

Beyond Variance

Asymmetric Labor Income Risk and Portfolio Entry

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1. Earnings risk

Measurement and variation across workers

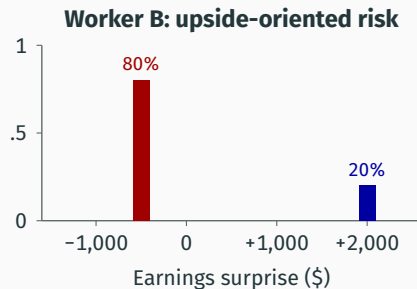
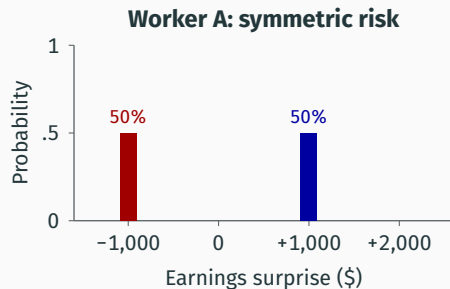
2. Portfolio entry

Earnings gains, losses and later ownership

3. Life-cycle model

Earnings paths and participation decisions

Variance and earnings composition



Same mean surprise: \$0

Same variance: $\$1,000^2$

Stock market entry?

Main findings

- **Annual entry: +1.60 pp** per source SD of composition
Baseline entry rate: 8.82%
- **More upside predicts entry and later ownership**
Entry followed by one or two later holdings
- **Model: opposing tail signs, smaller magnitudes**
Earnings-risk coefficients excluded from estimation

Empirical comparison

- Historical CPS earnings distributions linked to later SIPP entry
- Earnings gains, losses and entry at given resources

Quantitative interpretation

- Entry estimates from a model fitted to financial outcomes
- Earnings paths and household decision rules

Income risk and stock market participation

Earnings dynamics

Guvenen, Ozkan
& Song (2014)

Arellano, Blundell
& Bonhomme (2017)

Guvenen et al. (2021)

Income risk and portfolio choice

Guiso, Jappelli
& Terlizzese (1996)
Angerer & Lam (2009)
Fagereng, Guiso
& Pistaferri (2018)
Catherine, Sodini
& Zhang (2024)

Participation and market access

Fagereng, Gottlieb
& Guiso (2017)
Briggs et al. (2021)
Gálvez (2023)
Galaasen & Raja (2024)
Bonaparte et al. (2025)

This paper: earnings composition and entry

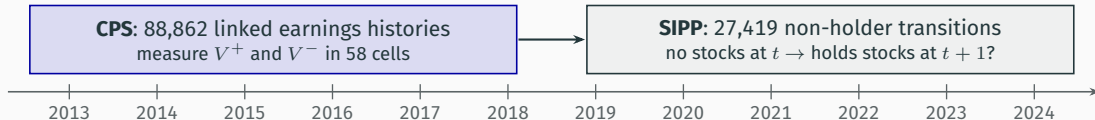
More upside predicts more entry.
More downside predicts less entry.

Entry and subsequent ownership at given mean
growth, variance and observed resources.

Consumption and saving

Carroll (1997)
Gourinchas & Parker (2002)
Eberly (1994)

Data and timing



- **CPS:** earnings distributions in 58 industry–education–age cells
- **SIPP:** historical risk assigned by baseline cell
- **Entry:** next-year stock/mutual-fund ownership among initial nonholders
Outside retirement accounts

Earnings growth

1. Annual nominal wage growth

$$g_{i,t+1} = \frac{2(y_{i,t+1} - y_{it})}{y_{i,t+1} + y_{it}}, \quad y_{it} > 0, \quad y_{i,t+1} \geq 0.$$

y_{it} : annual wages of CPS worker i in earnings year t . Zero destination wages: $g_{i,t+1} = -2$.

2. Remove the industry-education age profile

$$\epsilon_{i,t+1} = g_{i,t+1} - (\hat{\theta}_{0G} + \hat{\theta}_{1G}z_{it} + \hat{\theta}_{2G}z_{it}^2 + \hat{\theta}_{3G}z_{it}^3).$$

CPS-weighted cubic within industry-education group G .

$z_{it} = (a_{it} - 45)/20$; a_{it} is age at the first interview.

3. Center within the earnings cell

$$\mu_c = \mathbb{E}_c[\epsilon], \quad \text{within-cell deviation} = \epsilon_{i,t+1} - \mu_c.$$

c : industry-education-age-band cell.

Upper- and lower-tail variation

Age-adjusted earnings growth, centered within each cell

$$V_c^- = \mathbb{E}_c[(\epsilon - \mu_c)^2 \mathbf{1}\{\epsilon < \mu_c\}], \quad V_c^+ = \mathbb{E}_c[(\epsilon - \mu_c)^2 \mathbf{1}\{\epsilon > \mu_c\}].$$

Total dispersion

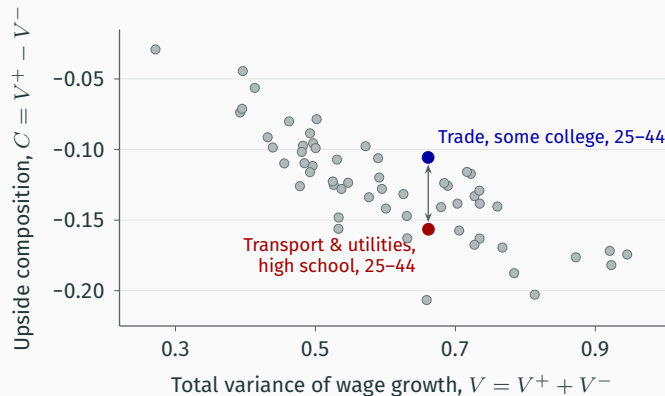
$$V_c = V_c^+ + V_c^-$$

Upside composition

$$C_c = V_c^+ - V_c^-$$

Higher C at fixed V : more upper-tail variation

Variation across earnings cells



58 earnings cells

Highlighted pair:

Variance ≈ 0.66

Composition gap ≈ 1.5 source SD

All cells: $C < 0$

Relative upside measure

$$\text{corr}(C, V) = -0.81.$$

Entry regression

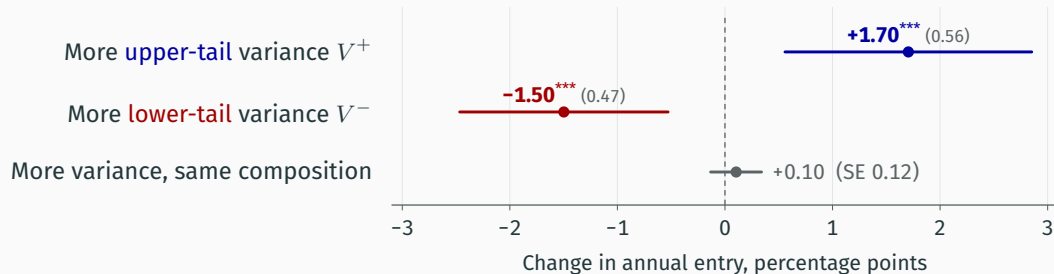
$$\begin{aligned} H_{i,t+1} = & \alpha + \beta_E \tilde{C}_{c(i,t)}^{\text{up}} + \gamma_1 \tilde{V}_{c(i,t)} + \gamma_2 \sqrt{\tilde{V}_{c(i,t)}} + \gamma_3 \tilde{\mu}_{c(i,t)} + \gamma_4 (\tilde{\mu}_{c(i,t)})^2 \\ & + \delta_1 \log(\max\{A_{it}, 1\}) + \delta_2 \log(\max\{\bar{y}_{it}^{(1)} + 1, 1\}) + \delta_3 \mathbf{1}\{\min_{m \in \mathcal{M}_{it}} y_{itm}^{(1)} \leq 0\} \\ & + \delta_4 a_{it} + \delta_5 a_{it}^2 + \delta_6 \text{Male}_{it} + \eta_{j(i,t)} + \kappa_{e(i,t)} + \lambda_{b(i,t)} + \tau_{t+1} + u_{i,t+1}, \quad H_{it} = 0. \end{aligned}$$

- **Outcome:** any-month stock/mutual-fund ownership next year
Initial nonholders
- **Risk:** composition, dispersion and mean growth
Fixed CPS source standardization
- **Controls:** assets, earnings, nonpositive earnings and demographics
Industry, education, age-band and year fixed effects

Portfolio entry

Growth measure	(1) Wages zeros included Arc	(2) Total earnings zeros included Arc	(3) Total earnings positive only Real log	(4) Total earnings positive only Arc
Upside composition	1.601*** (0.506)	1.042** (0.405)	0.875*** (0.279)	0.695*** (0.248)
Composition reliability	0.73	0.62	0.28	0.24
Group-specific cubic age adjustment	Yes	Yes	Yes	Yes
Risk and baseline controls	Yes	Yes	Yes	Yes
Industry, education, age-band, year FE	Yes	Yes	Yes	Yes
Nonholder transitions	27,419	27,419	27,419	27,419
Mean annual entry (%)	8.82	8.82	8.82	8.82
Assignment cells / inference groups	58 / 30	58 / 30	58 / 30	58 / 30

Earnings gains, losses and entry



Alternative specifications

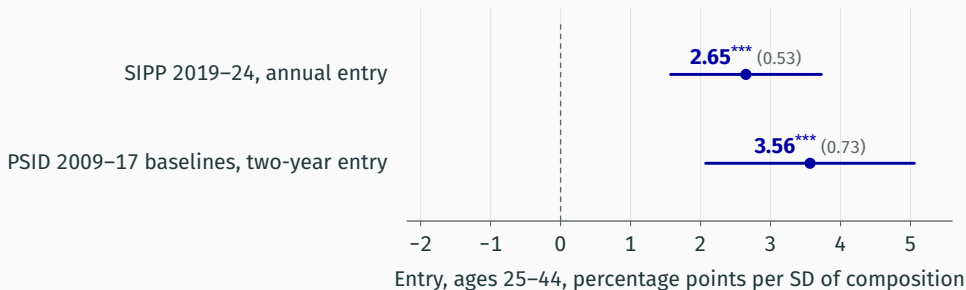
Specification	Composition (pp)	SE
Prospective-sample baseline	1.65 ^{**}	0.60
Industry $\times$ year; education $\times$ year	1.66 ^{**}	0.62
Industry $\times$ education effects	1.86 ^{**}	0.88
Reported, self-reported, stable households	2.56 ^{***}	0.56
Controls for realized earnings	1.57 ^{**}	0.59

Entry and subsequent ownership

Joint outcome	Entry + one later holding	Entry + two later holdings
Composition estimate (pp)	0.98*	1.89**
Standard error	(0.50)	(0.79)
Initial nonholders	9,236	3,254

Outcome: initial nonholder, then ownership at entry and later interviews

Entry at ages 25–44



Retirement contributions

Initial non-IRA stock ownership	Composition (pp)	SE
Nonholders	0.22	0.33
Holders	6.36 ^{***}	2.19
Holder minus nonholder	6.14 ^{**}	2.33

Outcome: any private IRA or annuity contribution

Upside beliefs and risky reallocation

Survey of Consumer Expectations (SCE), retirement accounts

Belief measure	Reallocation	Equity share
Upside-minus-downside tilt	0.028** (0.013)	−0.576 (0.664)
Sum of semideviations	−0.017 (0.018)	− 3.805*** (1.011)
Respondents	2,136	3,332
Controls Fixed effects / SEs	Expected earnings growth, age, education and income State and module year / 50 state clusters	

Reallocation score: +1 riskier, −1 safer, 0 unchanged. Equity share: percentage points.

Household expenditure

	Furnishings/ equipment \$1,000	Selected nondurables/ services \$10,000	Food \$10,000
Asinh dollar scale			
<i>Wage composition, holding variance fixed</i>			
Initial nonholders	0.007 (0.013)	0.001 (0.008)	0.002 (0.005)
Initial holders	0.114*** (0.041)	0.012 (0.020)	0.009 (0.017)
Holder minus nonholder	0.107** (0.046)	0.011 (0.024)	0.006 (0.019)
Baseline-weight-share average	0.027** (0.012)	0.003 (0.006)	0.004 (0.004)
<i>Dispersion, holding composition fixed</i>			
Initial holders	0.021*** (0.006)	0.003 (0.004)	0.001 (0.003)
33,353 observations; 30 industry-education clusters			
Furnishings: stronger association among initial holders			

Participation threshold

Log-utility example, earnings realized before the portfolio choice

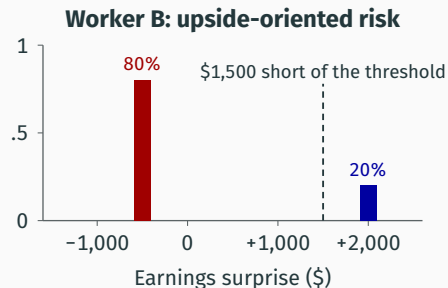
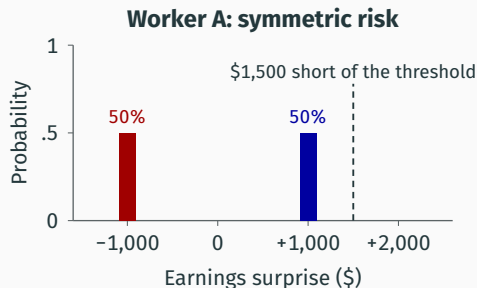
$$\text{Hold equity} \iff w + Y \geq w^*.$$

- Fixed cost relative to available resources
- Entry response concentrated near the threshold

Related margins: retirement contributions and durable purchases

Durable adjustment thresholds: Eberly (1994)

Earnings gains near the threshold



Entry probability: **0%** for A

20% for B

Earnings risk and stock market participation

Saving, entry opportunities and holding costs

Related models

Published model	Model and finding	This paper adds
Briggs et al. (2021, JFE)	Life-cycle saving, entry and holding costs. Overpredicted entry after lottery windfalls.	Measured earnings environments. Intermittent entry opportunities and holding costs.
Catherine (2022, RFS)	Cyclical earnings skewness. Joint earnings and stock losses, low participation among the young.	Resource accumulation and entry. Independent stock and earnings shocks.
Gálvez & Paz-Pardo (2026, JFE)	Non-normal earnings shocks and nonlinear persistence in life-cycle portfolios.	Opposite entry patterns for upside and downside risk. Contributions of earnings paths and participation choices.

Participation decision

Observed before choice: resources, access and recurring cost

$$V_t(M, z, d, a, \xi) = \begin{cases} \mathcal{V}_t^0(M, z), & a = 0, \\ \max\{\mathcal{V}_t^0(M, z), \mathcal{V}_t^1(M - \kappa_R \xi, z)\}, & a = 1. \end{cases}$$

- Consumption and saving chosen in both branches.
- Equity share chosen when participating.
- Continuation values include future earnings, exit and re-entry.

Budget and portfolio constraints

$$c_t + A_t + D_t \kappa_R \xi_t = M_t,$$

$$M_{t+1} = A_t \{R_{f,t+1} + \alpha_t (R_{t+1}^s - R_{f,t+1})\} + Y_{t+1}.$$

- Participation: $D_t \in \{0, 1\}$, with $D_t \leq a_t$.
- $0 \leq \alpha_t \leq D_t$; no borrowing or short positions.
- Funded equity: $\alpha_t A_t \geq \$1 \times D_t$.

Entry opportunities and holding costs

$$\Pr(a_t = 1 \mid D_{t-1}) = D_{t-1} + (1 - D_{t-1})q, \quad q = 0.176.$$

$$K_t = \kappa_R \xi_t, \quad \mathbb{E}[\xi_t] = 1, \quad \kappa_R = \$524.$$

- Nonholders: a new opportunity draw each year.
- Holders: annual choice to continue or exit.
- Access permits entry; payment and investment remain choices.
- After exit: return to the nonholder opportunity process.

Earnings process

Ingredient	Economic role	Empirical discipline
Persistent promotions and losses	Lasting earnings changes	CPS one-year and PSID multi-year moments
Transitory shocks and reporting error	Short-lived earnings variation	One-, two-, four- and six-year moments
Departures and returns to wage work	Employment and resource changes	Zero-wage spells
58 cell adjustments	Growth, dispersion, asymmetry and departures	Industry-education-age environments

Earnings laws are held fixed during financial estimation.

Calibration and parameter estimates

Calibration and data inputs

Inputs held fixed	Value / source
Safe gross real return	1.02
Ordinary stock gross mean / SD	1.06 / 0.18
Annual crash probability	1%
Crash net real return	-48.5%
EIS ψ	0.5
Earnings laws / resources	CPS / PSID
Observed initial states	SIPP

Calibrated: returns and EIS. **Estimated separately:** earnings laws.

From data: resource profiles and initial household states.

Estimated financial parameters

Parameter	Estimate
Risk aversion γ	8.801
Discount factor β	0.811
Recurring mean κ_R	\$524
Log-cost dispersion σ_κ	0.944
Opportunity probability q	0.176

Joint simulated method of moments (SMM): five common parameters, eight financial targets.

Untargeted entry regressions

17,606 observed initial nonholders; financial parameters held fixed

- ① **Initial states:** each worker's observed resources and inferred earnings state.
- ② **Entry probability:** average over earnings, opportunities and cost draws.
- ③ **Regression:** replace observed entry (0 or 1) with its predicted probability; retain regressors and survey weights.

$$\hat{b}^L = (X'WX)^{-1}X'W\hat{p}^L, \quad L \in \{\text{cell, pooled}\}.$$

Predicted entry; same earnings-risk measures, controls, fixed effects and survey weights.

Pooled benchmark

- Education-specific career dynamics retained.
- Cell adjustments to growth, dispersion, asymmetry and departures removed.
- Optimal choices recomputed.

Hold fixed

- Financial parameters and observed origins.
- Initial earnings posteriors and group wage levels.
- Returns, regressors and survey weights.

$$\Delta b_C = b_C^{\text{cell}} - b_C^{\text{pooled}}.$$

Entry estimates: data and model

Opportunity model: untargeted projections on 17,606 matched origins

Entry estimate (pp)	Data	SE	Cell	Pooled	Net
Composition	1.816***	(0.480)	0.241	-0.005	0.247
Upper tail	1.967***	(0.513)	0.115	-0.116	0.230
Lower tail	-1.665***	(0.470)	-0.368	-0.105	-0.263
Dispersion	0.151	(0.104)	-0.127	-0.110	-0.016

- Cell vs. pooled: upper-tail estimate turns positive, lower-tail estimate becomes more negative.
- Tail magnitudes well below the data.

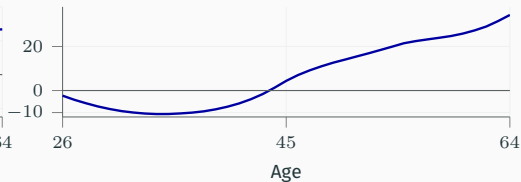
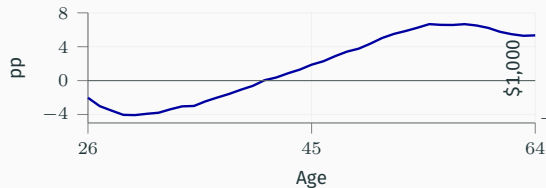
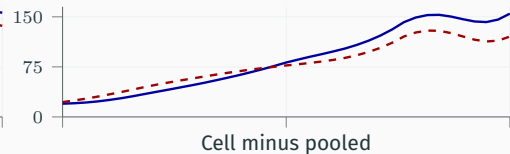
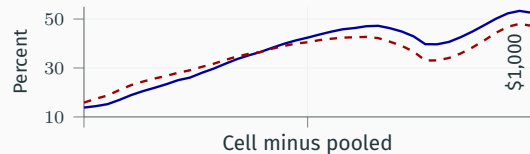
Ownership and wealth paths

Solid: cell earnings laws

Dashed: pooled earnings laws

Ownership

Financial wealth



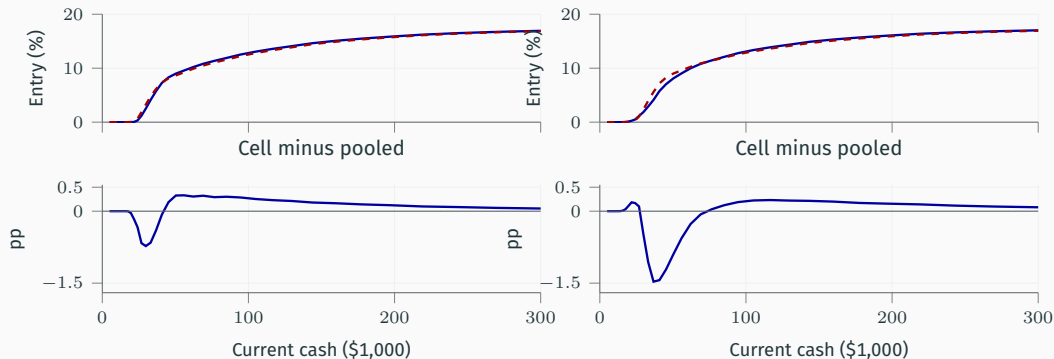
Entry probabilities by current cash

Solid: cell earnings laws

Dashed: pooled earnings laws

Education and health

Professional/business services



Model results and limitations

- Cell laws reproduce opposing tail signs without fitting the coefficients.
- Earnings realizations affect entry through resources and saving.
- Recurring costs and repeated opportunities shape later ownership.
- Entry estimates too small, nonholder wealth growth too high.

- **Entry: +1.60 pp** per source SD of earnings composition
More upside predicts more entry, more downside predicts less
- **Subsequent ownership:** also more likely with more upside
- **Life-cycle model:** matching signs, smaller magnitudes
Most of the model association comes from earnings paths

Questions and discussion

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Evidence and measurement

- ▶ Sample
- ▶ Earnings construction
- ▶ Skewness
- ▶ Composition example
- ▶ Four constructions
- ▶ Entry results
- ▶ Inference
- ▶ Tail algebra
- ▶ Risk preferences
- ▶ Sustained entry
- ▶ External evidence
- ▶ Holder outcomes
- ▶ Entry and retention
- ▶ Consumption mechanism

Model and financial fit

- ▶ Financial fit
- ▶ Risk coefficient figure
- ▶ Model ingredients
- ▶ Observed initial states
- ▶ Life-cycle profiles
- ▶ Sustained model ownership
- ▶ Parameters
- ▶ Targets and weighting
- ▶ Costs and opportunities
- ▶ Financial wealth
- ▶ Pooled laws
- ▶ Law and policy contributions
- ▶ Later ownership estimates
- ▶ Recursive problem

Comparisons and experiments

- ▶ Portfolio-model literature
- ▶ Analytical identities
- ▶ Related empirical evidence
- ▶ Selected references
- ▶ Permanent eligibility
- ▶ Alternative financial fit
- ▶ Alternative entry estimates
- ▶ Alternative dynamics
- ▶ Participation frictions
- ▶ Earnings news
- ▶ Windfall response
- ▶ Model mechanisms
- ▶ Model assessment
- ▶ Numerical checks
- ▶ Experiment coverage

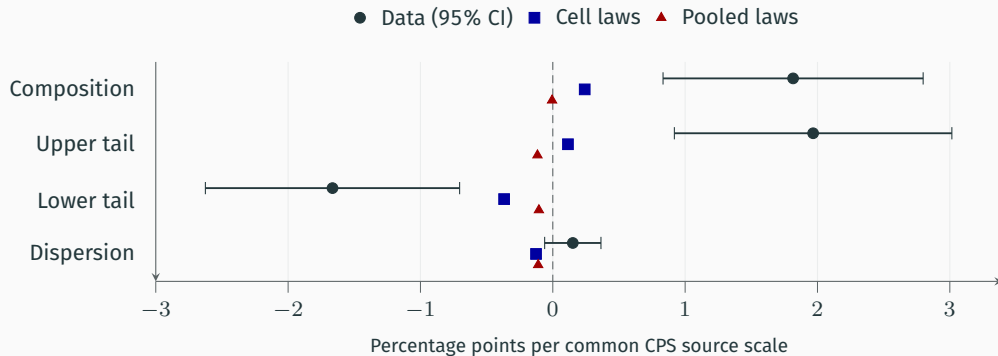
Targeted financial moments

Moment	Unit	Data	SE	Model
Entry: low initial wealth	%	2.93	(0.26)	3.18
Entry: middle initial wealth	%	5.84	(0.36)	5.51
Entry: high initial wealth	%	10.36	(0.48)	10.44
Retention: low initial equity share	%	66.19	(1.43)	67.75
Retention: high initial equity share	%	76.31	(1.23)	74.34
Next equity share: all initial holders	%	33.38	(0.84)	34.40
Wealth change: initial nonholders	\$	3,939	(778)	9,941
Wealth change: initial holders	\$	1,946	(5,177)	511

Main discrepancy: excess nonholder wealth growth

Entry estimates from the model

17,606 matched initial nonholders, untargeted coefficients



Earnings risk and portfolio models

Non-Gaussian earnings risk

Barndorff-Nielsen, Kinnebrock & Shephard (2010)
Segal, Shaliastovich & Yaron (2015)
Ghysels, Plazzi & Valkanov (2016)
Arellano, Blundell & Bonhomme (2017)
Guvenen et al. (2021)

Life-cycle portfolio models

Cocco, Gomes & Maenhout (2005)
Gomes & Michaelides (2005)
Catherine (2022)
Gálvez & Paz-Pardo (2026)

This paper

Measurement. Upper and lower partial variances from zero-inclusive earnings histories, measured independently of portfolio choices.

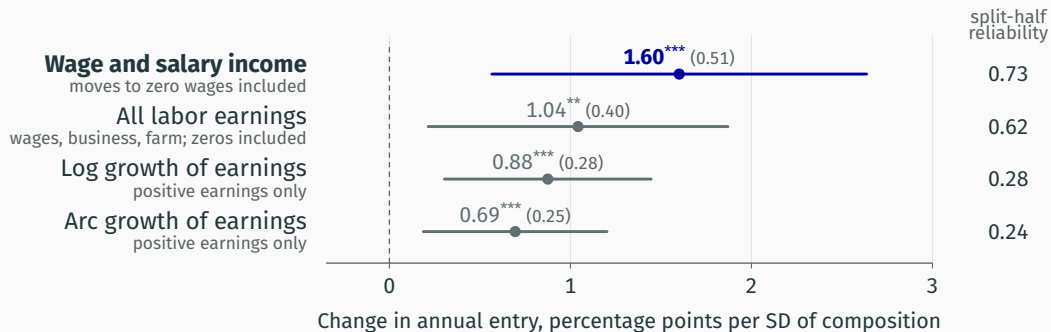
Untargeted predictions. Cell earnings laws predict more entry with upside risk and less with downside risk. Pooled laws miss this pattern in the main model.

Composition at fixed variance

	Symmetric risk	Upside-oriented risk
Lower outcome	−1,000 (50%)	−500 (80%)
Upper outcome	+1,000 (50%)	+2,000 (20%)
Lower partial variance	500,000	200,000
Upper partial variance	500,000	800,000
Total variance	1,000,000	1,000,000
Composition	0	600,000

Composition: upper minus lower partial variance.

Entry estimates across earnings measures



Positive entry estimates across all four measures. Zero-inclusive wages are the most reliable.

Established owners

Resources well above the threshold

Participation under either earnings law

Marginal entrants

Entry after a favorable earnings realization

Later ownership depends on subsequent resources

Lower average retention need not imply lower retention for every incumbent.

Model ingredients

Model ingredient	Economic role
Career earnings risk	Realized income and future resources
Optimal saving	Resources carried forward
Entry opportunity	Chance to consider a funded equity position
Recurring cost	Ownership when benefits exceed the holding cost

Observed initial states

21,188 SIPP worker-year pairs, ages 25–63 at origin

Input	Use in the model
Wages, wealth, ownership and shares	Latent earnings from wages; observed financial positions
Taxes and own pension contributions	Wages net of taxes and contributions
Own retirement income	PSID Social Security and pensions by education and age
Calendar returns	Returns on inherited portfolios in observed transitions

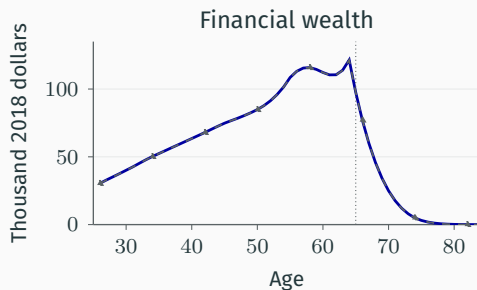
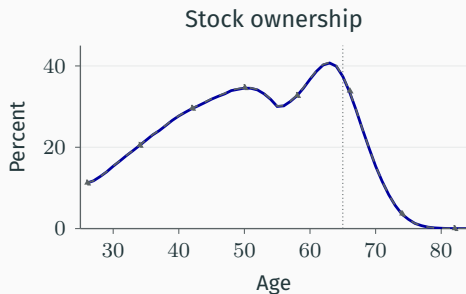
Future return expectations: stationary.

Conditional life-cycle profiles

Conditional projection from 452 observed age-25 origins in 29 cells

Solid: 141-node grid

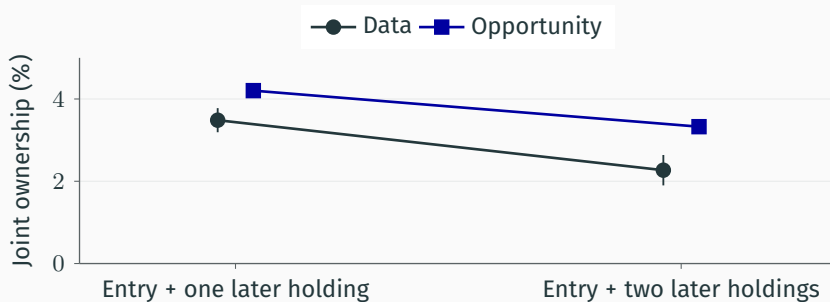
Dashed triangles: 201-node grid



Numerical accuracy: almost identical paths on finer cash and return grids.

Entry and subsequent ownership

Untargeted predictions on common data/model followup cohorts



Sustained ownership levels remain overpredicted.

► Common-cohort estimates

Samples

Sample	Observations
CPS linked earnings histories	88,862
CPS histories with zero destination wages	5,490
SIPP full entry sample	27,419
SIPP prospective allocation sample	31,569
Model financial-fitting worker-year pairs	21,188
Matched model/data entry regression	17,606

Worker transitions, household assets. Mixed-asset mutual funds included.
Retirement-account allocation unobserved.

$$g_{i,t+1} = \frac{2(y_{i,t+1} - y_{it})}{y_{i,t+1} + y_{it}}.$$

- Positive origin wages, zero destinations included: $g = -2$
- Weighted cubic age adjustment by industry–education group
- Residuals centered within industry–education–age cells
- Zero wages: nonemployment or a different income source, not necessarily dismissal

Zero-inclusive wage measure	Composition	Skewness
Split-half reliability	0.73	0.39

- Partial correlation given $V, \sqrt{V}$: 0.91
- Composition: difference between upper and lower partial variances
- Substantial overlap with conventional skewness

Alternative earnings measures

Construction	Composition (pp)	SE
Wages, zeros included	1.601 ^{***}	0.506
Total labor earnings, zeros included	1.042 ^{**}	0.405
Real log growth, positive support	0.875 ^{***}	0.279
Nominal arc growth, positive support	0.695 ^{***}	0.248

Controls: V , $\sqrt{V}$, μ , μ^2 , household characteristics
Industry, education, age-band and year fixed effects

- **Coefficient tests:** 30 industry–education clusters, $CR1/t_{29}$
- **Wild-cluster bootstrap:** $p = 0.039$
- **Source uncertainty:** re-estimated CPS moments in separate checks
- Restricted samples: actual cluster count. Unadjusted coefficient stars.

Risk component in unstandardized units

$$f(V^+, V^-) = b_C(V^+ - V^-) + b_V(V^+ + V^-) + b_S\sqrt{V^+ + V^-}.$$

$$\frac{\partial f}{\partial V^+} = b_C + b_V + \frac{b_S}{2\sqrt{V}}, \quad \frac{\partial f}{\partial V^-} = -b_C + b_V + \frac{b_S}{2\sqrt{V}}.$$

- Half-difference: composition coefficient
- Half-sum: local dispersion derivative
- Common reference volatility and CPS source scaling

Risk preferences and sorting

- Risk preferences affect participation thresholds and earnings responses
- Composition slopes may differ across preference groups
- Reported risk appetite: noisy sorting diagnostic

Sorting remains a possible source of the association.

Entry and subsequent ownership

Composition estimate (pp)	One followup	Two followups
Any entry	2.09 ^{***}	3.31 ^{**}
Entry and later holdings	0.98 [*]	1.89 ^{**}
Entry with an interruption	1.11 ^{**}	1.42
Initial nonholders	9,236	3,254

Joint outcomes partition entry within each cohort.

Imprecise estimates of retention among entrants. Followup selection and weaker three-date reporting screen.

Period differences and age groups

Young-worker SIPP entry gap (pp)	Estimate
Original period gap	2.885
After symmetric overlap weighting	2.623
Change in gap	−0.262
SE of change	0.294
<i>p</i> -value of change	0.381

PSID composition: all ages −0.18 (SE 0.39)

Ages 45–65: 0.44 (SE 1.30). All-age replication inconclusive.

Initial-holder outcomes

Initial-holder outcome	Composition (pp)	SE
Next-period ownership / retention	-3.72**	1.71
Next risky share, controlling initial share	-0.51	0.94

- Retention wild-cluster bootstrap $p = 0.12$.
- All initial holders, including subsequent exits
- Initial-holder retention differs from survival among new entrants

Participation and consumption

Auxiliary two-date log-utility example with endogenous saving

$$c^*(m, d) = \frac{m - \kappa d}{1 + \beta}.$$

$$\Delta \mathbb{E}[c] = -\frac{\kappa}{1 + \beta} \Delta \Pr(d = 1) \quad \text{at fixed mean resources.}$$

- Small consumption response possible, exact invariance unnecessary
- IRA/annuity outcome: contribution participation only
- Furnishings: positive primary asinh estimate among holders. Imprecise dollar and original-construction estimates.

Threshold and selection formulas

$$w^* = \frac{\kappa}{1 - e^{-b}} - h, \quad \pi(w, F) = \Pr(Y \geq w^* - w).$$

$$\text{Entry} = \frac{\mathbb{E}[\pi(1 - \pi)]}{\mathbb{E}[1 - \pi]},$$

$$\text{Retention} = \frac{\mathbb{E}[\pi^2]}{\mathbb{E}[\pi]},$$

$$\text{Entry} + k \text{ later holdings} = \frac{\mathbb{E}[(1 - \pi)\pi^{k+1}]}{\mathbb{E}[1 - \pi]}.$$

$b > 0$: optimized log-return gain. h : safe nontradable terminal income.

Fixed wealth, independent draws across dates. Signs depend on resources and earnings laws.

- Catherine, S. (2022). Countercyclical Labor Income Risk and Portfolio Choices over the Life Cycle. *Review of Financial Studies*.
- Catherine, S., P. Sodini and Y. Zhang (2024). Countercyclical Income Risk and Portfolio Choices: Evidence from Sweden. *Journal of Finance*.
- Briggs, J., D. Cesarini, E. Lindqvist and R. Östling (2021). Windfall Gains and Stock Market Participation. *Journal of Financial Economics*.

Related empirical evidence

Study	Empirical comparison	This paper's contribution
Gálvez (2023)	Participation responses to persistent earnings shocks	Historical earnings environments before subsequent entry
Catherine, Sodini and Zhang (2024)	Cyclical tail exposure and stockholding	Opposite tail estimates. Composition at fixed variance.
Van den Akker et al. (2026)*	Subjective income expectations linked to administrative portfolios	Independently measured environments, entry and sustained ownership

Complementary subjective-expectations evidence

Permanent participation eligibility

$T_i \in \{0, 1\}$, T_i remains fixed throughout the path.

- Current holders and reported former holders: $T_i = 1$.
- Among other initial nonholders, $\Pr(T_i = 1) = 0.119$.
- Eligible: annual choice to pay and hold equity. Ineligible: safe asset only.
- Five parameters fitted separately to the same eight financial targets.

Permanent exclusion applies to a fixed share of initially unknown nonholders.

Financial fit under both access models

Moment	Data	Opportunity	Permanent
Entry: low initial wealth	2.93	3.18	3.21
Entry: middle initial wealth	5.84	5.51	5.49
Entry: high initial wealth	10.36	10.44	10.39
Retention: low initial equity share	66.19	67.75	68.01
Retention: high initial equity share	76.31	74.34	73.83
Next equity share: all initial holders	33.38	34.40	33.81
Wealth change: initial nonholders	3,939	9,941	10,005
Wealth change: initial holders	1,946	511	501

Both models: positive wealth growth, excessive nonholder accumulation.

Entry estimates under permanent eligibility

Entry estimate (pp)	Data	Opportunity net	Permanent net
Composition	1.816	0.247	0.171
Upper tail	1.967	0.230	0.155
Lower tail	-1.665	-0.263	-0.188
Dispersion	0.151	-0.016	-0.016

- Pooled laws already give opposite signs. Both estimates move further from zero with cell laws.
- Net magnitudes remain well below the data in both models.

Participation dynamics under both access models

Untargeted outcome	Data	Opportunity	Permanent
Re-entry: reported former holders (%)	27.16	9.83	57.68
Entry + one later holding (%)	3.48	4.20	3.82
Entry + two later holdings (%)	2.27	3.33	2.24
Projected age-45 ownership (%)	—	31.83	16.31
Windfall response after two years (pp)	—	15.25	3.44

Permanent eligibility: closer fit to longer sustained ownership; excessive re-entry among reported former holders.

Parameter estimates by access model

	Opportunity	Permanent
Risk aversion γ	8.801	8.917
Discount factor β	0.811	0.810
Recurring mean κ_R	\$524	\$413
Log-cost dispersion σ_κ	0.944	1.013
Opportunity q / active share p	0.176	0.119
EIS ψ , fixed	0.5	0.5
Additional entry fee	0	0

Parameters fixed before earnings-risk and dynamic comparisons. No binding bounds.

$$Q = Q_E + 0.1Q_H + Q_W = 9.77.$$

- Marginal covariance blocks: entry, holder outcomes and wealth changes.
- Wealth covariance: \$2,000 regularization. Primary-grid growth buffer: \$500 for both groups.
- Native convergence. At 201/7: wealth growth of \$9,937 for nonholders and \$498 for holders.
- Excluded targets: earnings risk, duration, windfalls and life-cycle profiles.

Opportunity friction and recurring payments

- Opportunity: a nonholder can reconsider participation.
- Advice, attention and search are possible interpretations, not separately identified.
- Recurring cost paid only when holding equity.
- Offered cost: mean \$524, median \$335. Participants select lower draws.

Selected recurring payment	Real 2018 dollars
Entrants, supported origins	235
Retained holders	359

Wealth growth and saving net of returns

$$\Delta A_t = \text{gains on inherited assets} + Y_t - c_t - D_t \kappa_R \xi_t.$$

Nonholder wage tercile	Data growth (\$)	Model growth (\$)
Low	2,388	3,588
Middle	236	8,705
High	9,195	17,535

Holders have positive wealth growth but negative aggregate saving net of returns.

- Fixed: origins, group wage levels, earnings posteriors and calendar returns.
- Remove cell adjustments; reoptimize at common financial parameters.
- Initial resources may remain correlated with earnings cells.
- Pooled holder wealth growth: about \$483 below zero. Positive growth is imposed in the fitted cell model.

Four-corner accounting by risk measure

$$\Delta_L = \frac{1}{2}\{B(c, c) - B(p, c) + B(c, p) - B(p, p)\},$$

$$\Delta_P = \frac{1}{2}\{B(c, c) - B(c, p) + B(p, c) - B(p, p)\}.$$

Entry estimate (pp)	Laws	Decisions	Total
Composition	+0.274	-0.027	+0.247
Upper tail	+0.302	-0.072	+0.230
Lower tail	-0.245	-0.018	-0.263
Dispersion	+0.029	-0.045	-0.016

Decision rules dampen the upper-tail contribution and reinforce the negative lower-tail contribution.

Entry and later ownership: estimates

	One later holding	Two later holdings
Origins	5,459	1,801
Data composition (pp)	0.11	0.77
Data SE	(0.66)	(0.77)
Opportunity net, two seeds	0.19–0.20	0.18–0.22
Permanent net, two seeds	0.14–0.19	0.08–0.13

Smaller common cohorts: imprecise empirical composition estimates. Simulation-seed ranges are not confidence intervals.

Model fit and remaining discrepancies

Comparison	Model result	Discrepancy
Entry by wealth	Increasing across wealth terciles	Imperfect financial fit
Entry and earnings risk	Opposing net tail signs	Magnitudes well below data
Participation dynamics	Entry rises after gains and windfalls	Sustained levels too high; re-entry too low
Saving and positions	Positive wealth changes for both groups	Excess nonholder accumulation; too few small accounts

Permanent alternative: excessive re-entry; closer sustained-ownership fit.

Earnings-risk mechanisms in related models

	Earnings mechanism	Portfolio implication
Catherine (2022)	Downside earnings risk when stock returns are poor	Joint downside exposure discourages equity
Gálvez-Paz-Pardo (2026)	Non-normal shocks and nonlinear persistence by age and earnings position	Lifetime earnings risk limits portfolio risk taking
This paper	Earnings environments and resources near participation margins	Opposite entry patterns for upside and downside risk, without fitting them
Common framework: life-cycle saving, portfolio choice and participation frictions.		

Recursive household problem

$\rho = 1 - 1/\psi$, $\omega = 1 - \gamma$; x : resources after any recurring payment

$$V_{jt}(z, x) = \max_{(A, \alpha) \in \mathcal{A}_j(x)} \left[(x - A)^\rho + \beta s_t \left\{ \mathbb{E} \left[\bar{V}_{t+1}(z', j, AR(\alpha) + Y')^\omega \mid z \right] \right\}^{\rho/\omega} \right]^{1/\rho}.$$

$$W_t(z, m, \xi) = \max\{V_{0t}(z, m), V_{1t}(z, m - \kappa_R \xi)\}.$$

$$\bar{V}_t(z, d, m)^\omega = (1 - q_d)V_{0t}(z, m)^\omega + q_d \mathbb{E}_\xi[W_t(z, m, \xi)^\omega], \quad q_d = d + (1 - d)q.$$

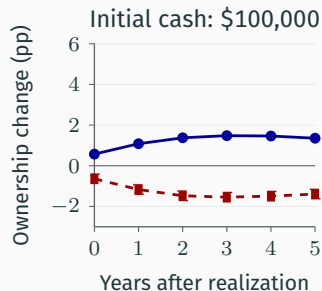
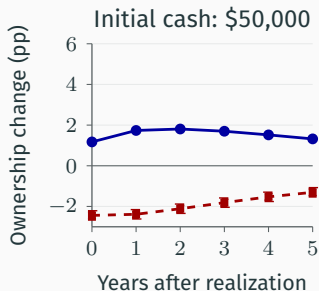
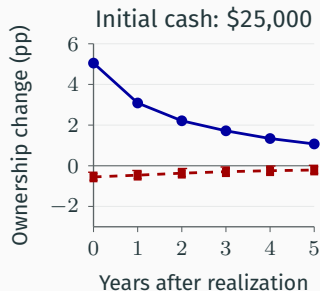
$\mathcal{A}_j$ imposes nonnegative assets and funded equity if $j = 1$. At age 84, $\bar{V}_{84}(z, d, m) = m$; no bequest motive.

Response to realized earnings shocks

Age 45: a one-year shock equal to 25% of a fixed reference gross wage

25% earnings gain

25% earnings loss



► Earnings news at fixed current resources ◀ Back

Realized earnings and earnings news

Experiment	What changes	Interpretation
Realized transitory shock	Current cash; fixed future laws	Gains can finance entry
Upper-tail news	Future distribution; fixed current resources	Participation response can be small
Composition news	Future distribution; fixed current resources	Response varies with cash and horizon

Composition-news responses can reverse sign at low cash. More upside need not raise entry.

- Financial fit, matched entry projections and four-corner accounting: declared finer-grid checks passed.
- Life-cycle grids: 141/5 and 201/7. Some local policies, cash responses and consumption remain grid-sensitive.
- Realized-earnings events: separate 301-node refinement.
- Simulation dispersion and grid differences measure numerical, not sampling, uncertainty.

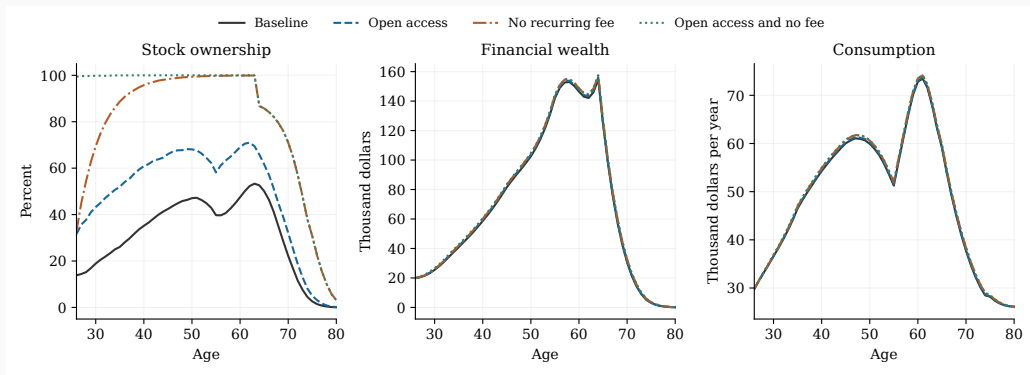
Additional model experiments

Family	Exercises in both specifications
Saving and portfolios	Age profiles, consumption, funded shares, entry and exit
Access frictions	Open access, zero and altered recurring costs
Earnings and retirement	Transitory and persistent risk, income insurance, pensions
Preferences and returns	Risk aversion, patience, EIS, expected returns and volatility
Household responses	Realized earnings, windfalls, fixed-resource news, value of future income

39 scenarios per model, plus conditional policy and valuation diagnostics. Alternative and sensitivity results in the online appendix.

Participation-friction counterfactuals

Remove each friction; reoptimize household choices



SMM targets and weighting

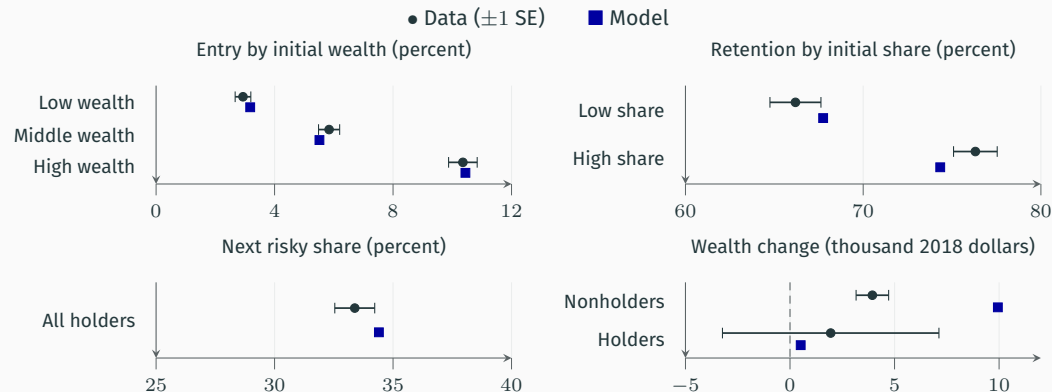
$$\theta = (\gamma, \beta, \kappa_R, \sigma_\kappa, q), \quad \hat{\theta} = \arg \min_{\theta} \{Q_E(\theta) + 0.1Q_H(\theta) + Q_W(\theta)\}.$$

Block	Targets	Economic discipline
Entry (3), Q_E	Three rates by initial wealth	Opportunities and affordability
Holders (3), Q_H	Two retention rates and one next equity share	Continued participation and allocation
Wealth (2), Q_W	Two changes by initial ownership	Saving and resource use

Weight 0.1: entry and wealth growth receive priority over retention and share fit.

Financial targets: data and model

Eight financial moments; five estimated parameters



Main discrepancy: excessive wealth growth among initial nonholders.

Earnings-law and policy contributions

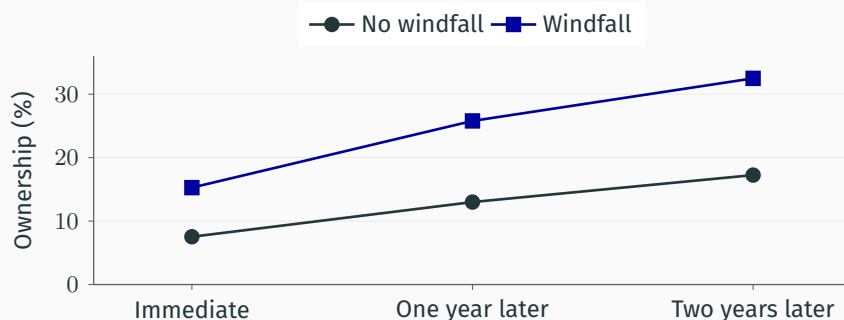
1. Earnings laws: change future earnings and resources; retain the same choices at a given household state.

2. Decision rules: reoptimize saving, participation and portfolio shares under the new laws.

Contribution to the composition estimate	pp per source SD
Earnings laws and resulting resources	+0.274
Reoptimized decision rules	−0.027
Total: cell minus pooled	+0.247

Windfall response

Untargeted experiment: \$150,000 to 423 age-44 initial nonholders



Model: +7.7 pp immediately; +15.2 pp after two years.

Swedish lottery evidence: about +12 pp in the winning year (Briggs et al., 2021).