Made poorer by choice:

Worker outcomes in social security v. private retirement accounts

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Retirement Facts

- Social Security Income
  - 37.6 million retirees receive SS benefits
  - Max benefit: $30,396/year
  - Average benefit: $15,228/year
  - 39% of total elderly income

- For many households, Social Security is the primary source of income. Among elderly,
  - 26% (9 million) rely on SS for 90% or more of their income

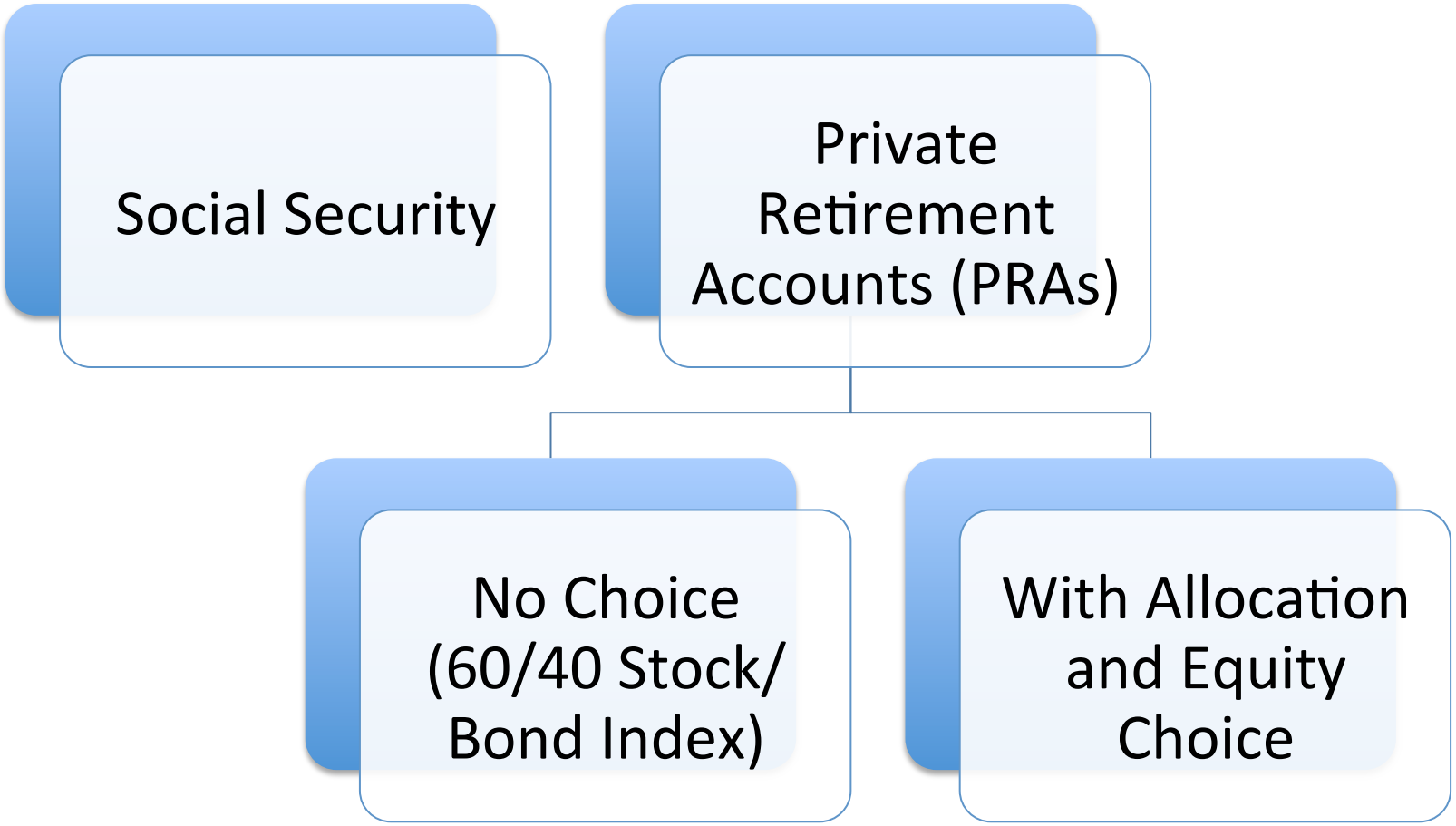
Source: http://www.socialsecurity.gov/pressoffice/basicfact.htm and Income of the Population 55 or Older, 2010.

Ida May's Cohort Received

$14 trillion subsidy (2014 dollars)

Geanakoplos, Mitchell, Zeldes, 1998

Objective:
Compare Worker-Level Outcomes



How does investor choice affect outcomes in PRAs?

- Baseline: All workers choose 60/40 stock/bond portfolio

- Allocation Choice: Choice of stock v. bonds
  - Investor outcome will depend on his stock-bond allocation decision.

- Equity Choice: Choice of funds/stocks
  - Portfolio theory: Choice improves the opportunity set and leads to unambiguous improvement in utility
  - In practice: Choice can lead to bad outcomes if an investor fails to diversify.

Summary of Main Results: Choice increases the probability of bad retirement outcomes

- Choice in PRAs increases the risk of PRA income shortfall relative to Social Security benefits. For example, at age 88
  - **Without choice**, the risk of a shortfall is **31.0%**
  - **With allocation and equity choice**, the risk of a shortfall is **45.4%**

- Allocation Choice ➔ Low Stock Market Participation and investors fail to enjoy the equity risk premium

- Equity Choice ➔ Some investors fail to diversify increasing the probability of an income shortfall in retirement

- At reasonable levels of risk aversion, the majority of workers prefer Social Security to PRAs.

Summary of Main Results: Representative Worker Outcome is a flawed metric

- Representative Worker earns average wage of his cohort in each year during his life
- Representative Worker is indifferent between SS and PRA for risk aversion of 4.0
- A worker chosen randomly at birth (i.e., with uncertain income) is indifferent for risk aversion of 1.7
- Why?
  - Social Security provides insurance against a low lifetime earnings outcome
  - The Representative Worker earns much more than most workers (and thus does not benefit from the progressive nature of SS)
  - The Representative Workers works much longer than most workers (though benefits are tied to only 35 years of work)

Choice in private accounts

- Allocation choice: All major reform models allow stock/bond choice.

- Equity choice: Most reform models advocate restricted choice set.
  - In practice, retirement options have generally expanded over time.
    - 401(k) – number of options have generally increases
    - Australia Superannuation Funds: Choice of Funds Legislation, 2005

Method

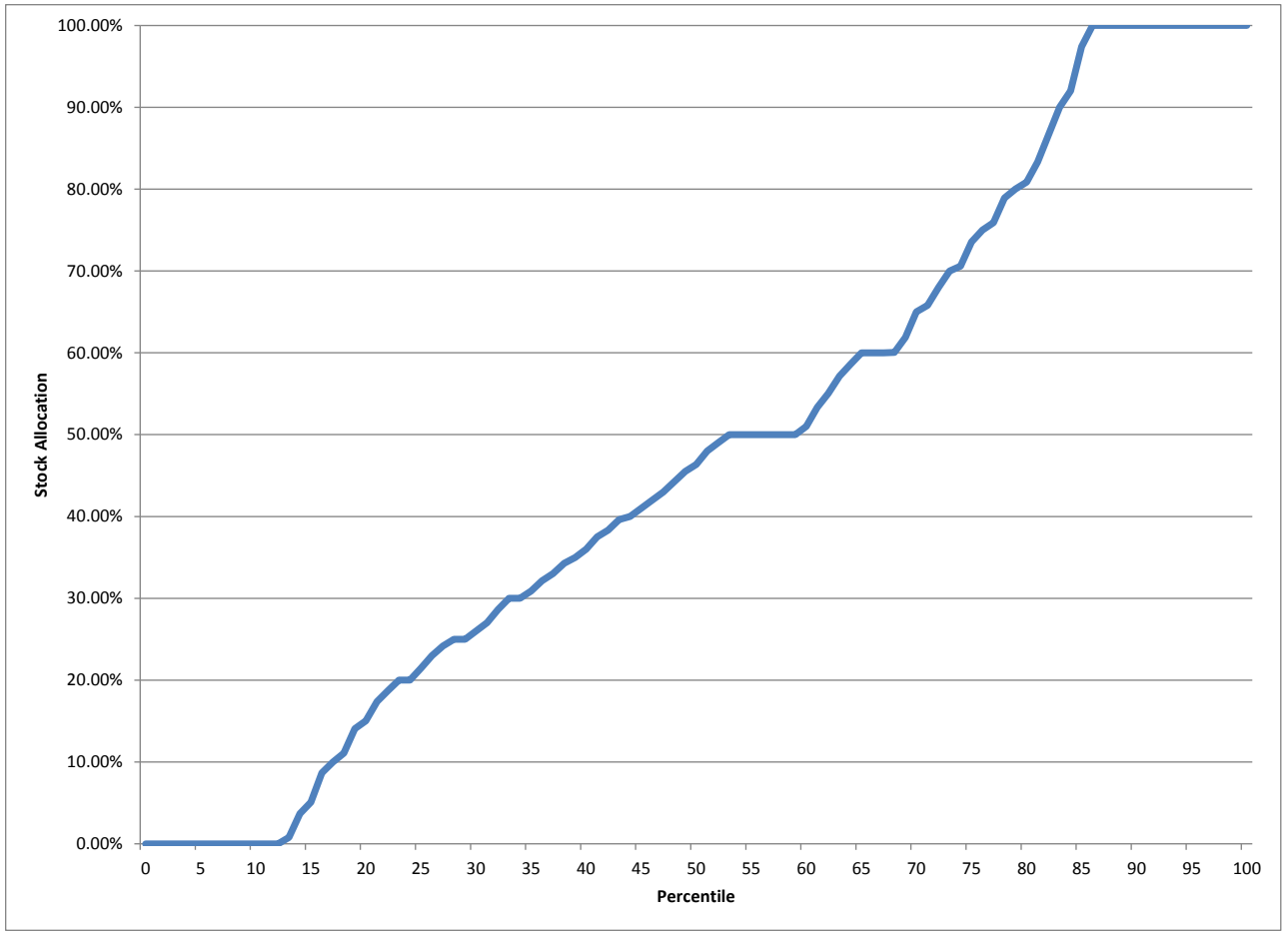
- Simulation
  - Use microsimulation data for income paths of 1979 birth cohort (~3,600 individuals)

- Baseline comparison for each worker:
  - Social Security Benefit
  - Distribution of Outcomes under PRA alternative without choice (forced 60/40 stock/bond index fund for all workers)

Method

- Relative to baseline results, we consider two dimensions of investor choice:
  - Allocation choice: Allow for cross-sectional variation in stock/bond allocation.
    - Bootstrap to observed allocation choice in 2010 SCF
  - Equity choice: Allow for cross-sectional variation in equity outcomes.
    - Bootstrap to observed dispersion in 401k returns using data from Large Discount Broker

Choice in PRA benefits: allocation



- Source: 2010 Survey of Consumer Finance
- Average equity holdings in IRA, Keogh, 401k

Comparing Social Security and PRA Outcomes

- Shortfall Risk
  - "Worker outcomes"
    - Incidence of Shortfall (PRA < SS)
    - Across individuals and simulated market outcomes
  - "Percent at risk"
    - % of individuals facing > 25% chance of shortfall
- Utility
  - Assume time additive CRRA Utility
  - Assume each worker has a given level of risk aversion
  - Calculate proportion of workers who prefer Social Security to PRA
  - The paradox of utility with choice: E.g., no risk averse investor would fail to diversify, yet many investors do not do so.

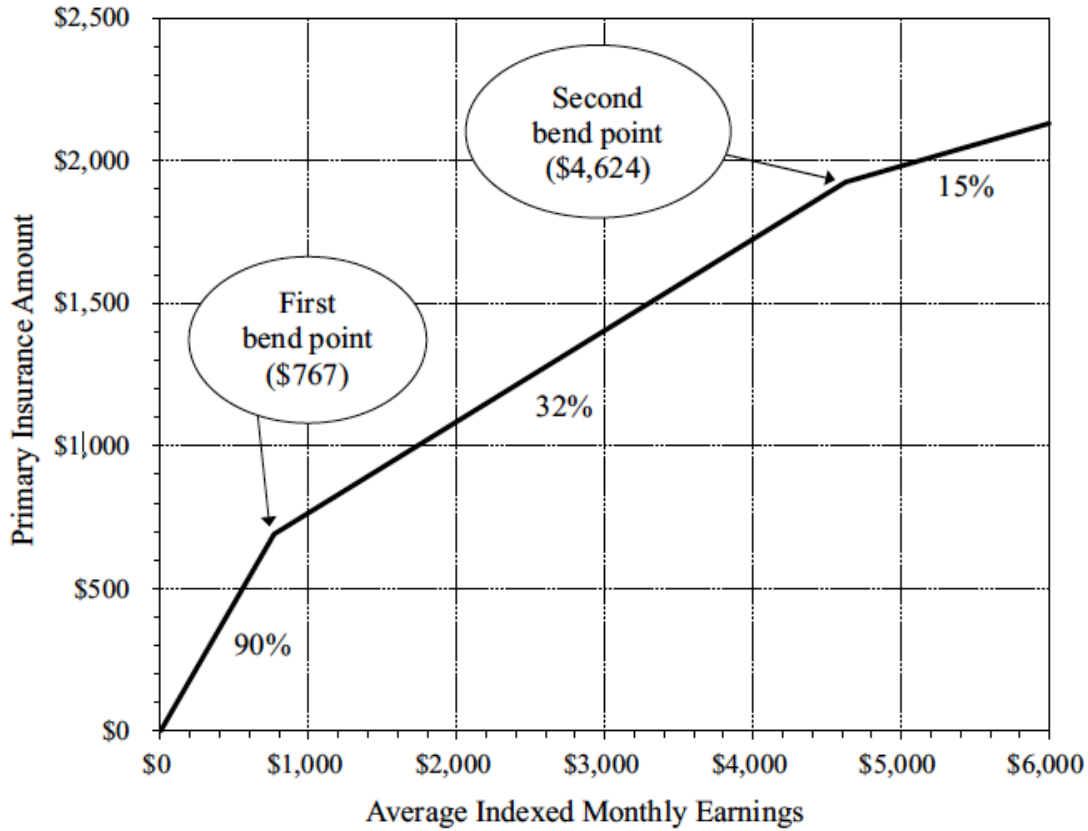
Common Key Assumptions

- Retirement Age of 68
- Price Inflation of 3%
- Wage Inflation of 4%
- Assume savings rate that sets internal rate of return for one cohorts Social Security equal to interest rate on long term government bonds
- Microsimulation Data for Each Worker
  - Earnings
  - Mortality

Estimating PayGo benefits

- Concave function of average indexed monthly earnings (AIME)

Figure V.C1.—Primary-Insurance-Amount Formula for Those Newly Eligible in 2012



Estimating PRA benefits

- Pre-retirement:
  - Savings rate
  - Portfolio allocation (equity and bond funds)
  - Return assumptions
- Post-retirement:
  - Homogenous investment in variable annuity
  - Return assumptions
  - Mortality

Key Assumptions: PRA Outcomes

- Baseline:
  - All workers invested in 60/40 Stock/Bond Index
  - Bond returns = post-war average
  - Stock returns shaved from post-war average
  - Annual 60/40 return earns 7.7% (SD ≈ 14.2%)

- Mandatory Variable Annuity in Retirement
  - Payout is proportional to worker's contribution to cohort annuity
  - Implicit assumption: No bequest

Return Assumptions (cont'd)

- Volatility, Correlation, and E(R) on bonds is based on Historical averages
- Equity Returns (& the Equity Premium Puzzle)
  - Shave 2% from historic returns
  - Mehra and Prescott (1985)
  - Most scholars argue the equilibrium equity risk premium is lower
- Portfolio Returns are Consistent with Pension Fund Projections
  - 60/40 portfolio yields average annual return of 7.7%
  - Range of Expected Returns for State Pension Funds: 7.3% to 8.5% (Novy-Marx and Rauh, 2008)

Key Assumptions: Choice in PRA Accounts

- Allocation Choice: Bootstrap to Survey of Consumer Finances Data on Allocations Choice
  - For each worker, randomly draw from a U(0,1) distribution and assign the worker that stock/bond allocation for his life
- Equity Choice: Bootstrap to observed outcome in 401(k) accounts at a Large Discount Broker
  - For each worker, add idiosyncratic risk to the annual market outcome.

Main Results (Table 4)

	Age	No Stock Investment Choice	With Stock Investment Choice
Panel A: Worker Outcomes (% PRA < SS Benefit)			
60/40	68	20.4	35.4
Stock/Bond	78	26.8	39.7
Allocation	88	31.0	42.4
Stock/Bond	68	26.1	37.4
Allocation	78	32.6	42.5
Choice	88	36.5	45.4

Distribution of Payout Ratio (PRA/SS)

Results by earnings quintile (Table 5)

		No Stock Investment Choice across Lifetime Earnings Quintiles					Stock Investment Choice across Lifetime Earnings Quintiles				
		1	2	3	4	5	1	2	3	4	5
	Age	(Lo)				(Hi)	(Lo)				(Hi)
		Panel A: Worker Outcomes (% PRA < Social Security Benefit)									
60/40 Stock/Bond Allocation	68	45.3	29.8	14.4	8.8	3.6	58.4	46.1	31.9	24.8	15.8
	78	50.3	37.0	22.1	15.9	9.0	60.8	49.8	36.8	30.1	21.1
	88	51.6	40.0	26.8	20.7	13.2	61.3	51.3	39.4	33.1	24.4
Stock/Bond Allocation Choice	68	55.0	38.4	19.8	12.2	5.2	64.6	50.2	32.9	24.4	14.9
	78	57.9	44.3	28.1	20.6	12.0	66.0	54.0	39.2	31.5	21.6
	88	58.2	46.5	32.5	25.6	16.7	65.9	55.2	42.1	35.2	25.6

Results by return quintile (Table 6)

		No Stock Investment Choice across Lifetime Earnings Quintiles					Stock Investment Choice across Lifetime Earnings Quintiles				
	Age	1 (Lo)	2	3	4	5 (Hi)	1 (Lo)	2	3	4	5 (Hi)
		Panel A: Worker Outcomes (% PRA < Social Security Benefit)									
60/40 Stock/Bond Allocation	68	45.3	29.8	14.4	8.8	3.6	58.4	46.1	31.9	24.8	15.8
	78	50.3	37.0	22.1	15.9	9.0	60.8	49.8	36.8	30.1	21.1
	88	51.6	40.0	26.8	20.7	13.2	61.3	51.3	39.4	33.1	24.4
Stock/Bond Allocation Choice	68	55.0	38.4	19.8	12.2	5.2	64.6	50.2	32.9	24.4	14.9
	78	57.9	44.3	28.1	20.6	12.0	66.0	54.0	39.2	31.5	21.6
	88	58.2	46.5	32.5	25.6	16.7	65.9	55.2	42.1	35.2	25.6

Utility Calculations

- Utility Assumptions

$$E[u] = E\left[\sum_{t=68}^{100} \beta^{t-68} u(C_t)\right] \qquad u(C_t) = \frac{C_t^{1-\gamma} - 1}{1-\gamma}$$

- Beta = 0.96

- Assume all households have relative risk aversion parameter (γ)
  - Consider values of 2.0, 3.8, or 6.7

- Calculate the proportion of households that prefer SS to PRAs

What is the distribution of risk aversion?

- Many papers and a variety of estimates
- Our approach: calibrate risk aversion using estimates from a setting that maps closely to our own (Barsky et al., QJE, 1997):

Suppose that you are the only income earner in your family, and you have a good job guaranteed to give you your current (family) income every year for life. that you are about to retire, and have two choices for a pension.

You are given the opportunity to take a new and equally good job, with a 50-50 chance it will double your (family) income and a 50-50 chance that it will cut your (family) income by a 33%.

Would you take the new job?

(Barsky, Juster, Kimball, & Shapiro (1997)

Estimates of Risk Aversion

	Upper	Lower	% of Respondents
Reject 33%; Reject 20%	∞	3.76	64.6
Reject 33%; Accept 20%	3.76	2	11.6
Accept 33%; Reject 50%	2	1	10.9
Accept 33%; Accept 50%	1	0	12.8

Barsky, Juster, Kimball, Shapiro (1997)

Suppose that you are about to retire, and have two choices for a pension.

1. You would have a pension equal to your take-home family income now.

2. There would be a 50-50 chance the pension would double your take-home income and a 50-50 chance that it be 20% less than your take-home.

You would have no other source of income, and no chance of employment or help from family, friends, or agencies.

Which would you prefer, Choice 1 or Choice 2?

Hanna, Gutter, & Fan (2001)

Median implied coefficient of risk-aversion, $\gamma = 5.65$

Percentage of Workers that Prefer SS to PRAs at different levels of risk aversion (γ)

	γ	No Investment Choice	Investment Choice
60/40 Allocation	2.0	27.7	54.6
	3.8	53.8	95.5
	5.65	84.6	99.9
Allocation Choice	2.0	33.0	64.5
	3.8	67.5	99.8
	5.65	92.0	100.0

Percentage of Workers that Prefer SS to PRAs at different levels of risk aversion (γ) by Earnings Quintile

		Panel B: By Quintile of Lifetime Earnings									
		Quintile of Lifetime Earnings					Quintile of Lifetime Earnings				
		1 (Lo)	2	3	4	5 (Hi)	1 (Lo)	2	3	4	5 (Hi)
60/40	2.00	98.7	39.5	0.0	0.0	0.0	100.0	99.5	62.3	11.3	0.0
Stock/Bond	3.80	100.0	98.6	60.9	9.7	0.0	100.0	100.0	100.0	99.6	78.0
Allocation	5.65	100.0	100.0	99.1	88.2	35.5	100.0	100.0	100.0	100.0	99.6
Stock/Bond	2.00	100.0	63.5	1.4	0.0	0.0	100.0	100.0	84.3	36.3	2.0
Allocation	3.80	100.0	100.0	89.1	46.0	2.3	100.0	100.0	100.0	100.0	98.9
Choice	5.65	100.0	100.0	100.0	97.1	63.0	100.0	100.0	100.0	100.0	100.0

Percentage of Workers that Prefer SS to PRAs at different levels of risk aversion (γ) by Earnings Quintile

		No Investment Choice					With Investment Choice				
		Panel B: By Quintile of Lifetime Earnings									
		Quintile of Lifetime Earnings					Quintile of Lifetime Earnings				
		1 (Lo)	2	3	4	5 (Hi)	1 (Lo)	2	3	4	5 (Hi)
60/40	2.00	98.7	39.5	0.0	0.0	0.0	100.0	99.5	62.3	11.3	0.0
Stock/Bond	3.80	100.0	98.6	60.9	9.7	0.0	100.0	100.0	100.0	99.6	78.0
Allocation	5.65	100.0	100.0	99.1	88.2	35.5	100.0	100.0	100.0	100.0	99.6
Stock/Bond	2.00	100.0	63.5	1.4	0.0	0.0	100.0	100.0	84.3	36.3	2.0
Allocation	3.80	100.0	100.0	89.1	46.0	2.3	100.0	100.0	100.0	100.0	98.9
Choice	5.65	100.0	100.0	100.0	97.1	63.0	100.0	100.0	100.0	100.0	100.0

Representative Worker vs. Worker at Birth Indifference Risk Aversion Parameter

	No Investment Choice	Investment Choice
Worker who Earns Average Wage (Representative Worker)		
60/40 Allocation	4.01	2.29
Allocation Choice	3.60	2.08
Worker at Birth		
60/40 Allocation	1.68	1.33
Allocation Choice	1.55	1.23

Discussion

Why we may underestimate potential shortfalls:

- Mandatory Annuitization
- Assume low-fee mutual funds (40 bps)
- Assume self-managed accounts earn average returns
- Do not model variation in investor ability
  - Poor and less educated might plausibly earn lower returns
  - Be less likely to participate in stock markets
- Parametric assumptions may underestimate tail risks
  - E.g., Japan

Conclusion

- Choice risk is an important feature of PRA systems
  - Allocation choice reduces mean PRA income (low stock market participation)
  - Idiosyncratic risk from equity investment choice increases dispersion, number in worse-off set
- 'Representative' outcomes ignore dispersion and the impact on low-income workers