponential-growth bias $\longrightarrow$ influences perception of optimal saving rate (Eisenhauer and Ventura, 2006; Stango and Zinman, 2009; Levy and Tasoff, 2015a, b, d; Goda et al., 2015)
- ▶ Present bias $\longrightarrow$ influences ability to overcome transaction and cognitive costs and take action (Laibson, 1997; O'Donoghue and Rabin, 1998, 1999, 2001; Heutel et al., 2014; Goda et al., 2015; Stango, Yoong and Zinman, 2017)

Financial Literacy (Lusardi and Mitchell, 2014)

1. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?
   - ▶ More than today
   - ▶ Exactly the same
   - ▶ Less than today
2. True or False: Buying a single company stock usually provides a safer return than a stock mutual fund.
   - ▶ True
   - ▶ False
3. Suppose you had $100 in a savings account and the interest rate was 2% per yer. After 5 years, how much do you think you would have in the account if you left the money to grow?
   - ▶ More than $102
   - ▶ Exactly $102
   - ▶ Less than $102

Financial Literacy (cont.)

4. True or False: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less.
   - ▶ True
   - ▶ False
5. If interest rates fall, what should happen to bond prices?
   - ▶ They should rise
   - ▶ They should fall
   - ▶ They should stay the same
   - ▶ There is no relationship between bond prices and the interest rate

Exponential-growth bias is a misperception in the value of assets growing growing exponentially
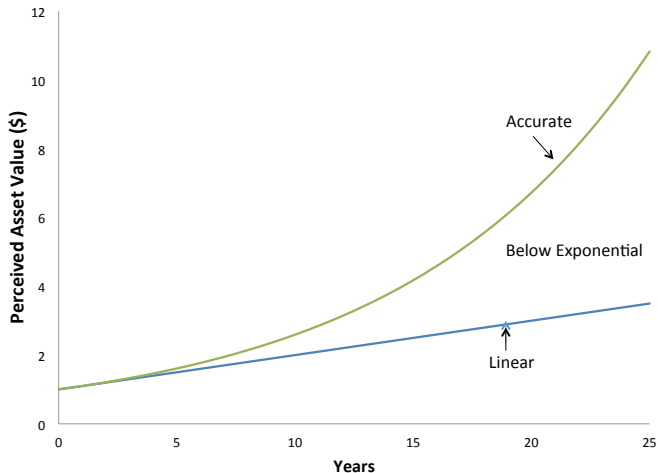
EGB and the Budget Constraint

Let $p(\vec{\imath}, t; \alpha)$ be the agent's perception of the value of a dollar invested at time t at period $T > t$:

$$p(\vec{\imath}, t; \alpha) = \prod_{s=t}^{T-1}(1 + \alpha i_s) + \sum_{s=t}^{T-1}(1 - \alpha)i_s \tag{1}$$

- ▶ $\alpha = 1$: individual correctly perceives growth to be exponential
- ▶ $\alpha = 0$: individual incorrectly perceives growth to be linear
- ▶ $\alpha \in (0, 1)$: individual perceptions in between

EGB affects the intertemporal budget constraint:

$$\sum_{s=0}^{T} \hat{c}_s \cdot p(\vec{\imath}, s; \alpha_i) \leq \sum_{s=0}^{T} y_s \cdot p(\vec{\imath}, s; \alpha_i) \tag{2}$$

Present Bias: Quasi-hyperbolic Discount Function

We assume individual i has quasi-hyperbolic utility (Laibson, 1997) over a vector of consumption $x \in \mathbb{R}^{T-t+1}$ of the form:

$$U_{i,t}(x) \equiv u_i(x_t) + \beta_i \sum_{\tau=t+1}^{T} \delta_i^{\tau-t} u_i(x_\tau) \tag{3}$$

- ▶ δ_i is long-run discount factor (i.e. tradeoffs between future dates)
- ▶ Individual use $\beta_i \times \delta_i$ when considering tradeoffs involving today
- ▶ $1 - \beta_i$ is degree of present bias ($\beta = 1$ is not present biased)

Partnership with the U.S. Office of Personnel Management (OPM)

▶ Agency that provides human resources, leadership and support to most federal agencies

▶ 5,472 employees as of April 2017 located primarily in DC, MD, PA and VA

Linked administrative and survey data

▶ Administrative data from HR records and TSP contribution elections

▶ Online survey fielded March-April 2017 with 29 percent response rate

Institutional details: Thrift Savings Plan (TSP)

Benefits-eligible federal employees can participate in the Thrift Savings Plan (TSP), in addition to a mandatory defined benefits plan

- ▶ Base TSP contribution = 1 percent of pay
- ▶ Agency matches each dollar of an employee's first 3 percent of pay and $0.50 on the dollar for the next two percent
- ▶ Maximum contribution limit set by IRS; $18,000 in 2017
- ▶ Can elect to invest contributions in five different funds or a lifecycle fund

Default provisions

- ▶ Employees hired before August 1, 2010 had to opt-in to contribute to TSP ("opt-in regime")
- ▶ Employees hired on or after August 1, 2010 were automatically enrolled in TSP at a 3 percent contribution rate ("auto-enrollment regime")

Elicitation of EGB and Present Bias

Exponential-Growth Bias ("Alpha"): adapted from Levy and Tasoff (2015).
3 questions used to get a mean Alpha. Measured twice using slightly different
questions.

▶ Example question: "An asset has an initial value of $100 and grows at an
interest rate of 10% each period. What is the value after 20 periods?"
▸ more

Time preference parameter elicitation ("Beta" and "Delta"): adapted
time-staircase procedure from Falk et al. (2016). Measured twice using slightly
different questions.

▶ *Present-Future staircase:* "Would you rather receive $100 today or $[X] in
12 months?"

▶ *Future-Future staircase:* "Would you rather receive $120 in 12 months or
$[Y] in 24 months?"

▶ Subjects answer 5 questions for each staircase to titrate to an indifference
point.

Outcome variables - administrative data

	Opt-In Regime	Auto-Enroll Regime
TSP Amount ($/year)	8699.480	5160.133
	(6418.502)	(4987.889)
Passive		0.118
		(0.323)
At Default	0.088	0.147
	(0.284)	(0.354)
At Maximum Match	0.614	0.576
	(0.487)	(0.495)
At 0%	0.088	0.048
	(0.284)	(0.215)
At Cap	0.131	0.042
	(0.337)	(0.202)
Observations	735	661

Notes: TSP Amount reflects annual Roth and Traditional TSP contributions subject to annual maximum, including catch-up contributions if eligible. See text for more details.

▸ Non-responders

Survey data

	mean	sd	min	max
Alpha	0.50	0.80	-1.00	3.00
Beta	1.01	0.09	0.65	1.40
Delta	0.87	0.09	0.65	1.00
Fin Lit	4.06	0.82	0.00	5.00
Trust in Fed. Gov. as Employer	3.24	1.04	0.00	5.00
Observations	1396			

Notes: Trust in Fed. Gov. as Employer reflects level of agreement with the following statement: "Benefits by Fed. Gov. are designed to best fit the needs of its employees."
Fin Lit reflects number of correct answers among Big Five financial literacy questions.

▸ Correlations

Covariates - administrative data

	mean	sd	min	max
Total Pay	86437.89	32253.08	26786.00	187000.00
Age	47.32	10.82	21.00	80.00
Eligible for Catch-Up Contributions	0.46	0.50	0.00	1.00
Tenure in Years	8.77	7.87	0.00	43.00
Highest Education				
High School	0.16	0.37	0.00	1.00
College	0.16	0.37	0.00	1.00
Bachelor	0.40	0.49	0.00	1.00
Post Bachelor	0.28	0.45	0.00	1.00
Race/Ethnicity:				
White	0.71	0.45	0.00	1.00
Hispanic	0.05	0.21	0.00	1.00
Black	0.20	0.40	0.00	1.00
Other Race	0.05	0.21	0.00	1.00
Work Location:				
DC	0.26	0.44	0.00	1.00
MD	0.09	0.29	0.00	1.00
PA	0.29	0.46	0.00	1.00
VA	0.05	0.21	0.00	1.00
Other Location	0.31	0.46	0.00	1.00
Job Position:				
Non-Supervisory	0.87	0.34	0.00	1.00
Team Leader	0.03	0.18	0.00	1.00
Supervisor or Manager	0.10	0.30	0.00	1.00
Observations	1396			

Effects of behavioral and cognitive factors on staying at default and passivity

	(1) At Default	(2) At Default	(3) Passive
Alpha	-0.012	-0.021	-0.003
	(0.012)	(0.018)	(0.016)
Beta	0.199	-0.554***	-0.394**
	(0.145)	(0.193)	(0.174)
Delta	0.054	-0.118	-0.085
	(0.130)	(0.176)	(0.163)
Fin Lit (z-score)	-0.027**	-0.007	-0.007
	(0.013)	(0.016)	(0.014)
Alpha	OLS	OLS	OLS
Beta	OLS	OLS	OLS
Delta	OLS	OLS	OLS
Sample	Opt-In Regime	Auto-Enroll Regime	Auto-Enroll Regime
Mean DV	.088	.147	.118
R-squared	0.081	0.098	0.113
Cluster	735	661	651
Observations	735	661	651

Notes: Standard errors in parentheses and clustered on ID. Dependent variables as indicated in column heading. All specifications also include controls for Salary, Salary squared, Age, Age squared, Education, Race, Tenure, Tenure squared, Eligibility for Catch-Up contributions, Work Location, Job Position and Trust in Fed. Gov. as Employer. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Effects of behavioral and cognitive factors on participation and annual cap

	(1) At 0%	(2) At 0%	(3) At Cap	(4) At Cap
Alpha	-0.012	0.016	-0.001	0.004
	(0.012)	(0.015)	(0.013)	(0.008)
Beta	0.199	-0.113	0.208	0.136*
	(0.145)	(0.124)	(0.141)	(0.070)
Delta	0.054	-0.008	0.231	0.211**
	(0.130)	(0.121)	(0.145)	(0.083)
Fin Lit (z-score)	-0.027**	0.006	0.025**	0.001
	(0.013)	(0.010)	(0.012)	(0.008)
Alpha	OLS	OLS	OLS	OLS
Beta	OLS	OLS	OLS	OLS
Delta	OLS	OLS	OLS	OLS
Sample	Opt-In Regime	Auto-Enroll Regime	Opt-In Regime	Auto-Enroll Regime
Mean DV	.088	.048	.131	.042
R-squared	0.081	0.043	0.139	0.134
Cluster	735	661	735	661
Observations	735	661	735	661

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Effects of behavioral and cognitive factors on maximizing match and TSP contributions

	(1) At Maximum Match	(2) At Maximum Match	(3) TSP Amt.	(4) TSP Amt.
Alpha	0.002 (0.021)	-0.002 (0.027)	268.808 (241.668)	146.018 (197.238)
Beta	-0.498** (0.228)	0.079 (0.244)	3230.082 (2782.962)	5259.325*** (1626.511)
Delta	0.082 (0.226)	-0.353 (0.234)	5651.808** (2601.748)	3947.988** (1627.919)
Fin Lit (z-score)	0.002 (0.018)	-0.022 (0.021)	684.246*** (233.851)	56.760 (146.118)
Alpha	OLS	OLS	OLS	OLS
Beta	OLS	OLS	OLS	OLS
Delta	OLS	OLS	OLS	OLS
Sample	Opt-In Regime	Auto-Enroll Regime	Opt-In Regime	Auto-Enroll Regime
Mean DV	.614	.576	8699.48	5160.133
R-squared	0.086	0.073	0.282	0.450
Cluster	735	661	735	661
Observations	735	661	735	661

Notes: Standard errors in parentheses and clustered on ID. Dependent variables as indicated in column heading. All specifications also include controls for Salary, Salary squared, Age, Age squared, Education, Race, Tenure, Tenure squared, Eligibility for Catch-Up contributions, Work Location, Job Position and Trust in Fed. Gov. as Employer. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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	(0.018)	(0.021)	(233.851)	(146.118)
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Beta	OLS	OLS	OLS	OLS
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Robustness to correcting for measurement error

Main concern in OLS: measurement error in survey measures of present bias, exponential-growth bias and financial literacy

We use the "Obviously Related Instrumental Variables" (ORIV) approach by Gillen et al. (2017)

▶ instrument survey measure with another survey measure
▶ use all measures simultaneously as regressors and instruments for one another
▶ cluster standard errors by subject

Effects of behavioral and cognitive factors on staying at default and passivity (ORIV)

	(1) At Default	(2) At Default	(3) Passive
Alpha	-0.022 (0.016)	-0.030 (0.027)	-0.002 (0.025)
Beta	0.256 (0.189)	-0.622** (0.247)	-0.481** (0.229)
Delta	0.245 (0.257)	-0.235 (0.361)	-0.182 (0.342)
Fin Lit (z-score)	-0.028** (0.014)	-0.012 (0.016)	-0.012 (0.014)
Alpha	IV	IV	IV
Beta	OLS	OLS	OLS
Delta	IV	IV	IV
F-Stat Alpha	177.386	88.049	93.108
F-Stat Delta	25.811	21.581	20.329
Sample	Opt-In Regime	Auto-Enroll Regime	Auto-Enroll Regime
Mean DV	.087	.143	.116
R-squared	.071	.089	.11
Cluster	705	638	629
Observations	4230	3828	3774

Notes: Standard errors in parentheses and clustered on ID. Dependent variables as indicated in column heading. Controls same as in OLS specifications. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Effects of behavioral and cognitive factors on participation and annual cap (ORIV)

	(1) At 0%	(2) At 0%	(3) At Cap	(4) At Cap
Alpha	-0.022 (0.016)	0.021 (0.023)	-0.008 (0.018)	0.009 (0.013)
Beta	0.256 (0.189)	-0.110 (0.166)	0.289 (0.200)	0.230** (0.102)
Delta	0.245 (0.257)	-0.008 (0.251)	0.408 (0.302)	0.419** (0.179)
Fin Lit (z-score)	-0.028** (0.014)	0.007 (0.010)	0.031*** (0.012)	0.003 (0.008)
Alpha	IV	IV	IV	IV
Beta	OLS	OLS	OLS	OLS
Delta	IV	IV	IV	IV
F-Stat Alpha	177.386	88.049	177.386	88.049
F-Stat Delta	25.811	21.581	25.811	21.581
Sample	Opt-In Regime	Auto-Enroll Regime	Auto-Enroll Regime	Opt-In Regime
Mean DV	.087	.047	.129	.042
R-squared	.071	.042	.131	.11
Cluster	705	638	705	638
Observations	4230	3828	4230	3828

Notes: Standard errors in parentheses and clustered on ID. Dependent variables as indicated in column heading. Controls same as in OLS specifications. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Effects of behavioral and cognitive factors on maximizing match and TSP contributions (ORIV)

	(1) At Maximum Match	(2) At Maximum Match	(3) TSP Amt.	(4) TSP Amt.
Alpha	0.009	-0.014	343.284	285.815
	(0.029)	(0.041)	(335.707)	(311.523)
Beta	-0.446	-0.137	5401.092	7091.528***
	(0.310)	(0.316)	(3809.223)	(2126.547)
Delta	0.115	-0.738	9347.045*	7962.024**
	(0.457)	(0.488)	(5482.675)	(3492.184)
Fin Lit (z-score)	-0.001	-0.022	711.376***	66.282
	(0.019)	(0.022)	(245.291)	(150.289)
Alpha	IV	IV	IV	IV
Beta	OLS	OLS	OLS	OLS
Delta	IV	IV	IV	IV
F-Stat Alpha	177.386	88.049	177.386	88.049
F-Stat Delta	25.811	21.581	25.811	21.581
Sample	Opt-In Regime	Auto-Enroll Regime	Opt-In Regime	Auto-Enroll Regime
Mean DV	.613	.58	8685.865	5204.147
R-squared	.086	.06	.26	.438
Cluster	705	638	705	638
Observations	4230	3828	4230	3828

Notes: Standard errors in parentheses and clustered on ID. Dependent variables as indicated in column heading. Controls same as in OLS specifications. * p < 0.10, ** p < 0.05, *** p < 0.01.

Overview and Conclusion

▶ We investigate the relationship between cognitive/behavioral factors and saving outcomes across two different enrollment regimes using admin + survey data

▶ We find that:
  ▶ Before auto-enrollment: higher financial literacy $\Rightarrow$ being at the default contribution rate $\downarrow$, being at the annual maximum $\uparrow$, and annual contributions $\uparrow$
  ▶ After auto-enrollment: higher present bias $\Rightarrow$ being at the default contribution rate $\uparrow$, being at the annual maximum $\downarrow$, and annual contributions $\downarrow$

▶ Results suggest that the underlying default determines selection into default option

▶ Potential role for understanding ways to mitigate present bias and low levels of financial literacy in order to change saving outcomes

Ongoing work

▶ Examine effects of change in default asset allocation on contribution outcomes
  ▶ Change in default asset allocation on September 5, 2015 from G Fund (government securities) to L Fund (lifecycle fund)

▶ Randomly roll out new and revamped Ballpark Savings Estimator tool to help federal employees understand current preparedness for retirement and ways to achieve retirement saving goals
  ▶ Completed roll-out to OPM employees
  ▶ Stay tuned!

Exponential-Growth Bias Elicitation

▶ "An asset has an initial value of $100 and grows at an interest rate of 5% each year. How much do you think this asset is worth after 50 years?"

▶ "An asset has an initial value of $100 and grows at an interest rate of 7% each year. How much do you think this asset is worth after 30 years?"

Outcome variables - administrative data - non-responders

	Opt-In Regime	Auto-Enroll Regime
TSP Amount ($/year)	7084.558	4573.400
	(5918.133)	(4652.062)
Passive		0.177
		(0.382)
At Default	0.107	0.203
	(0.309)	(0.402)
At Maximum Match	0.615	0.537
	(0.487)	(0.499)
At 0%	0.107	0.082
	(0.309)	(0.274)
At Cap	0.072	0.038
	(0.258)	(0.191)
Observations	2080	1763

Notes: TSP Amount reflects annual Roth and Traditional TSP contributions subject to annual maximum, including catch-up contributions if eligible. See text for more details.

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Correlation matrix

	Mean Alpha	Mean Beta	Mean Delta	Fin Lit (z-score)
Mean Alpha	1.000			
Mean Beta	-0.016	1.000		
Mean Delta	0.034	-0.466***	1.000	
Fin Lit (z-score)	0.118***	0.032	0.023	1.000
Observations	1396			

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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