A Model of Expenditure Shocks

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Motivation

- Anecdotally, a large share of household expenditure is random and unexpected. E.g.,
  - Auto and home repairs; medical emergencies; educational expenses
- These expenditure items are also *hard* to adjust (downward) in the short-run ("$\approx$ neccesities or consumption commitments")
- Households with limited financial resources, that are susceptible to these shocks, decrease net assets or simply cannot afford them
- Policymakers and politicians usually refer to these households as debt burdened
  - they allocate additional income to debt service (net asset accumulation) rather than additional consumption (relative to average)

In this paper, we explore this story

What we do (1)

Document facts from microdata (PSID)

1. Consumption expenditure is as volatile as income (within HHs, overtime)
2. Expenditure is relatively uncorrelated with income (within HHs, overtime)
3. Consumption growth is strongly negatively autocorrelated (within HHs, overtime)
4. Consumption and income growth are much less correlated among households experiencing *high consumption* (within a period, across HHs)

These facts are, jointly, difficult to reconcile with standard Bewley models and its extensions (habits, heterogeneous preferences, wealth-type expenditure shocks, etc)

What we do (2)

Theory

- Develop a heterogeneous agents model with incomplete markets and *stochastic minimum consumption thresholds*
- Add an additional dimension of heterogeneity from the consumption side
  - Households ”dislike” falling below the stochastic threshold. Expenditure shocks provide an extra precautionary saving motives
- Existence of “saving-constrained” households that consume ”too much” and save ”too little”, compared to the standard Bewley model

The model is able to rationalize our facts and few other puzzling facts from the microdata

Show me the equations

Household-level evidence

Microecononomic Facts

Panel Study of Income Dynamics (PSID)

- Biennial panel data
- Panel on consumption starting in 1999 (until 2017)
- Balanced panel: sample of households that are in every wave since 1999 ($\approx$ 6,000 HHs)

Facts 1 and 2: volatile and independent expenditure

		PSID	Bewley
		(1)	(2)
Panel A: Average across households			
Fact 1	$sd(d\log C)/sd(d\log I)$	1.05	0.29
		(0.09)	
Fact 2	$corr(d\log C, d\log I)$	0.23	0.64
		(0.02)	

Note: $sd(d\log C)/sd(d\log I)$ and $corr(d\log C, d\log I)$ in Panel A are the cross-sectional means of the listed statistics, which are first calculated at the household level. The model-based moments are calculated from a quarterly simulated panel of 20,000 households aggregated to ten biennial periods.

▸ Non-durable consumption

▸ Income process calibration

Fact 3: negatively autocorrelated expenditure growth

		PSID	Bewley
		(1)	(2)
Panel B: Panel autoregression coefficients			
	AR coefficient (log C), FE	0.21	0.67
		(0.02)	
	AR coefficient (log C), pooled	0.67	0.94
		(0.01)	
	AR coefficient (C growth), FE	-0.38	-0.078
		(0.02)	
Fact 3	AR coefficient (C growth), pooled	-0.36	0.019
		(0.02)	

Note: Autoregressive (AR) coefficients in Panel B are calculated via regression with (FE) or without (pooled) household fixed effects. Time-fixed effects are included in all PSID-based autoregressions. Estimation procedures that account for possible Nickell bias yield slightly larger estimates. The PSID statistics are nearly identical when focusing exclusively on nondurable goods.

Fact 4: state-dependency in the cross-sectional correlation of consumption and income growth

high $C = 1$ is one when household C is 1.5 standard deviations larger than average consumption (0 otherwise) Decomposing Episodes

		PSID	Bewley
		(1)	(2)
Panel C: Cross-sectional correlation			
	$corr(d\log C, d\log I)$	0.21	0.65
		(0.09)	
	$corr(d\log C, d\log I)$ (*high* C=1)	0.07	0.67
		(0.02)	
Fact 4	ratio	0.35	1.03
		(0.12)	

Note: Panel C reports the average (across years) of cross-sectional correlations. Cross sectional conditional $corr(d\log C, d\log I)$ limits the sample to households experiencing high consumption, defined as household consumption exceeding the within-household average by 1.5 standard deviations.

Summary of “puzzling” facts

- Household-level consumption is too volatile and yet uncorrelated with income
- Household-level consumption growth is negatively autocorrelated
- Household-level consumption is path dependent: past high expenditure determines lower correlation between consumption and income growth

Jointly, these facts are hard to reconcile with models of incomplete markets and liquidity constraints (or others alternatives)

A Model of Expenditure Shocks

Microfoundation: Consumption Thresholds

Households subject to persistent consumption thresholds

- Medical problems, car/house repairs
- Network/neighbor/friends effects
- Family commitments
- Households take on debt or reduce assets to avoid a large utility cost

Environment

- There is a continuum of ex-ante identical households $i \in [0, 1]$ that provide labor inelastically, consume non-durable goods (c), and accumulate the *only asset* in the economy capital wealth (k)
- Households are subject to idiosyncratic productivity shocks (persistent z and (nearly) permanent x)
- Households are credit constrained by $k' > (b \leq 0)$. In addition, the interest rate on loans is greater than the interest rate on saving
- We incorporate stochastic consumption thresholds ($\underline{c}$). Household pay a utility cost (λ) if they violate the threshold

Model: Households

Agents solve

$$V(k,z,x,\underline{c}) = \max_{c\geq 0}\left\{\log(c) - \lambda \max\{\underline{c}-c,0\} + \beta E_{z',x',\underline{c}'}\left[V\left(k',z',x',\underline{c}'\right)|z,x,\underline{c}\right]\right\}$$

subject to the budget constraint

$$c + k' \leq (1 + r - \delta + \phi \mathbf{1}(k \leq 0))\, k + w \exp(z+x)\, \overline{h},$$

the borrowing constraint

$$k' \geq b,$$

and stochastic income and consumption threshold processes

$$\begin{aligned} z' &= \rho_z z + \epsilon'_z \\ x' &= \rho_x x + \epsilon'_x \\ \underline{c}' &= (1-\rho_c)\mu_c + \rho_c \underline{c} + \epsilon'_c, \end{aligned}$$

Intro

Model: Firms

In each period, the representative firm chooses capital K and effective labor L to solve

$$\max_{K,L}\{Y - rK - wL\}.$$

subject to

$$Y = K^{\alpha}L^{1-\alpha}$$

Stationary equilibrium

We examine *stationary equilibria*, which consist of constant firm capital K^* and labor L^*, a constant wage w^*, a constant household wealth distribution Ω^*, and household value and policy functions V^*, c^*, and k'^* such that

1. the value and policy functions solve the household problem given prices,
2. K^* and L^* solve the firm problem:

$$r = \alpha(L^*/K^*)^{1-\alpha}, \; w^* = (1-\alpha)(K^*/L^*)^{\alpha} = (1-\alpha)\left(r/\alpha\right)^{\frac{\alpha}{\alpha-1}},$$

3. the labor market clears: $L^* = \overline{H}$, and
4. Ω^* is generated by k'^*.

Global solution iterating on the Bellman equation. We approximate V using Piecewise-Cubic Hermite polynomials in k and solve the maximization using Feasible Sequential Quadratic Programming (FSQP).

Calibration and estimation

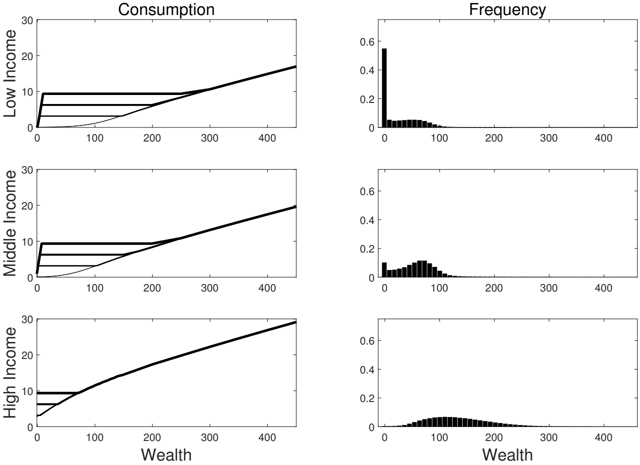
Calibration and estimation

- We choose the productivity process parameters to approximate household income from the PSID: $\rho_z = 0.74$, $\sigma_z = 0.78$, $\rho_x = 0.99$, and $\sigma_x = 0.15$ ▸ Income process calibration
- We set: $\phi = 0.03$, $\delta = 0.0125$, $r = 0.0225$, $b = -1$
- We then choose the discount rate (β), utility cost (λ), and $\underline{c}$ process (μ_c, ρ_c, σ_c) to target

$$
\begin{aligned}
\frac{\overline{K}}{Y} &= 12 \\
Corr\left(d\log I, d\log C\right) &= 0.23 \\
\frac{Std\left(d\log C\right)}{Std\left(d\log I\right)} &= 1.05 \\
Corr\left(log(C_t), log(C_{t-1})\right) &= 0.67 \\
Fraction\left(k < 0\right) &= 0.1
\end{aligned}
$$

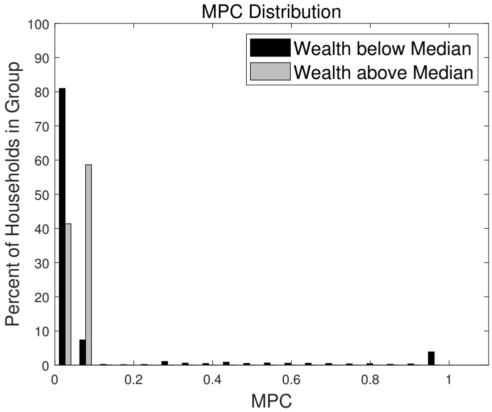
- Via global optimization (DiRect), the best–fit parameter values are $\beta = 1/1.039$, $\lambda = 24.30$, $\rho_c = 0.587$, $\sigma_c = 3.07$, and $\mu_c = 0.053$.

Consumption functions by income and values of $\underline{c}$



Note: The left column shows the consumption policy functions at different income levels, and the right column shows the steady-state wealth distribution conditional on these income levels. Line thickness corresponds to the value of $\underline{c}$. Low (Middle, High) income means both the permanent and persistent components of productivity are at their low (middle, high) discretized values.

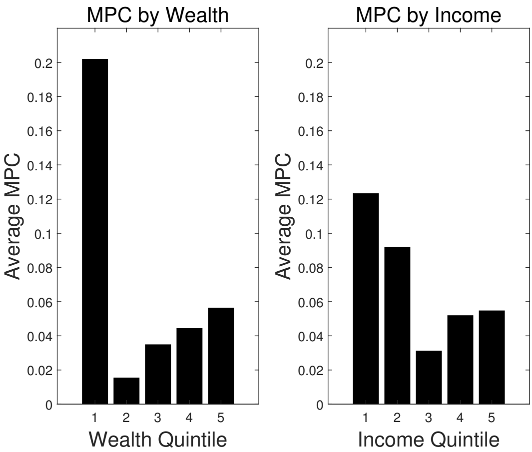
MPC distribution by wealth groups



Note: The figure shows the expenditure shock model's ergodic MPC distribution for households, divided into low and high wealth groups. The bin size is 0.05

Our model is able to rationalize the existence of poor-savers (low MPC poor) in the data (Misra and Surico 2014; Lewis, Melcangi, and Piloshoph, 2022)

Average MPC by wealth and income



Note: The figure shows average MPC by wealth or income quintile in the ergodic distribution of the expenditure shock model.

Our model is able to rationalize the U shaped distribution of MPC by income and wealth (Misra and Surico 2014) Bewley

Fit of the PSID facts

		PSID	Bewley	Exp. Shock	Meas. Error	Het. Pref
		(1)	(2)	(3)	(4)	(5)
Panel A: Average across households						
Fact 1	$sd(d\log C)/sd(d\log I)$	1.05	0.29	1.10	1.13	0.55
Fact 2	$corr(d\log C, d\log I)$	0.23	0.64	0.34	0.18	0.82
Panel B: Panel autoregression coefficients						
	AR coefficient (log C), FE	0.21	0.67	0.12	0.26	0.76
	AR coefficient (log C), pooled	0.67	0.94	0.68	0.68	0.98
	AR coefficient (C growth), FE	-0.38	-0.078	-0.46	-0.34	-0.036
Fact 3	AR coefficient (C growth), pooled	-0.36	0.019	-0.44	-0.31	0.11
Panel C: Average across years						
	$corr(d\log C, d\log I)$	0.21	0.65	0.29	0.21	0.92
	Conditional $corr(d\log C, d\log I)$	0.073	0.67	0.098	0.22	0.92
Fact 4	ratio	0.35	1.03	0.34	1.05	1.00

Note: We add a Bewley model with measurement error in consumption $m_t = \rho_m m_{t-1} + \sigma_m u_t,\ u_t \sim iidN(0,1)$, and a heterogeneous preferences model as in Agiar, Bils and Boar (2020). Both calibrated to match the PSID facts.

▸ Calibrations

▸ Detailed het. pref.

High C *Episodes* and saving constraints

Using our empirical measure of High C Episodes, the model shows a large correspondence between saving constraints and High Consumption Episodes

	Share of agents who	Quarterly (1)		Biennial (2)
(1)	Are on saving constraint in a given quarter	0.24	Are on saving constraint for at least a quarter out of the year	0.48
(2)	Are on saving constraint for four consequtive quarters	0.05	Are on saving constraint for a full year	0.05
(3)	Have high consumption	0.09		0.09
(4)	Are saving constrained if experiencing high consumption	0.61	Are saving constrained for at least a quarter if experiencing high consumption	0.64
(5)	Have very high consumption	0.05		0.04
(6)	Are saving constrained if experiencing very high consumption	0.72	Are saving constrained for at least a quarter if experiencing very high consumption	0.73
(7)	Are paying the utility cost (consumption $<$ minimum threshold)	0.05	Are paying the utility cost for at least a quarter	0.10

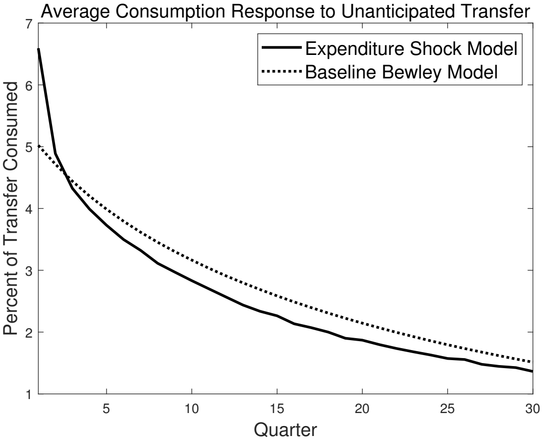
Counterfactual experiments

Fiscal transfers

Fiscal transfer experiment

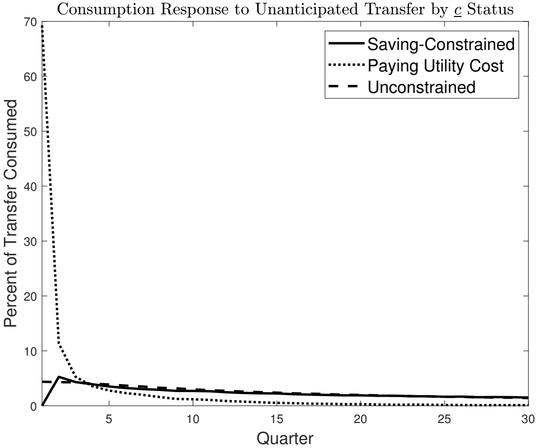
- Simulate the effect of a one-time unanticipated transfer to households (all or by type)
- Draw 200,000 households from the stationary distribution and simulate economy for 30 quarters
- Impulse response are differences between consumption paths with and without initial transfer of 0.5 ($\approx$ 13% of quarterly income)

Aggregate consumption responses (universal transfer)



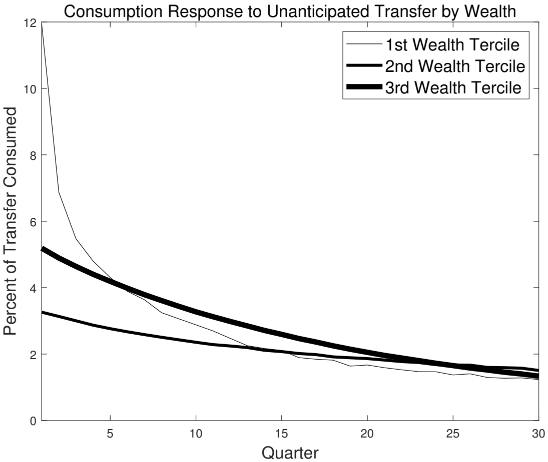
Note: The figure shows the effect on aggregate consumption of a one-time wealth transfer of 0.5 to all households (a little over 13% of average quartly income), starting at the ergodic distribution. Each line is the difference between the average consumption path with and without the transfer, divided by the transfer and then multiplied by 100. Therefore, the y-axis is the amount of the transfer consumed on average in the corresponding quarter.

Disaggregated consumption responses by type (targeted transfer)



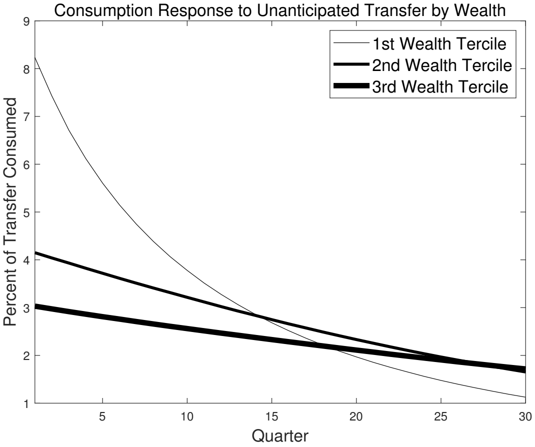
Note: The figure shows the average consumption response to a one quarter unanticipated transfer of 0.5 for saving-constrained households (solid, $|c - \underline{c}| < 0.00001$), unconstrained households (dashed, $c \geq \underline{c} + 0.00001$), and households paying the utility cost (dotted, $c \leq \underline{c} - 0.00001$), starting at the ergodic distribution. For each group, the line is the difference between the average consumption path with and without the transfer, divided by the transfer and then multiplied by 100. Therefore, the y-axis is the amount of the transfer consumed on average in the corresponding quarter.

Disaggregated consumption responses by wealth



Note: The figure shows the average consumption response, in the expenditure shock model, to a one quarter unanticipated transfer of 0.5 by wealth, starting at the ergodic distribution. Line thickness corresponds to wealth tercile, so the thinnest line represents the bottom 33% by wealth in the ergodic distribution. For each group, the line is the difference between the average consumption path with and without the transfer, divided by the transfer and then multiplied by 100. Therefore, the y-axis is the amount of the transfer consumed on average in the corresponding quarter

Disaggregated consumption responses by wealth (Bewley)



Note: The figure shows the average consumption response, in the baseline Bewley model without expenditure shocks, to a one quarter unanticipated transfer of 0.5 by wealth, starting at the ergodic distribution. Line thickness corresponds to wealth tercile, so the thinnest line represents the bottom 33% by wealth in the ergodic distribution. For each group, the line is the difference between the average consumption path with and without the transfer, divided by the transfer and then multiplied by 100. Therefore, the y-axis is the amount of the transfer consumed on average in the corresponding quarter

Asymmetric consumption responses

Consumption falls sharply at a predictable decline in income (exhaustion of UI benefits in Ganong and Noel, 2019)

- Particularly evident among low-income households
- Difficult to rationalize in standard frameworks

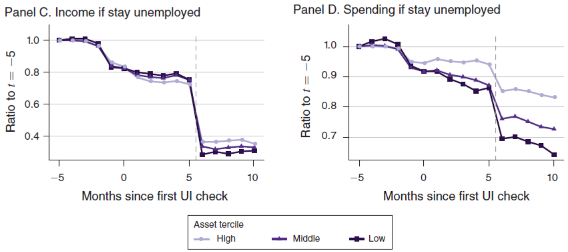
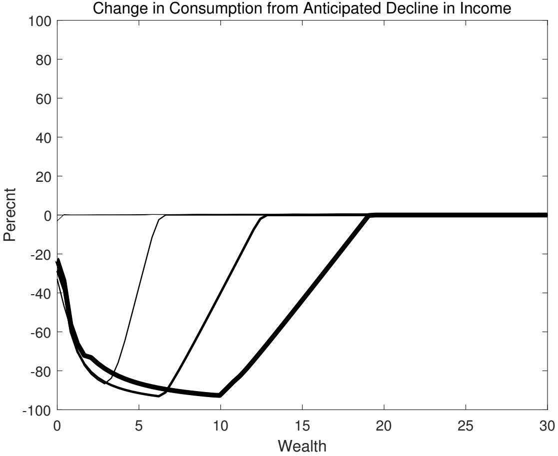


Figure: Ganong and Noel (2019)

Anticipated income decline (≈ UI expiration)

- Simulate effect of a 25% decline in income (that lasts 10 quarters) that is anticipated 5 quarters prior
- Calculate percentage change in consumption between periods 4 and 5, as a function of period 4 wealth
  - Consider households with the lowest realization of the income process in period 4 (≈ unemployed) for different values of consumption threshold

Responses to anticipated income declines (Ganong and Noel (2019), Shea (1995))



Note: The figure shows the percent change in consumption between periods 4 and 5 from a 25% decline in income in periods 5 through 15 that was announced in period 1, as a function of period 4 wealth, for households with the lowest realization of the income process in period 4. Line thickness corresponds to $\underline{c}_4$, with the thickest representing the highest realization of $\underline{c}$. While wealth changes endogenously between periods 4 and 5, we assume the exogenous shocks remain unchanged between 4 and 5

Counterfactual experiments

Welfare costs of income fluctuations

Welfare costs of income fluctuations

To what extent do expenditure shocks amplify the welfare costs of income fluctuations?

- We solve for the % permanent increase in consumption from the original model that gives the same utility as freezing labor income at that point.

$$V^* \left(k, z, x, \underline{c}; \psi \left(k, z, x, \underline{c}\right)\right) = V \left(k, z, x, \underline{c}\right).$$

- the welfare gain in the Bewley model is 2.84%, in the heterogeneous preferences model is 6.7%, and in the expenditure shock model is 37.03%

Consumption threshold shocks reduce the efficacy of self-insurance by constraining saving and limiting the ability of households to smooth out the effects of random income declines

Conclusion

Expenditure shocks and saving constraints can help rationalize the following facts:

- Consumption volatile relative to income
- Consumption relatively uncorrelated with income
- State-dependent cross-sectional correlation between income and consumption growth
- Many low-wealth/high-debt households have low (zero) MPCs
- Can rationalize asymmetric response to anticipated income changes (Shea, Ganong-Noel)

Important implications for the effects of fiscal stimulus and welfare costs of income fluctuations

Decomposing high C episodes

Table: Decomposing High Expenditure Episodes

	Share of Total Expenditure (1)	Ratio of Category Expenditure Relative to Total Expenditure during High Expenditure Episodes (2)	Coefficient from Linear Probability Model (3)	Coefficient from Probit Model (4)
Food	0.24	0.13	0.15	0.96
Housing	0.38	0.19	0.22	1.27
Transportation	0.26	0.49	0.44	1.99
Education	0.03	0.10	0.13	0.94
Child Care	0.01	0.02	0.06	0.48
Health	0.08	0.08	0.10	0.76

Note: This table presents statistics for the broad categories that make up the measure of total expenditure. Expenditure on Clothing, Trips, Other Recreation, Household Repairs, Household Furnishings, and Telephone/Internet are not included in the measure of total expenditure since they were only recorded beginning in 2005. In column (2), expenditure during episodes is relative to within-household averages. In columns (3) and (4), the depicted statistics are the coefficients from a regression of an indicator for a high expenditure episode on indicator variables for high sub-category expenditure. All regression coefficients are significant at the 1% level.

Back

Facts 1, 2, 3, and 4: alternative expenditure measures

Expenditure Measure:	Average reltive volatility (Fact 1)	Correlation with income growth (Fact 2)	Autocorrelation of consumption growth (Fact 3)	Ratio of cross-sectional correlations (Fact 4)
Baseline	1.05	0.23	-0.38	2.88
Broad	1.05	0.25	-0.38	1.48
Baseline Net Durables	0.99	0.23	-0.40	2.26
Broad Net Durables	1.00	0.24	-0.38	1.70

Note: This table presents, for various definitions of expenditure in the PSID, the average volatility relative to income (Fact 1), the average correlation with income growth (Fact 2), the autoregressive coefficient on expenditure growth (Fact 3), and the ratio of the cross-sectional correlation between consumption growth and income growth in the full sample relative to the subset of households experiencing high expenditure (Fact 4). The baseline measure of expenditure excludes all categories of expenditure that were added in 2005: clothing, travel other recreational expenses, telephone, internet, household repairs, and household furnishing. The Broad measure includes these categories. The Baseline Net Durable measure excludes purchases of automobiles, and the Broad Net Durable measure excludes purchases of household furnishings as well as purchases of automobiles.

Back

Alternative income process and models

Table: Simulations with Off-the-Shelf Income and Heterogeneous Preferences.

		PSID	Heterogeneous Preferences				
			All	Low β Low σ	Low β High σ	High β Low σ	High β High σ
		(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Average across households							
Fact 1	$sd(\log C)/sd(\log I)$	1.05	0.55	0.82	0.95	0.46	0.54
Fact 2	$corr(d\log C, d\log I)$	0.23	0.82	0.92	0.97	0.79	0.81
Panel B: Panel autoregression coefficients							
	AR coefficient ($\log C$), FE	0.21	0.76	0.68	0.69	0.79	0.82
	AR coefficient ($\log C$), pooled	0.67	0.98	0.93	0.94	0.99	0.98
	AR coefficient (C growth), FE	-0.38	-0.04	0.063	-0.073	-0.018	0.027
Fact 3	AR coefficient (C growth), pooled	-0.36	0.11	0.12	0.04	0.16	0.21
Panel C: Average across years							
	Cross-sectional $corr(d\log C, d\log I)$	0.21	0.92	0.96	0.99	0.93	0.92
	Cross-sectional conditional $corr(d\log C, d\log I)$	0.073	0.92	0.98	0.99	0.94	0.94
Fact 4	ratio	0.34	1.00	1.02	1.00	1.01	1.03
	Fraction of households		1.00	0.001	0.16	0.73	0.11

Back

Income process calibration

In the model, quarterly log income for household i ($y_{i,t}$, $t = 1, 2, 3, \ldots$) follows

$$\begin{aligned} y_{i,t} &= x_{i,t} + z_{i,t} \\ x_{i,t} &= \rho_x x_{i,t-1} + \sigma_x \varepsilon_{x,t} \\ z_{i,t} &= \rho_z z_{i,t-1} + \sigma_z \varepsilon_{z,t}, \end{aligned}$$

where $\rho_x = .99$, and ε_x and ε_z are i.i.d. $\mathcal{N}(0,1)$. In the PSID, however, we observe only log annual income ($a_{i,\tau}$, $\tau = 1, 2, 3, \ldots$) sampled biennially. In the model, this corresponds to

$$\begin{aligned} a_{i,1} &= \log \sum_{t=1}^{4} \exp\left(y_{i,t}\right) \\ a_{i,2} &= \log \sum_{t=9}^{12} \exp\left(y_{i,t}\right) \\ a_{i,3} &= \log \sum_{t=17}^{20} \exp\left(y_{i,t}\right) \\ &\vdots \end{aligned}$$

Income process calibration

In the PSID, we estimate

$$a_{i,\tau} = FI_i + \rho_a a_{i,\tau-1} + \sigma_a \varepsilon_{a,\tau},$$

which yields estimates of $var\left(FI_i\right) \approx 1.06^2$, $\rho_a \approx .05$, and $\sigma_a \approx .96$. We choose σ_x, σ_z, and ρ_z such that when we run the fixed-effects panel regression on model-simulated $a_{i,\tau}$, the resulting values for $var\left(FI_i\right)$, ρ_a, and σ_a match what we see in the PSID.

▸ Back

Misra and Surico (2014)

Quantile regression approach:

$$\Delta C_{it+1} = q(R_{it+1}, X_{it}, M_s, \lambda_{it+1}) \quad with \quad \lambda_{it+1} | R_{it+1}, X_{it}, M_s \sim U(0,1),$$

where λ_{it+1} captures the unobserved heterogeneity in households with similar observed characteristics (R_{it+1}, X_{it}, M_s). Let $q(R_{it+1}, X_{it}, M_s, \tau)$ be the conditional τ-th quintile of ΔC_{it+1}, given observables.

For each $\tau \in$ (0,1), the linear quantile model is

$$\Delta C_{it+1} = q(R_{it+1}, X_{it}, M_s, \tau) = \sum_s \alpha_{0s}(\tau) \times M_s + \alpha_1(\tau)' X_{it} + \alpha_2(\tau) R_{it+1}.$$

Back

Wealth and MPC

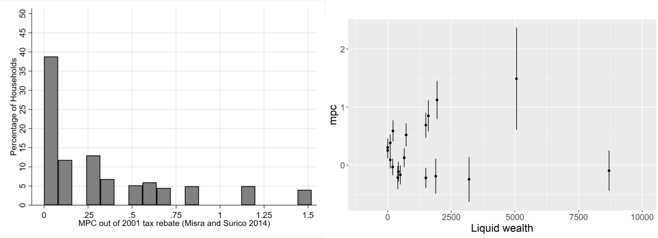
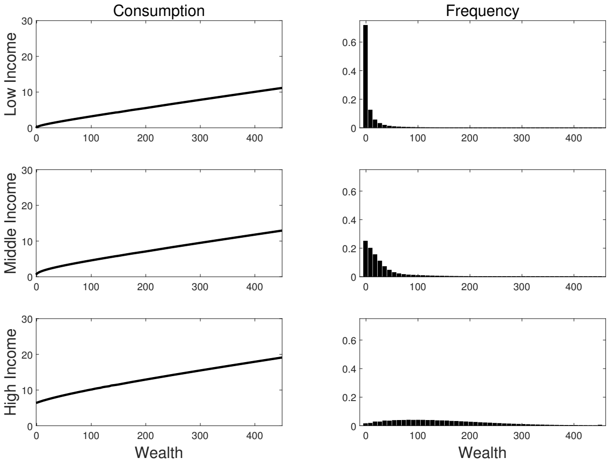


Figure: Left panel plots the distribution of estimated MPCs for U.S Households with liquid wealth below the median. Right panel plots median liquid wealth for each MPC quantile.

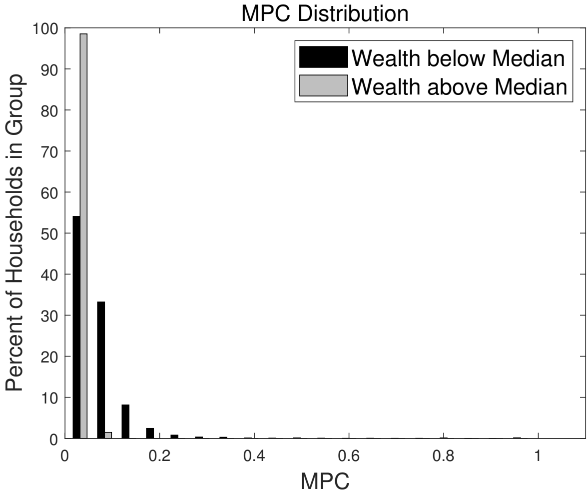
Back

Bewley model's calibration



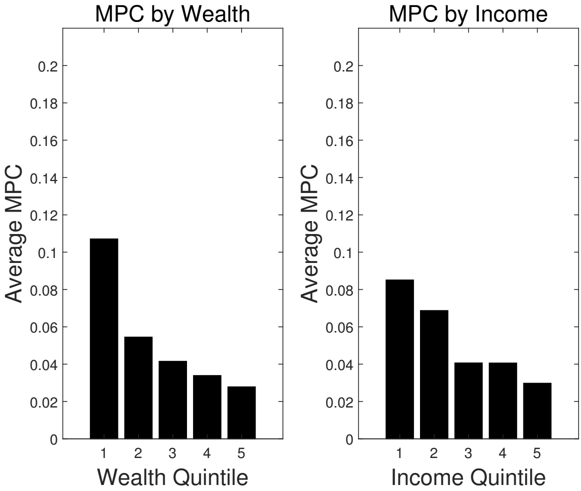
Note: The left column shows the Bewley model consumption policy functions (without expenditure shocks) at different income levels, and the right column shows the steady-state wealth distribution conditional on these income levels. Low (Middle, High) income means both the permanent and persistent components of productivity are at their low (middle, high) discretized values. Back

Bewley model's calibration



Note: The figure shows the baseline Bewley model's ergodic MPC distribution for households, divided into low and high wealth groups. The bin size is 0.05 Back

Bewley model's calibration



Note: The figure shows average MPC by wealth or income quintile in the ergodic distribution of the Bewley model without expenditure shocks

Back

Calibration of models

Back

		Bewley	Expenditure shock model	Bewley with meas. error	Notes
Calibrated Parameters	ρ_z	0.74	0.74	0.74	Inc. AR, pers.
	σ_z	0.78	0.78	0.78	Inc. vol., pers.
	ρ_x	0.99	0.99	0.99	Inc. AR, perm.
	σ_x	0.15	0.15	0.15	Inc. vol., perm
	ϕ	0.03	0.03	0.03	Borrowing cost
	α	0.36	0.36	0.36	Capital share
	δ	0.0125	0.0125	0.0125	Depreciation
	r	0.0225	0.0225	0.0225	Rental rate
	b	-1	-1	-1	Borrowing constr.
	$\bar{h}$	0.33	0.33	0.33	Labor normalization
	β			0.9889	Discount factor
Estimated Parameters	β	0.9889	0.9622		Discount factor
	λ		24.394		$\underline{c}$ utility cost
	ρ_c		0.5867		$\underline{c}$ AR
	σ_c		3.0767		$\underline{c}$ volatility
	μ_c		0.0529		$\underline{c}$ average
	ρ_m			0.2915	ME AR
	σ_m			0.8709	ME volatility
Moments	$\frac{\overline{K}}{\overline{K}^{\alpha}\overline{H}^{1-\alpha}}$	11.9377	14.0878	11.9377	Wealth/income
	$\frac{sd(d\log C)}{sd(d\log I)}$	0.3431	1.1089	1.0342	Ave. relative vol.
	$\rho(C,I)$	0.6518	0.2974	0.2175	$corr(d\log C, d\log I)$
	$k<0$	0.0365	0.0987	0.0365	Fraction borrowers
	$AR(C_t)$	0.9412	0.6852	0.6800	C AR

Alternative models

Buffer stock model

- High consumption $t-1$ from temporary increase in wealth (including income) generates disaving at t (to comeback to target initial lower target wealth)
  - In our case, high consumption in the past increases saving at t instead
- There is also lower MPC at t as consumption is concave in wealth
  - However, we do account for wealth

Standard Expenditure Shock

- An expenditure shock at $t-1$ is equivalent to a negative wealth shock in the budget constraint
- At t the households displays higher marginal utility of consumption and high MPC instead

Consumption commitments

- Symmetric and smooth (non-large shocks) consumption adjustment
- There is no stochastic component in consumption spending (key in our set up)

Back