Permanent Income Shocks, Target Wealth, and the Wealth Gap

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Motivation

- Several tests of precautionary saving: Euler equations, reduced forms, simulations, etc.

- Buffer stock model is a leading framework to explain precautionary saving. Key impications:

1. Do revisions in permanent income lead to a proportionate revision in “target wealth”? That is, do people understand what they should be doing?

2. Do people actually adjust their wealth when it is off target? That is, do people actually do what they should be doing?

Outline

- Panel data on self-reported wealth held for precautionary purposes in 2002-2016 SHIW.

Two empirical strategies:

- Stochastic structure of income process.
- IV

- Findings:

1. People understand what they should do (revise one-for-one their reported target wealth in response to permanent shocks).
2. Heterogeneity of response for shocks of different sign and size.
3. Change in actual wealth is not always negatively correlated with target wealth, particularly when wealth is below target.

Several approaches to test precautionary saving

- Degree of prudence from the consumption Euler equation.
  - Dynan (1993), Bertola et al (2005), Christelis et al (2019), Fagereng et al (2017).

- Estimation-by-simulation methods to match empirical and theoretical moments of the consumption and wealth distributions.
  - Gourinchas and Parker (2002), Cagetti (2003).

- Reduced form for wealth with proxies for income risk.
  - Skinner (1988), Guiso et al. (1992), Carroll and Samwick (1997), Fuchs-Schündeln (2005).

- Direct survey questions.
  - Kennickell and Lusardi (2004), Jappelli, Padula, Pistaferri (2008), Fulford (2015).

A leading model of intertemporal choice

$$max E_0 \sum_t \beta^t u(c_t)$$

$$\text{s.t. } a_{t+1} = (1+r)(a_t + y_t - c_t)$$

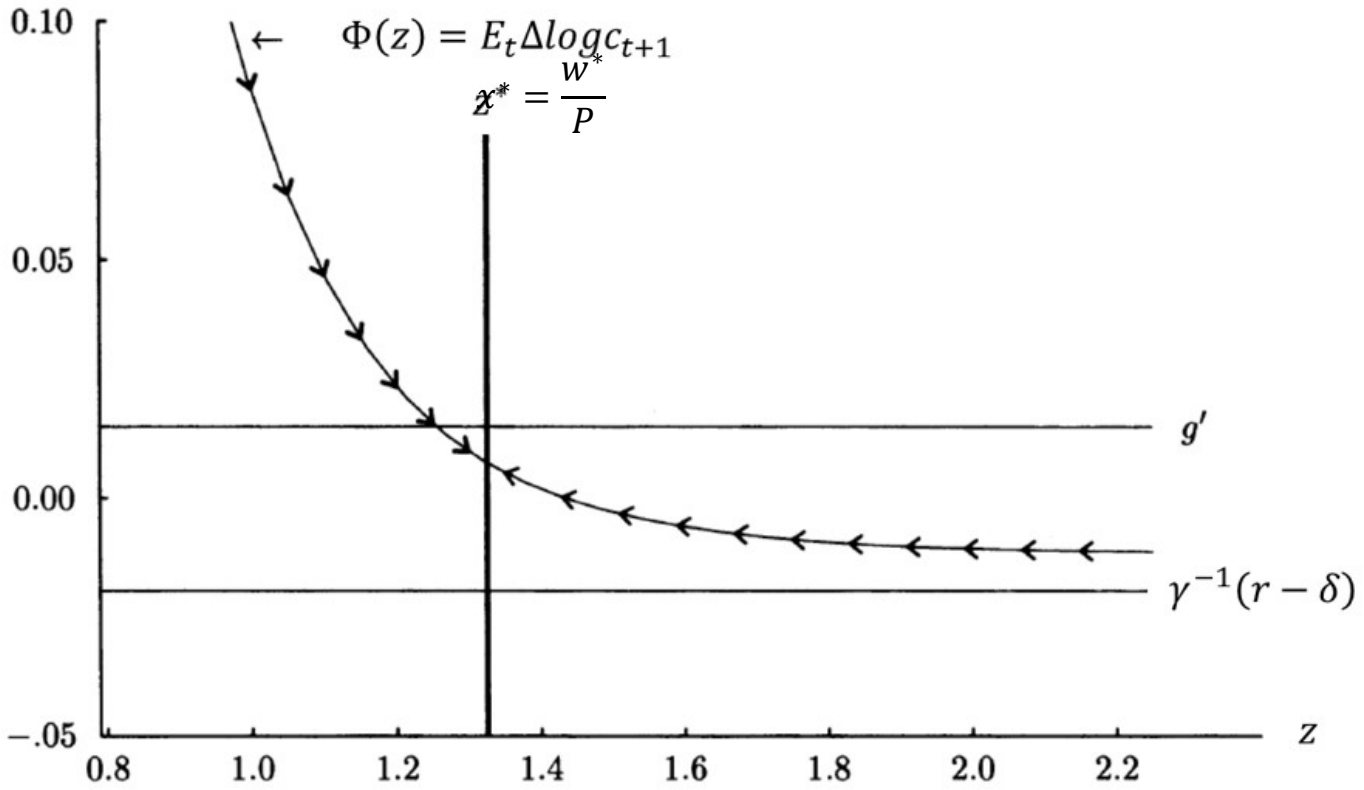
- Consumers are impatient
- Income grows and is risky, with permanent and transitory shocks

$$\ln y_t = \ln P_t + \varepsilon_t$$
$$\ln P_t = g + \ln P_{t-1} + \zeta_t$$

- Small probability that income is zero. Implication: ratio of cash-on-hand to permanent income is constant in steady-state:

$$\frac{a_t + y_t}{P_t} = \frac{w_t^*}{P_t} = x_t^*$$

The model delivers a stable ratio of cash-on-hand to permanent income



Two key implications of the model

(1) Consumers maintain a "target" level of wealth that is proportional to permanent income.

- This implies that *any revision in permanent income leads to a proportionate revision in target wealth*.
- Intuition: to insure a higher level of consumption, people need to scale up their precautionary assets, and *vice versa*.
- Prediction never tested in previous empirical literature.

(2) Equilibrium is stable. If wealth is off-target, people should adjust wealth to reach their target.

Carroll (2020) proves these results in the general case, and also provides analytical solutions in some special cases.

Example: approximation with CRRA

$$x^* = \frac{w^*}{P} \approx 1 + \frac{1}{\left[(g-r)+\delta\left(1+\frac{g}{p}\right)\left(1-\frac{g}{p}\omega\right)\right]}$$

- More patient people (low δ) and more prudent people (high ω) have higher target wealth.

- Higher income growth (high g) and lower probability of unemployment (low p) reduce target wealth relative to permanent income.

Building the empirical test

- Denote target wealth by *w**, permanent income by *P*

$$x_i^* = \frac{w_{it}^*}{P_{it}}$$: unique and stable value of the ratio.

- Two sources of heterogeneity in x_i^* :
  - Preferences : more patient and more prudent individuals have higher x^*
  - Income process: higher income volatility and higher probability of unemployment require higher x^*.

Empirical strategy

- If income and preference heterogeneity are stable over time for a given individual, they can be captured by a fixed effect

$$\frac{w_{it}^*}{P_{it}} = \tilde{\theta}_i$$

$$\ln w_{it}^* = \ln P_{it} + \theta_i$$

- Assume we observe target wealth and permanent income, and consider the regression

$$\ln w_{it}^* = \alpha + \beta \ln P_{it} + \theta_i + v_{it}$$

- θ_i is a time invariant fixed effect and v_{it} captures measurement error
- The model predicts $\beta = 1$

Cross-sectional data?

- Cross-sectional data are not adequate for our test, since the fixed effect is related to individual preferences and income risk, which are clearly correlated with permanent income.

- Therefore OLS estimates of β are biased and inconsistent

$$\text{plim}\tilde{\beta}_{OLS} = \beta + \frac{cov(P_{it}, \theta_i)}{var(P_{it})}$$

- Bias depends on sign and magnitude of $cov(P_{it}, \theta_i)$, which in principle is ambiguous (likely to be positive).

How about panel data?

$$\Delta \ln w_{it}^{*} = \beta \Delta \ln P_{it} + \Delta v_{it}$$

- We get rid of the fixed effect and test if individuals who have experienced a change in their permanent income also report a change in their target wealth.

- We can also test heterogeneity of responses by sign of $\Delta \ln P_{it}$ (positive or negative) and size of $\Delta \ln P_{it}$ (small or large).

But still problems: w^* and P are not observed

- Target wealth: Direct survey evidence in 2002-16 in the SHIW

- Permanent income

(1) Use the stochastic structure of the income process to isolate the permanent component from transitory fluctuations.

- Imposes a structure on the income process.

- Requires panel data

- Can explore only some dimensions of heterogeneity.

(2) Exploit the non-linear relation between P, consumption and cash-on-hand.

Do people adjust wealth when it is off target?

- We estimate a regression for the change in the actual wealth to permanent income ratio *x*:

$$x_{it} - x_{it-1} = \alpha + \delta(x_{it-1} - x^*_{it-1}) + e_{it}$$

- A negative δ coefficient signals convergence towards target wealth.
- Reminiscent of convergence criteria of growth regressions: each individual has a different steady-state target wealth, and each converges to its own steady state.
- Magnitude of δ measures the speed of convergence. For instance, $\delta = 0.5$ means that half of the wealth gap at time *t*-1 is filled between period *t*-1 and period *t*.

Measuring target wealth

- "People save in various ways *(depositing money in a bank account, buying financial assets, property, or other assets) and for different reasons. A first reason is to prepare for a planned event, such as the purchase of a house, children's education, etc. Another reason is to protect against contingencies, such as uncertainty about future earnings or unexpected outlays (owing to health problems or other emergencies).* About how much do you think you and your family need to have in wealth to meet such unexpected events?"

- Available in 2002, 2004, 2010, 2012, 2014, 2016 SHIW

- Not asked in 2006 and 2008.

Empirical evidence

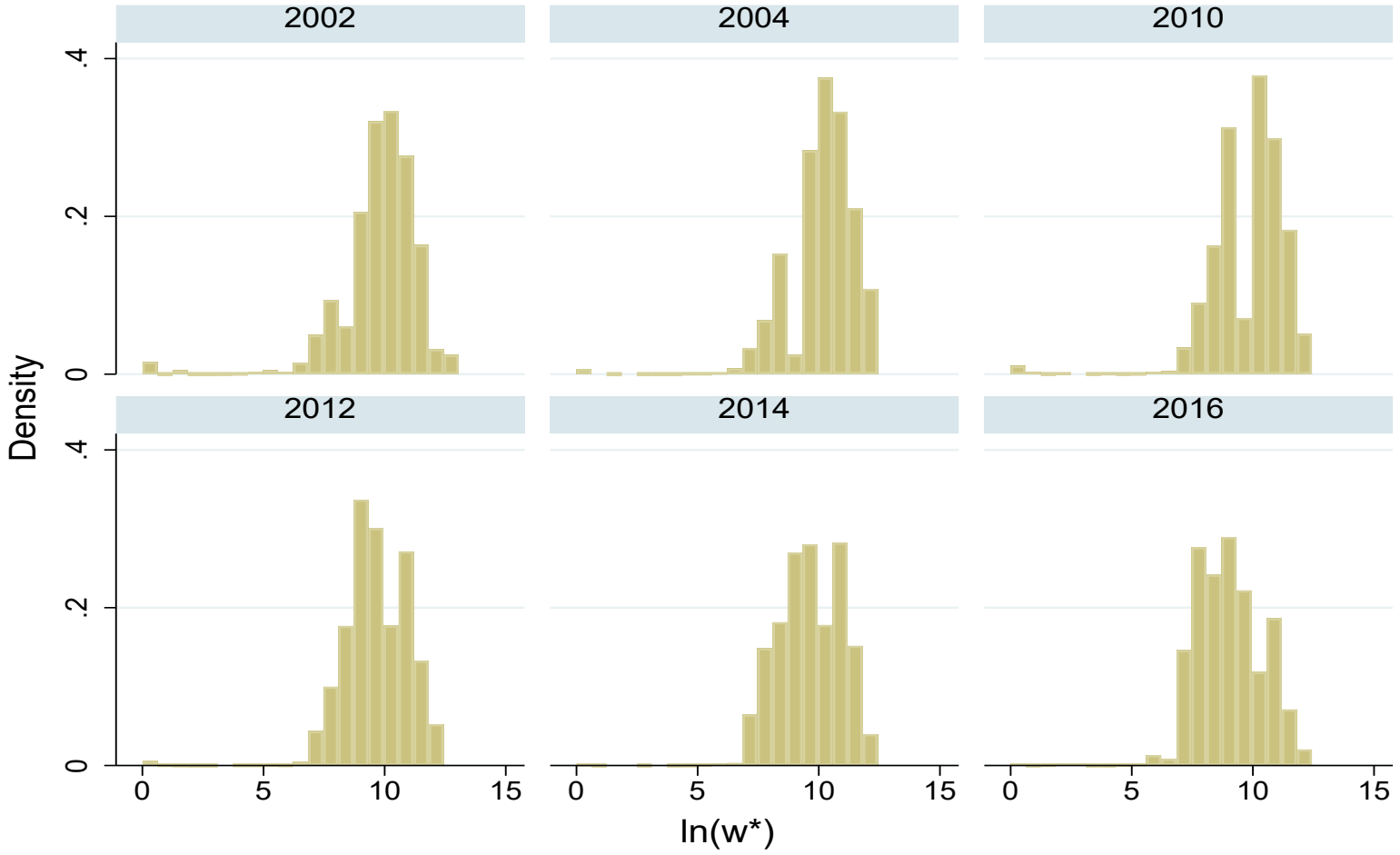
- Descriptive statistics

- GMM estimation: test of $\beta=1$
- Heterogeneity of response
- IV estimates: response to positive and negative shocks
- Regressions for convergence to target wealth

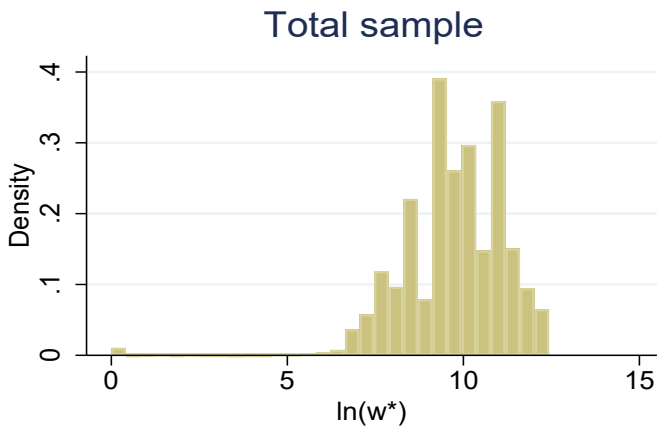
Sample statistics: 2002-2016 SHIW

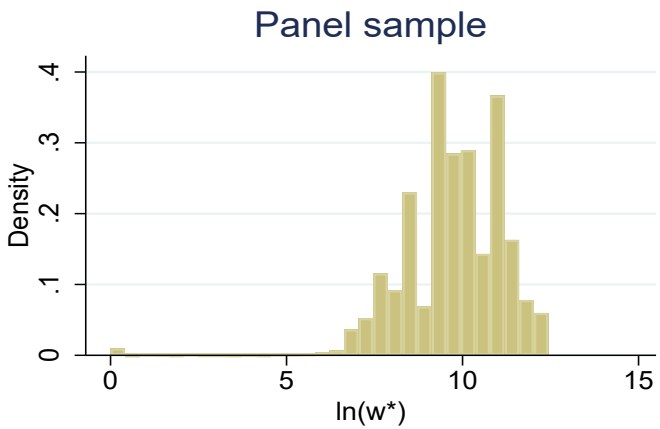
	Mean	Median
Target wealth	35,667	20,030
Non-durable consumption	24,848	21,265
Cash-on-hand	30,056	9,340
Target wealth / consumption (w*/c)	1.62	0.91
Wealth gap: (w-w*)/c	-0.57	-0.31
Observations	46,569	

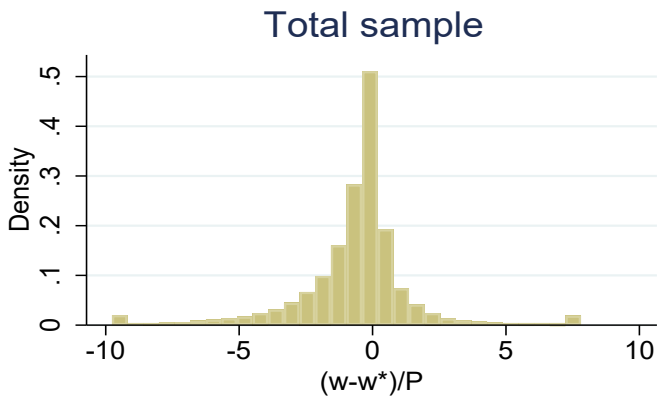
The distribution of log target wealth



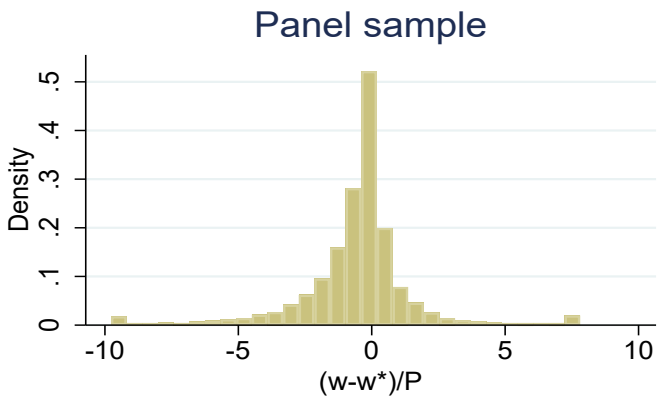
Target wealth and the wealth gap: total and panel samples





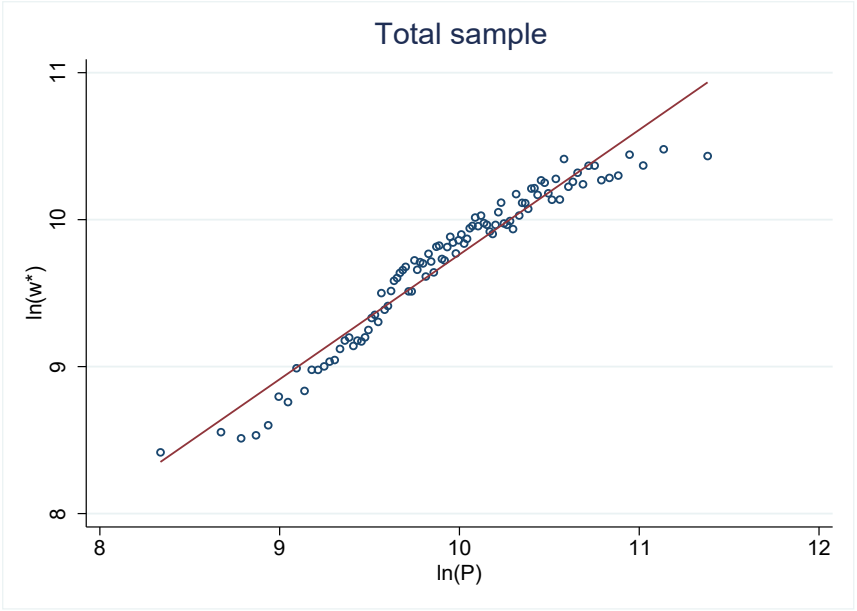


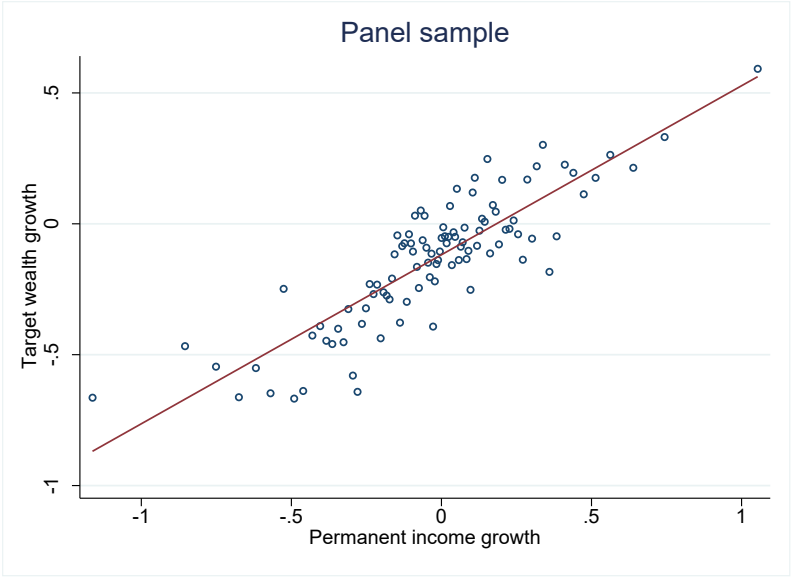
Note: Top and bottom 1% winsorization



Note: Top and bottom 1% winsorization

Target wealth and consumption are strongly correlated, even in first differences





Using the income process to obtain a measure of permanent income

Income process:

$$\ln y_{it} = X_{it}'\gamma^{y} + \ln P_{it} + \varepsilon_{it}$$

$$\ln P_{it} = \ln P_{it-1} + \zeta_{it}$$

First difference:

$$\Delta \ln y_{it} = \Delta X_{it}'\gamma^{y} + \zeta_{it} + \Delta\varepsilon_{it}$$

Target wealth process

$$\ln w_{it}^{*} = X_{it}'\gamma^{w^{*}} + \beta \ln P_{it} + \theta_{i} + v_{it}$$

First difference:

$$\Delta \ln w_{it}^{*} = \Delta X_{it}'\gamma^{w^{*}} + \beta\zeta_{it} + \Delta v_{it}$$

- We need to estimate four parameters:

  - variance of transitory and permanent shocks (σ_ζ^2 and σ_ε^2)
  - variance of target wealth (σ_v^2)
  - β coefficient.

$$g_{it}^{y} = \Delta \ln y_{it} - \Delta X_{it}' \gamma^{y} = \zeta_{it} + \Delta \varepsilon_{it}$$
$$g_{it}^{w^*} = \Delta \ln w_{it}^{*} - \Delta X_{it}' \gamma^{w^*} = \beta \zeta_{it} + \Delta v_{it}$$

Moment restrictions:

$$E\left(\left(g_{it}^{y}\right)^2\right) = \sigma_\zeta^2 + 2\sigma_\varepsilon^2$$

$$E\left(g_{it}^{y} g_{it-1}^{y}\right) = -\sigma_\varepsilon^2$$

$$E\left(g_{it}^{y} g_{it}^{w^*}\right) = \beta \sigma_\zeta^2$$

$$E\left(\left(g_{it}^{w^*}\right)^2\right) = \beta^2 \sigma_\zeta^2 + 2\sigma_v^2$$

GMM results

σ_ζ^2	0.021
	(0.002)***
σ_ε^2	0.056
	(0.003)***
σ_η^2	1.074
	(0.021)***
β	0.822
	(0.135)***
N	16,883
P-value test β=1	0.187

- Variance of permanent and transitory shocks comparable to previous estimates.
- Variance of target wealth is fairly large, reflecting sources of heterogeneity not captured by our specification and measurement error

Sample splits by age and cash-on-hand

	Age$\leq$ 45	Age>45	Poor	Rich
σ_ζ^2	0.024	0.019	0.021	0.021
	(0.011)**	(0.002)***	(0.006)***	(0.002)***
σ_ε^2	0.087	0.052	0.080	0.045
	(0.014)***	(0.003)***	(0.008)***	(0.003)***
σ_η^2	1.042	1.077	1.240	0.989
	(0.053)***	(0.026)***	(0.041)***	(0.024)***
β	1.056	0.852	1.125	0.701
	(0.548)*	(0.155)***	(0.372)***	(0.128)***
N	2,695	14,188	5,668	11,215
P-value test β=1	0.919	0.338	0.737	0.020

Robustness

- $\Delta \ln w_{it}^{*}$ affected also by transitory income
- $\Delta \ln w_{it}^{*}$ affected also by a preference shock
- Various sub-samples

IV Estimates of $\Delta \ln w_{it}^{*} = \beta \Delta \ln P_{it} + \Delta v_{it}$, distinguishing sign and size of shocks

	Baseline specification	Pos. and neg. cons. growth	Large and small cons. growth
Log(Cons.)	0.979		
	(0.147)***		
Log(Cons.)*1{Pos. cons. growth}		0.849	
		(0.316)***	
Log(Cons.)*1{Neg. cons. growth}		1.093	
		(0.262)***	
Log(Cons.)*1{Large cons. growth}			1.181
			(0.214)***
Log(Cons.)*1{Small cons. growth}			0.232
			(0.420)
N	16,554	16,554	16,554
P-value test $\beta = 1$	0.889		
P-value test $\beta_{\mathrm{p}} = \beta_{\mathrm{n}}$		0.623	
P-value test $\beta_{\mathrm{l}} = \beta_{\mathrm{s}}$			0.087

P is estimated through a flexible reduced form of labor income on consumption, cash-on-hand, and demographic variables [in the model $lnc - lnP = f(lnw - lnP)$]

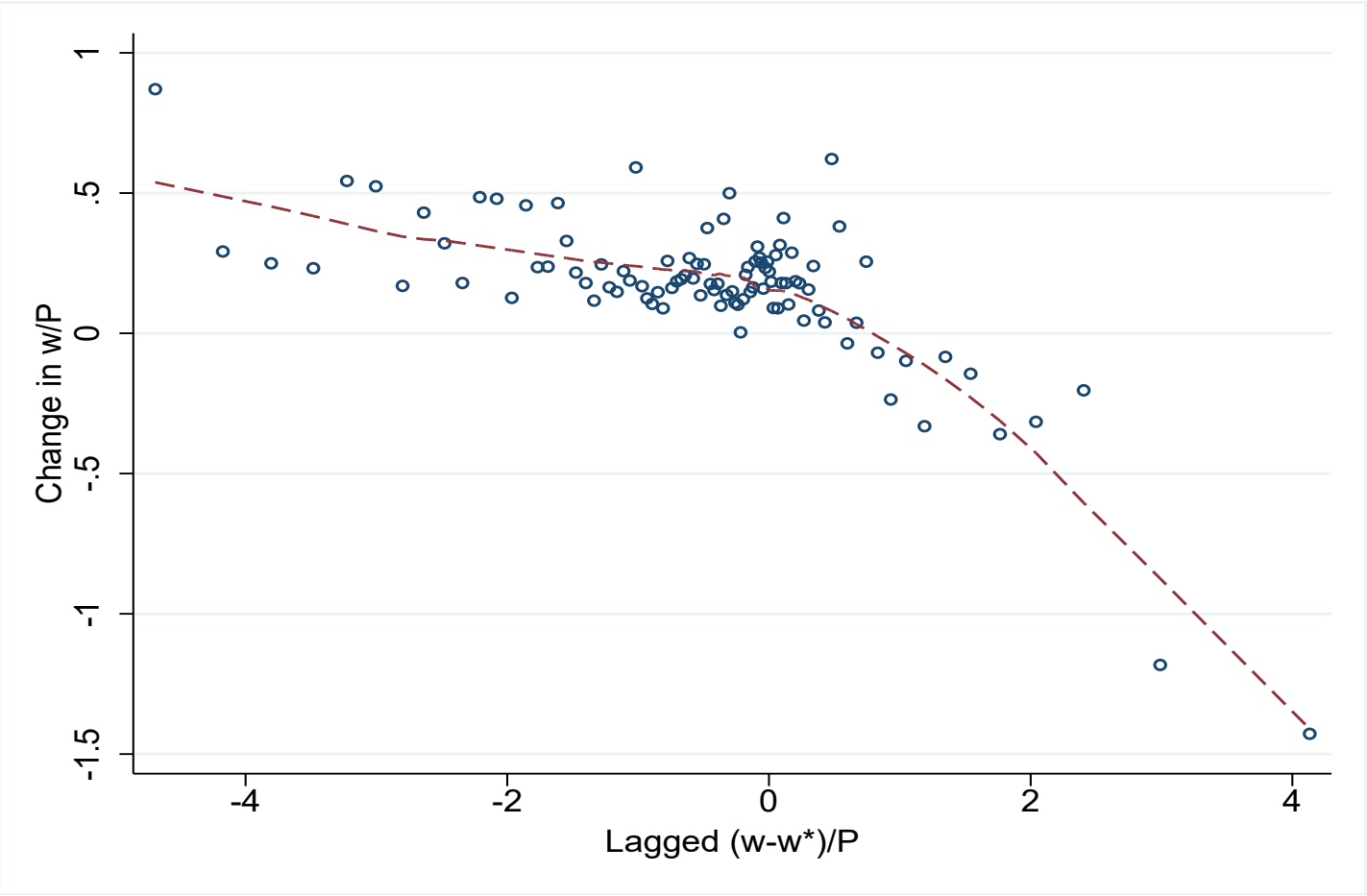
Adjustment to target wealth

- Findings so far suggest that people understand what they *should do* in response to a shock according to the buffer stock model.

- But do people *actually* adjust their stock of wealth when it is off-target?
  - Policy relevant: In many household surveys (SCF, HFCS) people typically report that they are unprepared to meet even small financial emergencies.

- We now check whether the ratio of cash-on-hand to permanent income is negatively correlated with the "wealth gap"

Negative correlation between change in wealth and wealth gap only evident when the gap is positive



$$x_{it} - x_{it-1} = \alpha + \delta(x_{it-1} - x^*_{it-1}) + e_{it}$$

Adjustment to target wealth only for those above target

	Baseline	Gap below/above target	Gap large/small	IV
$(x_{it-1} - x^*_{it-1})$	-0.388			-0.161
	(0.067)***			(0.113)
$(x_{it-1} - x^*_{it-1}) > 0$		-1.267		
		(0.228)***		
$(x_{it-1} - x^*_{it-1}) \leq 0$		0.051		
		(0.021)**		
$(x_{it-1} - x^*_{it-1}) > 2$			-0.400	
			(0.071)***	
$(x_{it-1} - x^*_{it-1}) \leq 2$			-0.260	
	0.014	0.108	0.012	-0.247
Age	(0.185)	(0.186)	(0.187)	(0.121)**
	0.038	0.092	0.036	0.104
Age sq./100	(0.046)	(0.044)**	(0.047)	(0.063)*
	-0.119	-0.054	-0.117	-0.111
Family size	(0.086)	(0.083)	(0.086)	(0.105)
	0.298	0.286	0.301	0.300
Married	(0.266)	(0.254)	(0.266)	(0.459)
			(0.032)***	
N	16,818	16,818	16,818	7,997

Summary

- Households revise approximately one-for-one their reported target wealth in response to permanent shocks.
- No significant differences for positive and negative permanent income shocks and for shocs of different size.
- People seem to understand that they should accumulate a buffer stock to guard against permanent changes in their incomes.
- But they find it hard to act on this understanding by changing their actual saving decisions (unless they overshoot the target).