Are Americans Saving "Optimally" for Retirement?

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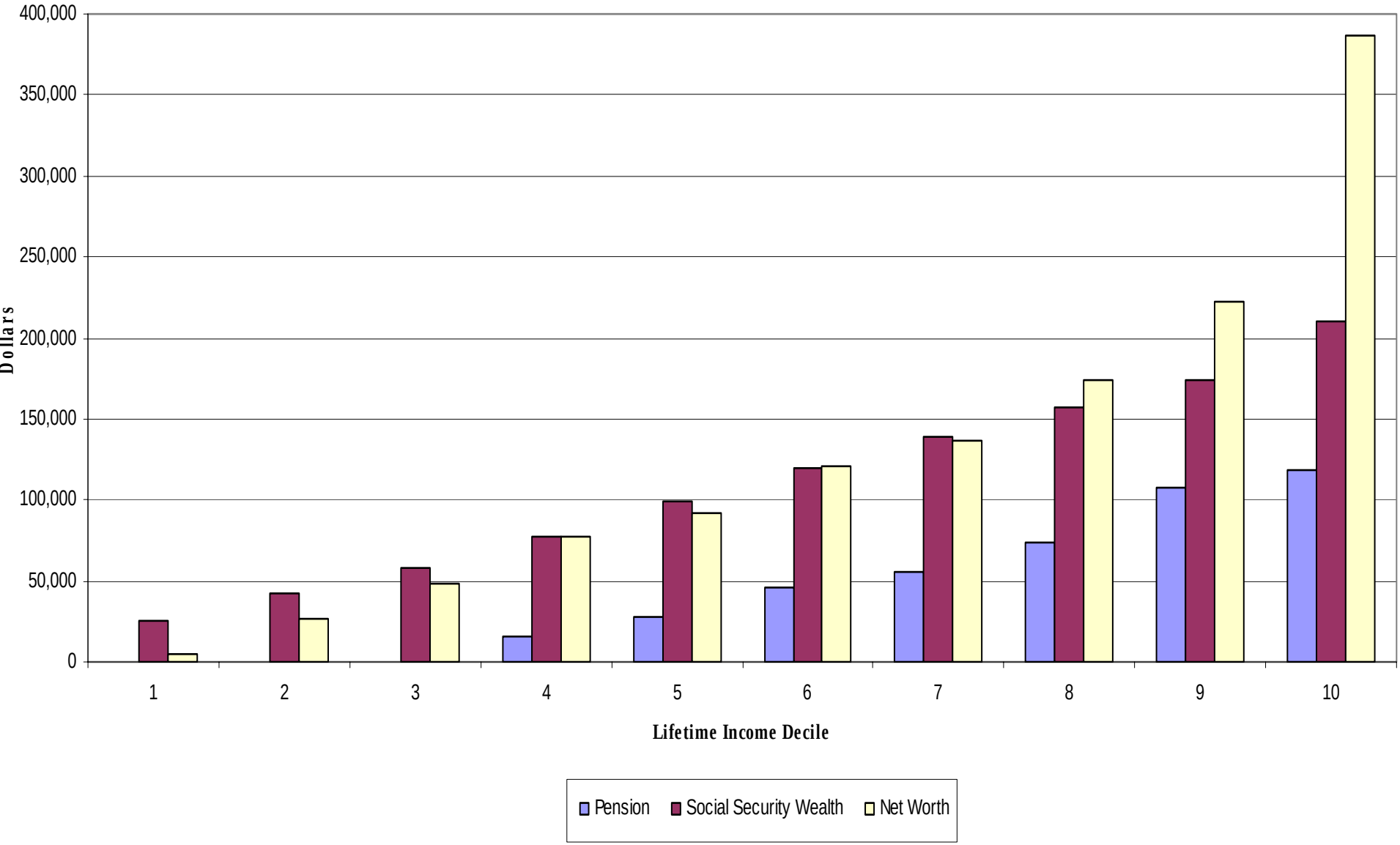
Figure 1: Median DB Pension Wealth, Social Security Wealth, and Net Worth (excluding DB Pensions) by Lifetime Income Decile, (1992 dollars)



Source: Authors' calculations from the 1992 HRS

Assessing the optimality of household saving

- Our strategy is straightforward.
  - We write down a specific augmented life-cycle model.
  - Use the model to determine optimal wealth, household-by-household in the HRS.
  - Compare the model to observed wealth in HRS.
    - Joint test: a) Did we write down a sensible model? And b) given the model, are people saving enough?
    - If the approach fails, it's hard to say whether a) or b) is the problem. A close match, however, is noteworthy for both the policy issue and for the life-cycle model.
  - Later in the paper we explore whether alternative models might do better and conduct sensitivity analyses.

We Build on the Large Life-Cycle Consumption Literature

- Features of the literature and our paper
  - Precautionary saving (Deaton; Carroll; Aiyagari).
  - Asset-tested transfers (Hubbard, Skinner, Zeldes, 1995)
  - Medical shocks (Palumbo, 1999)
    - We build on the fine paper of Engen, Gale, and Uccello (1999), which also addresses these issues.
  - The new features of our work include
    - 40 years of data on *actual* household earnings. These allow us to develop *household-specific* targets solving the dynamic programming problem for each household.
    - We model empirically household expectations about SS, DB pension benefits, and earnings trajectories
    - We incorporate time-varying representations of the individual income tax and transfer system.

A simple, augmented life-cycle model

$$E\left[\sum_{j=S}^{D}\beta^{j-S}U\left(c_j / g(A_j, K_j\right)\right], \text{ subject to}$$

$$y_j = e_j + ra_j + T(\cdot),\ j \in \{S,...,R-1\},$$

$$y_j = SS\left(\sum_{j=S}^{R} e_j\right) + DB\left(e_R\right) + ra_j + T(\cdot),\ j \in \{R,...,D\},$$

$$c_j + a_{j+1} = y_j + a_j - \tau\left(y_j\right),\ \ j \in \{S,...,R-1\}$$

$$c_j + a_{j+1} + m_j = y_j + a_j - \tau\left(y_j\right),\ \ j \in \{R,...,D\}$$

Recursive formulation: retired households

$$V(e_R, E_R, a, j, m, 3) = \max_{c,a'} \left\{ \begin{array}{l} U(c / g(2,0)) + \\ \beta p_{hj} p_{wj} \int V(e_R, E_R, a', j+1, m', 3) d\Omega_{jm}(m' \mid m) + \\ \beta p_{hj} (1 - p_{wj}) \int V(e_R, E_R, a', j+1, m', 1) d\Omega_{js}(m' \mid \frac{m}{2}) + \\ \beta p_{wj} (1 - p_{hj}) \int V(e_R, E_R, a', j+1, m', 2) d\Omega_{js}(m' \mid \frac{m}{2}) \end{array} \right\},$$

subject to $y = SS(E_R) + DB(e_R) + ra + T(e_R, E_R, a, j, n),$

$$c + a' + m = y + a - \tau(y),$$

Recursive formulation: the working adult case

$$V(e, E_{-1}, a, j) = \max_{c,a'} \left\{ U(c / g(A_j, K_j)) + \beta \int_{e'} V(e', E, a', j+1) d\Phi_j(e' \mid e) \right\},$$

subject to $y = e + ra + T(e, a, j, n),$

$$c + a' = y + a - \tau(y), \text{ and}$$

$$E = E_{-1} + e.$$

The Health and Retirement Study (HRS)

- National panel study of 7,702 households (12,652 persons) in 1992.
  - Face-to-face interviews of 1931-1941 birth cohort and their spouses (if married).
  - Oversamples blacks, Hispanics, and Floridians.
    - Follow-up telephone interviews every two years since 1992 (up to 2002).
      - We primarily use the 1992 survey.
  - Key features: social security earnings histories, fertility history, DB pension information, wealth data, and out-of-pocket medical expenses.

Our HRS Sample

- We make three sample exclusions, dropping...
  - 379 married households where one spouse refused to participate in the 1992 survey;
    - We lack needed information on household characteristics
  - 93 households who never worked full time;
    - We do not have a reasonable measure of lifetime resources
  - 908 households where the highest earner began working fulltime before 1951.
    - Our model used to impute earnings is computationally more difficult with missing initial values.
- Our resulting sample has 6,322 households.

Imputing Missing or Top-Coded Earnings Information

- Two problems (not created equally)
  - 22.8 percent of respondents refused to release SS earnings records (1951-91)
    - Results are unchanged if we drop these hhlds (fn. 9).
  - 16 percent between 1951-79 are top-coded (we have W2 records from 1980-91).
- Assume individual log-earnings process, where * indicates the latent variable

$$y^{*}_{i,0} = x'_{i,0}\beta_0 + \varepsilon_{i,0}$$

$$y^{*}_{i,t} = \rho y^{*}_{i,t-1} + x'_{i,t}\beta + \varepsilon_{i,t} \quad t \in \{1,2,...,T\}$$

$$\varepsilon_{i,t} = \alpha_i + u_{i,t}$$

Imputing Earnings, cont.

- Estimate with a dynamic panel Tobit model, with random effects assumption for the error term
- Parameters:
  - Estimate separately for 4 groups: gender x some college. Estimates are in Appendix Table A1.
- "Undoing" top-coded data:
  - Once we have the parameter estimates, we use a Gibbs Sampling procedure to calculate the conditional expectation of top-coded observations. An analytic expression is not available.

Model parameters

- Preferences

$$U(c) = \begin{cases} \dfrac{c^{1-\gamma}}{1-\gamma}, & \text{if } \gamma \neq 1 \\ \log c, & \text{if } \gamma = 1 \end{cases}$$

$$\beta = .97 \text{ and } \gamma = 3$$

- Equivalence scale

$$g(A_j, K_j) = (A_j + 0.7K_j)^{0.7}$$

- Taxes (dollar amounts in thousands)

$$\tau(y) = a_0 \left(y - \left(y^{-a_1} + a_2 \right)^{-1/a_1} \right), \text{ from Gouveia and Strauss (1994, 1999)}$$

Model parameters, continued

- Transfers

$$T = \max\left\{0, \underline{c} - \left[e + (1+r)a\right]\right\},$$

- Household Earnings Expectations

$$\log e_j = \alpha^i + \beta_1 AGE_j + \beta_2 AGE_j^2 + u_j$$

$$u_j = \rho u_{j-1} + \varepsilon_j,$$

  - Estimate parameters for 6 groups: married (one earner), married (two earner), and single, by 2 education statuses (college degree, yes or no).
    - Rho is .58 to .76 (sensitivity to .9)
- Real return 4% (sensitivity to 5%, 7%)

Model Parameters, continued

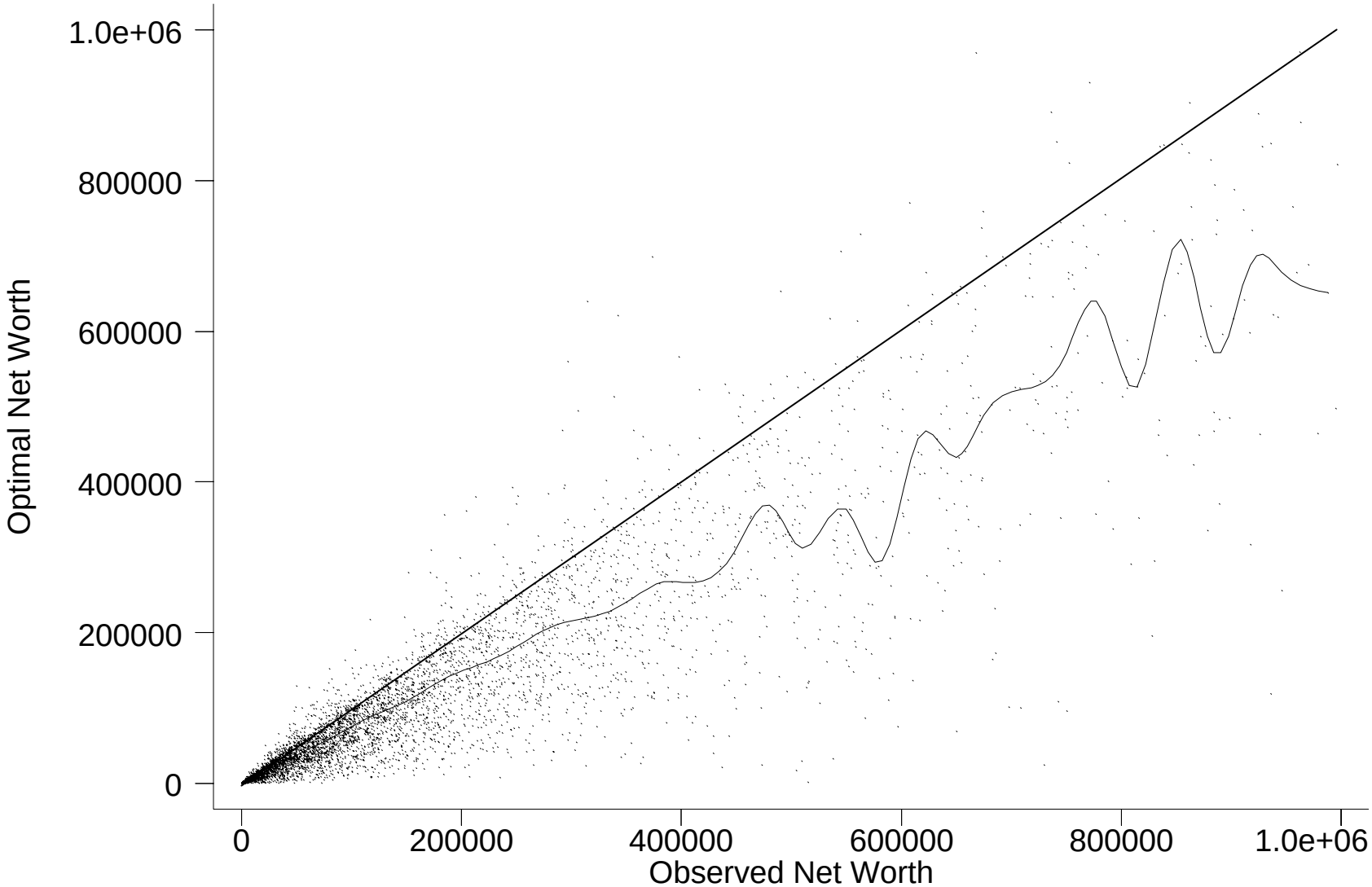
- Social Security
  - Using earnings realizations and expectations, we model social security rules.
- DB Pensions
  - We estimate empirical DB pension functions based on years of service in pension-covered job, unionization status, and the expectations about the final-year earnings.
- Out of Pocket Medical expenses (married*ed)

$$m_t = \beta_0 + \beta_1 AGE_t + \beta_2 AGE_t^2 + u_t,$$

$$u_t = \rho u_{t-1} + \varepsilon_t, \ \varepsilon_t \sim N(0, \sigma_\varepsilon^2),$$

Solving the model

- Start at the oldest possible date (100), solve backwards for all possible individual states of the world each period.
  - We construct discrete grids of feasible assets (100 points) and interpolate.
  - We successively move backwards solving for the value function and the decision rule for assets.
- Once we have all decision rules, we take the specific earnings realizations (from SS earnings records) for each household (and other characteristics) to solve for the optimal level of wealth in the 1992 HRS.


1.0e+06
800000
600000
400000
200000
0
Optimal Net Worth
0
200000
400000
600000
800000
1.0e+06
Observed Net Worth

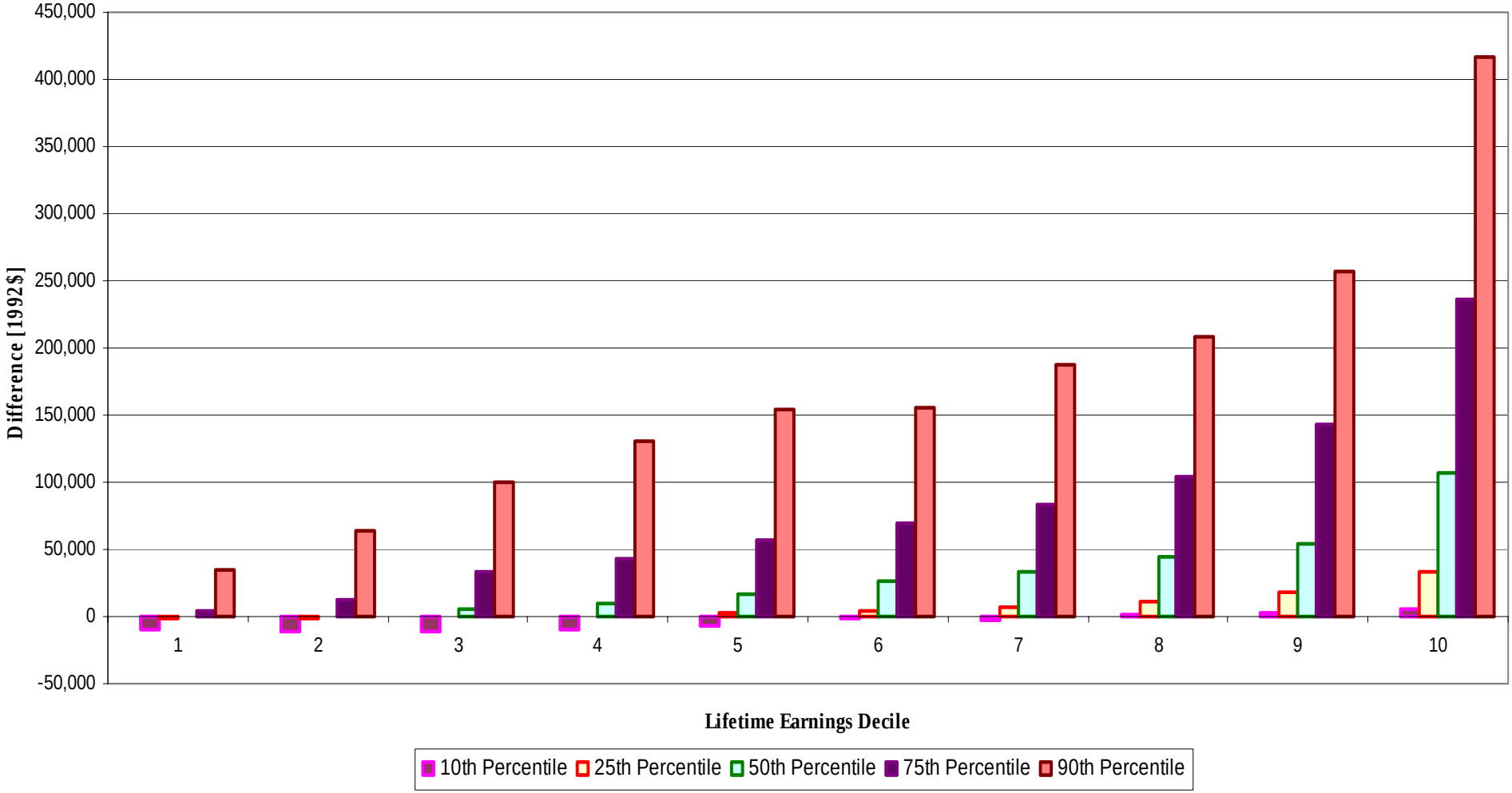
Group	Percentage Failing to Meet Optimal Target	Median Deficit (conditional on deficit)	Optimal Net Worth Target	Median Net Worth	Median Social Security Wealth	Median DB Pension Wealth
All Households	18.6%	$5,714	$69,777	$107,000	$97,150	$17,371
No High School Diploma	20.9%	$2,982	$22,524	$40,000	$71,774	$0
High School Diploma	19.1%	$5,315	$70,383	$106,000	$97,086	$21,290
College Degree	14.7%	$13,696	$137,528	$217,314	$127,167	$60,752
Post College Education	16.1%	$21,579	$178,924	$263,500	$126,691	$152,639
Lowest Lifetime Income Decile	34.6%	$2,885	$2,941	$5,288	$25,667	$0
4th Income Decile	24.5%	$5,500	$48,200	$80,938	$76,426	$18,428
7th Income Decile	12.2%	$13,415	$89,488	$138,000	$133,596	$55,100
Highest Lifetime Income Decile	6.4%	$29,062	$253,631	$395,889	$200,747	$123,192

Table 2X: Mean and Median Optimal Wealth Targets With and Without the Safety Net				
	With Safety Net		Without Safety Net	
	Median Target	Mean Target	Median Target	Mean Target
All Households	$69,777	$179,982	$69,785	$181,400
No High School Diploma	$22,524	$82,087	$25,285	$84,613
High School Diploma	$70,383	$161,442	$70,387	$162,760
College Degree	$137,528	$269,872	$137,533	$270,497
Post-College Education	$178,924	$382,371	$178,925	$382,897
Lowest Lifetime Income Decile	$2,941	$52,941	$9,562	$56,097
4th Income Decile	$48,200	$136,010	$48,209	$137,779
7th Income Decile	$89,488	$184,700	$89,495	$185,309
Highest Lifetime Income Decile	$253,631	$518,686	$253,632	$518,767

Correlates of Undersaving

	dF/dx §	Standard Error
2nd Lifetime Income Decile	.016	.018
3rd Lifetime Income Decile	-.005	.019
4th Lifetime Income Decile	.015	.023
5th Lifetime Income Decile	-.006	.024
6th Lifetime Income Decile	-.021	.025
7th Lifetime Income Decile	-.017	.028
8th Lifetime Income Decile	-.061**	.025
9th Lifetime Income Decile	-.046	.029
10th Lifetime Inc. Decile	-.043	.034
Retired	.001	.011
Has Pension	-.003	.011
Social Security Wealth	-9.41e-08	1.88e-07
Age	-.002	.001
Male	-.007	.012
Black	-.006	.012
Hispanic	-.028	.015
Married	-.272***	.017
High School Degree	.004	.012
College Degree	-.009	.018
Graduate Degree	-.000	.020
Self Employed	-.012	.014

Figure 3: Distribution of "Saving Adequacy"
Observed Minus Simulated Non-DB-Pension Net Worth (All Households)



Source: Authors' calculations from the baseline model and 1992 HRS

	Median Regression of "Saving Adequacy" (Actual-Optimal Net Worth)	
	Coefficient Estimates	Standard Error
8th Lifetime Income Decile	13,482.3***	5,237.6
9th Lifetime Income Decile	17,853.1***	6,860.9
10th Lifetime Income Decile	56,459.3***	5,420.9
Has Pension	-1,849.6**	1,231.1
Social Security Wealth	0.066***	0.0
Married	8,957.8***	1,620.3
Self-Employed	13,665.8***	2,993.9
Number of Children	-462.9**	212.4
Number of Grandchildren	162.1**	72.4
Subjective Probability of Living > 75	6.5	19.0
Subjective Probability of Living > 85	-8.4	18.0
Subjective Probability of Bequest > $10k	23.4***	9.7
Subjective Probability of Bequest > $100k	282.7***	30.6
Mid-Atlantic Division	471.8	4,344.8
East North Central Division	-206.1	4,632.2
West North Central Division SD, NE	2,198.0	4,901.5
South Atlantic Division	-45.1	4,989.6
East South Central Division	121.2	4,776.4
West South Central Division	-1,805.9	4,889.2
Mountain Division	731.0	5,146.5
Pacific Division	1,336.5	5,123.1

Sensitivity Analysis: Housing and Social Security

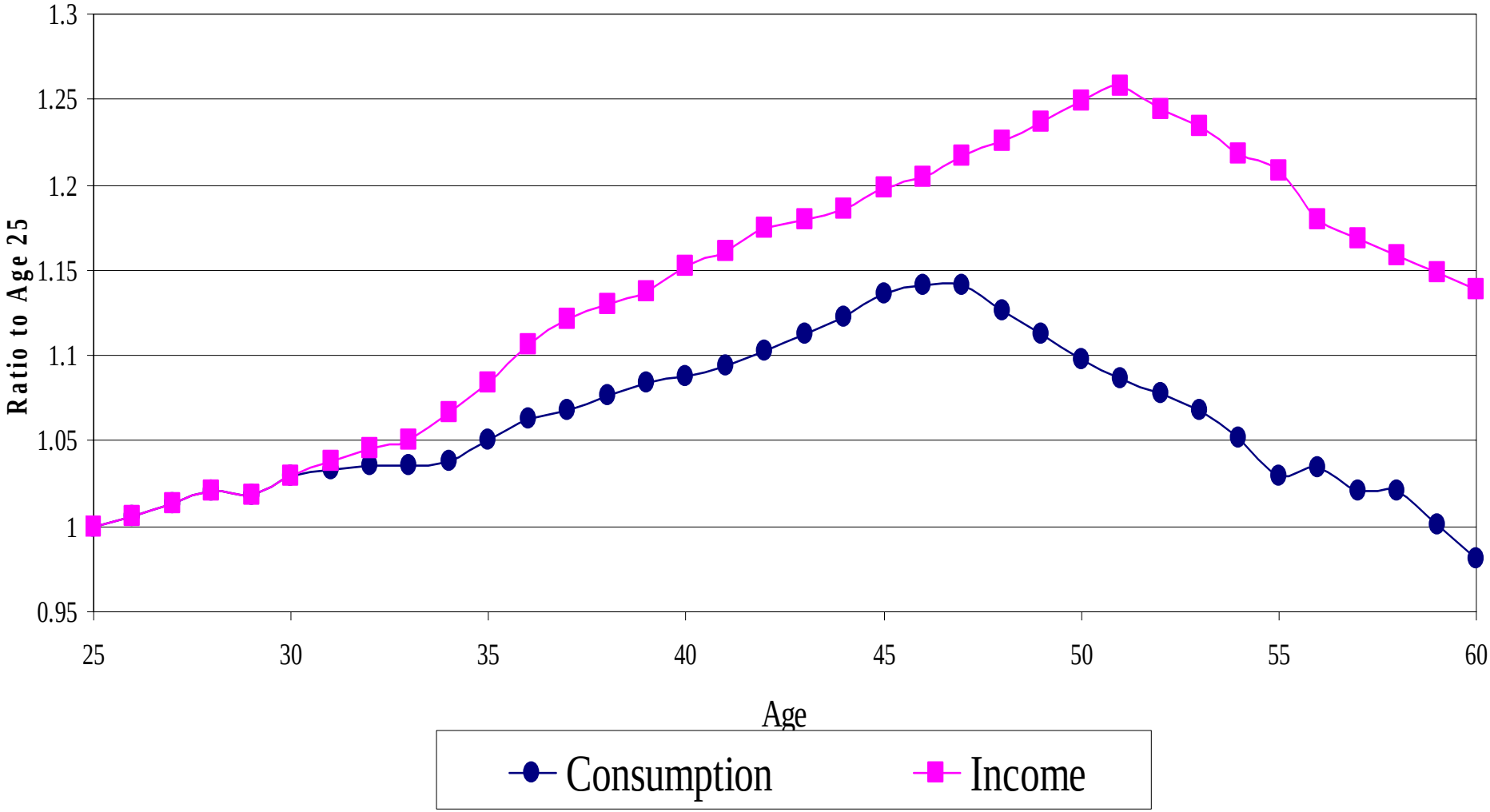
- Some believe the elderly are unwilling to use housing equity to support consumption.
  - Not clear this is true (Hurd, 2003).
    - Even if it is, we like including housing in net worth. Still...
  - Figure 4 assumes households are unwilling to use half of housing net worth to support living standards.
    - 57.9% of households meet or exceed their targets
    - 25th (10th) percentile conditional deficit is $10,296 ($40,371)
- The social security system modeled in the paper may be fiscally unsustainable.
  - Cut expected and actual SS benefits by 25 percent (from 1951) – 36.1 percent of households fail to meet optimal targets.

Table 6: Alternative Models	**R^2 (in percent)**
Naïve (save a constant fraction of Y_t)	7.1
Naïve (save an income-varying fraction of Y_t)	11.4
Modigliani ($S_t=a+bY_p$)	16.1
Constant Alpha	43.6
Reduced-Form Regression Including 41 Years of Earnings	25.3
Reduced-Form Regression Including Quadratic Terms for 41 Years of Earnings	29.7
Monte Carlo Draws on Earning Sequence	41.1
Base Case in Paper	83.7

Does the Model Match Other Features of the Data?

- Consumption tracks income.
  - Consumption trajectories (netting out the effects of children) are hump-shaped and peak at 46 (income trajectories peak at 51).
- The wealth distribution is skewed.
  - The top 1 percent holds 17 percent of wealth (it's 24 percent in the data, which is consistent with bequests playing a role in wealth accumulation).
- The model can explain 28 percent of the 1992-2000 *change* in wealth.
  - A reduced-form regression model with X's, 41 years of earnings, and earnings squared, accounts for 6.6%.

Figure 5: Consumption and Income by Age



Source: Authors' calculations from the baseline model and the 1992 HRS

Sensitivity Analysis: Fundamental Parameters

Parameter Value	Percentage Failing to Meet Optimal Target	Measure of fit: R^2 (in %)	Deficit Conditional on Failing to Meet Optimal Target (1992$)
Baseline: $\beta = 0.97, \gamma = 3, r = 4\%$	18.6	83.7	5,714
$\beta = 1.0$	25.6	85.5	6,242
$\beta = 0.93$	14.1	81.3	6,567
$r = 5\%$	24.7	85.1	6,000
$r = 7\%$	38.9	77.3	18,752
$\gamma = 1.5$	14.5	92.3	4,656
$\gamma = 5$	35.7	84.8	11,131
$\rho = 0.9$	27.6	68.9	18,634
5% chance of nursing home costs (4 years at $60k per year)	24.7	83.7	5,332

Conclusions

- With a common formulation of the life-cycle model, we explain 83 percent of the 1992 cross-sectional variation in wealth of HRS households.
  - Moreover, we find 81 percent of households meet or exceed their optimal wealth targets. And the conditional deficits tend to be small.
    - We interpret this as a) strongly suggestive that the life-cycle model is capable of explaining life-cycle wealth accumulation and b) that the consumption changes around retirement noted by Bernheim *et al.* are not driven by inadequate retirement wealth accumulation.
  - Results are prior to the 1990s stock market run-up

Final thoughts

- Are Americans saving “optimally”?
  - Deliberately provocative title, though we are much closer to saying “yes” than we were before doing this.
    - Some households in top half of lifetime income distribution are saving “too much”
      - Bequest motives?
      - Heterogeneity in rates of return or deep preference parameters?
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