The Distribution of Wealth and the Marginal Propensity to Consume

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Why Worry About the MPC ($\equiv \kappa$)?

Nobody trying to make a forecast in 2008-2010 would ask:

- Big ‘stimulus’ tax cuts
- Keynesian multipliers should be big in liquidity trap
- Crude Keynesianism: Transitory tax cut multiplier is $1/(1-\kappa)-1$
  - If $\kappa = 0.75$ then multiplier is 4-1=3
  - If $\kappa = 0.05$ then multiplier is only ≈ 0.05

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Our Claim: Heterogeneity Is Key To Modeling the MPC

- Clarida (2012): Missing this is why DSGE models failed
- Theory: HH c function is *concave* in market resources m
  - HH's at different m → *optimally* behave very differently
  - In addition to the MPC, m affects:

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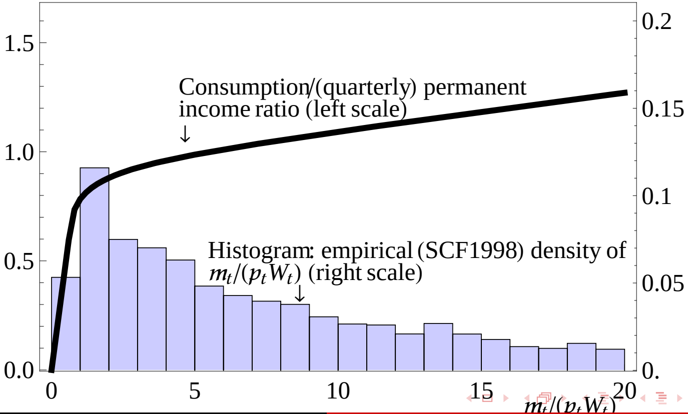
Consumption Concavity and Wealth Heterogeneity



Microeconomics of Consumption

Since Friedman's (1957) PIH:

- c chosen optimally:

  Want to smooth c *in light of* y fluctuations
- Single most important thing to get right is income dynamics!
- With smooth c, income dynamics drive everything!
  - Saving/dissaving: Depends on whether $\mathbb{E}[\Delta y] \uparrow$ or $\mathbb{E}[\Delta y] \downarrow$
  - Wealth distribution depends on integration of saving
- Cardinal sin: Assume crazy income dynamics
  - No end can justify this means
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Our Goal: "Serious" Microfoundations

Requires three changes to well-known Krusell-Smith model:

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- Finite lifetimes
- Match wealth *distribution*
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  - View it as a proxy for many kinds of heterogeneity

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1. Calibrate realistic income process
2. Match empirical wealth distribution
3. Back out optimal C and MPC out of transitory income
4. Is MPC in line with empirical estimates?

Our Question:

Does a model that matches micro facts about income dynamics and wealth distribution give different (and more plausible) answers than KS to macroeconomic questions (say, about the response of consumption to fiscal 'stimulus')?

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Friedman (1957): Permanent Income Hypothesis

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\begin{aligned}
Y_t &= P_t + T_t \\
C_t &= P_t
\end{aligned}
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Progress since then

- Micro data: Friedman description of income shocks works well
- Math: Friedman's words well describe optimal solution to dynamic stochastic optimization problem of impatient consumers with geometric discounting under CRRA utility with uninsurable idiosyncratic risk calibrated using these micro income dynamics (!)

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Our (Micro) Income Process

Idiosyncratic (household) income process is logarithmic Friedman:

$$\begin{aligned} \boldsymbol{y}_{t+1} &= p_{t+1}\xi_{t+1}\mathrm{W} \\ p_{t+1} &= p_t\psi_{t+1} \end{aligned}$$

p_t = permanent income
ξ_t = transitory income
ψ_{t+1} = permanent shock
W = aggregate wage rate

Further Details of Income Process

Modifications from Carroll (1992):

Trans income ξ_t incorporates unemployment insurance:

$$\begin{aligned} \xi_t &= \mu \text{ with probability } u \\ &= (1-\tau)\bar{\ell}\theta_t \text{ with probability } 1-u \end{aligned}$$

μ is UI when unemployed

τ is the rate of tax collected for the unemployment benefits

Model Without Aggr Uncertainty: Decision Problem

$$
\begin{aligned}
\mathrm{v}(m_t) &= \max_{\{c_t\}} \ \mathrm{u}(c_t) + \beta \not{D} \mathbb{E}_t \left[\psi_{t+1}^{1-\rho} \mathrm{v}(m_{t+1}) \right] \\
&\text{s.t.} \\
a_t &= m_t - c_t \\
a_t &\geq 0 \\
k_{t+1} &= a_t / (\not{D} \psi_{t+1}) \\
m_{t+1} &= (\daleth + r) k_{t+1} + \xi_{t+1} \\
r &= \alpha a (\boldsymbol{K} / \bar{\ell} \boldsymbol{L})^{\alpha - 1}
\end{aligned}
$$

Variables normalized by $p_t \mathrm{W}$

What Happens After Death?

- You are replaced by a new agent whose permanent income is equal to the population mean
- Prevents the population distribution of permanent income from spreading out

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Ergodic Distribution of Permanent Income

Exists, if death eliminates permanent shocks:

$$\not{D}\mathbb{E}[\psi^2] < 1.$$

Holds.

Population mean of p^2:

$$\mathbb{M}[p^2] = \left(\frac{\mathsf{D}}{1 - \not{D}\mathbb{E}[\psi^2]}\right)$$

Parameter Values

- β, ρ, α, δ, $\bar{\ell}$, μ , and u taken from JEDC special volume
- Key new parameter values:

Description	Param	Value	Source
Prob of Death per Quarter	D	0.005	Life span of 50 years
Variance of Log ψ_t	σ_{ψ}^2	0.016/4	Carroll (1992); SCF
Variance of Log θ_t	σ_{θ}^2	0.010×4	Carroll (1992)

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Annual Income, Earnings, or Wage Variances

	σ_ψ^2	σ_ξ^2
Our parameters	0.016	0.010
Carroll (1992)	0.016	0.010
Storesletten, Telmer, and Yaron (2004)	0.008–0.026	0.316
Meghir and Pistaferri (2004)*	0.031	0.032
Low, Meghir, and Pistaferri (2010)	0.011	—
Blundell, Pistaferri, and Preston (2008a)*	0.010–0.030	0.029–0.055
Implied by KS-JEDC	0.000	0.038
Implied by Castaneda et al. (2003)	0.028	0.004

*Meghir and Pistaferri (2004) and Blundell, Pistaferri, and Preston (2008a) assume that the transitory component is serially correlated (an MA process), and report the variance of a subelement of the transitory component. σ_ξ^2 for these articles are calculated using their MA estimates.

Typology of Our Models

Three Dimensions

1. Discount Factor β
   - 'β-Point' model: Single discount factor
   - 'β-Dist' model: Uniformly distributed discount factor
2. Aggregate Shocks
   - (No)
   - Krusell–Smith
   - Friedman/Buffer Stock
3. Empirical Wealth Variable to Match
   - Net Worth
   - Liquid Financial Assets

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Dimension 1: Estimation of β-Point and β-Dist

'β-Point' model

- 'Estimate' single $\grave{\beta}$ by matching the capital–output ratio

'β-Dist' model—Heterogenous Impatience

- Assume uniformly distributed β across households
- Estimate the band $[\grave{\beta} - \nabla, \grave{\beta} + \nabla]$ by minimizing distance between model (w) and data (ω) net worth held by the top 20, 40, 60, 80%

$$\min_{\{\grave{\beta},\nabla\}} \sum_{i=20,40,60,80} (w_i - \omega_i)^2,$$

s.t. aggregate net worth–output ratio matches the steady-state value from the perfect foresight model

Dimension 1: Estimation of β-Point and β-Dist

'β-Point' model

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'β-Dist' model—Heterogenous Impatience

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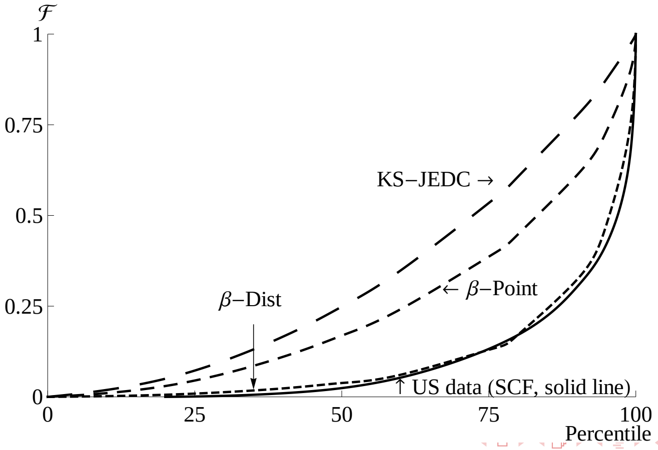
Results: Wealth Distribution

	Micro Income Process					
	Friedman/Buffer Stock		KS-JEDC	KS-Orig[◇]		
	Point Discount Factor[‡]	Uniformly Distributed Discount Factors[⋆]	Our solution		Hetero	
	β-Point	β-Dist				U.S. Data[*]
Top 1%	10.	26.4	3.	3.0	24.0	29.6
Top 20%	55.1	83.1	39.7	35.0	88.0	79.5
Top 40%	76.9	93.7	65.4			92.9
Top 60%	90.1	97.4	83.5			98.7
Top 80%	97.5	99.3	95.1			100.4

Results: Wealth Distribution



Dimension 2.a: Adding KS Aggregate Shocks

Model with KS Aggregate Shocks: Assumptions

- Only two aggregate states (good or bad)
- Aggregate productivity $a_t = 1 \pm \triangle^a$
- Unemployment rate u depends on the state (u^g or u^b)

Parameter values for aggregate shocks from Krusell and Smith (1998)

Parameter	Value
$\triangle^a$	0.01
u^g	0.04
u^b	0.10
Agg transition probability	0.125

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Solution Method

- HH needs to forecast $\boldsymbol{k}_t \equiv \boldsymbol{K}_t / \bar{\ell}_t \boldsymbol{L}_t$ since it determines future interest rates and wages.
- Two broad approaches
  1. Direct computation of the system's law of motion
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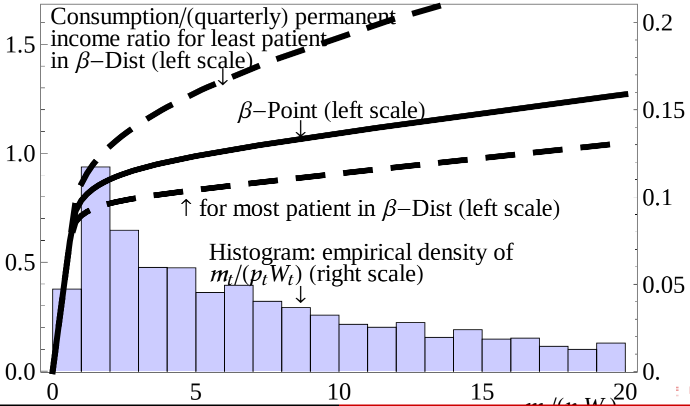
Marginal Propensity to Consume & Net Worth



Results: MPC (in Annual Terms)

	Micro Income Process		
	Friedman/Buffer Stock		KS-JEDC
	β-Point	β-Dist	Our solution
Overall average	0.1	0.23	0.05
By wealth/permanent income ratio			
Top 1%	0.06	0.05	0.04
Top 20%	0.06	0.06	0.04
Top 40%	0.06	0.08	0.04
Top 60%	0.07	0.12	0.04
Bottom 1/2	0.13	0.35	0.05
By employment status			
Employed	0.09	0.2	0.05
Unemployed	0.23	0.53	0.06

Estimates of MPC in the Data: ∼0.2–0.6

	Consumption Measure				
Authors	Nondurables	Durables	Total PCE	Horizon*	Event/Sa
Blundell, Pistaferri, and Preston (2008b)[‡]	0.05				Estimatio
Coronado, Lupton, and Sheiner (2005)			0.36	1 Year	2003 Tax
Hausman (2012)			0.6–0.75	1 Year	1936 Vete
Jappelli and Pistaferri (2013)	0.48				Italy, 201
Johnson, Parker, and Souleles (2009)	∼ 0.25			3 Months	2003 Chil
Lusardi (1996)[‡]	0.2–0.5				Estimatio
Parker (1999)	0.2			3 Months	Estimatio
Parker, Souleles, Johnson, and McClelland (2011)	0.12–0.30		0.50–0.90	3 Months	2008 Eco
Sahm, Shapiro, and Slemrod (2010)			∼ 1/3	1 Year	2008 Eco
Shapiro and Slemrod (2009)			∼ 1/3	1 Year	2008 Eco
Souleles (1999)	0.045–0.09	0.29–0.54	0.34–0.64	3 Months	Estimatio
Souleles (2002)	0.6–0.9			1 Year	The Reag of the Ea

Notes: ‡: elasticity.

Dimension 2.b: Adding FBS Aggregate Shocks

Friedman/Buffer Stock Shocks

- Motivation:
  More plausible and tractable aggregate process, also simpler
- Eliminates ‘good’ and ‘bad’ aggregate state
- Aggregate production function: $K_t^{\alpha}(L_t)^{1-\alpha}$
  - $L_t = P_t \Xi_t$
  - P_t is aggregate permanent productivity
  - $P_{t+1} = P_t \Psi_{t+1}$
  - Ξ_t is the aggregate transitory shock
- Parameter values estimated from U.S. data:

Description	Parameter	Value
Variance of Log Ψ_t	σ_{Ψ}^2	0.00004
Variance of Log Ξ_t	σ_{Ξ}^2	0.00001

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Results

Our/FBS model

- A few times faster than solving KS model
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- Average MPC
  - Matching net worth: 0.2
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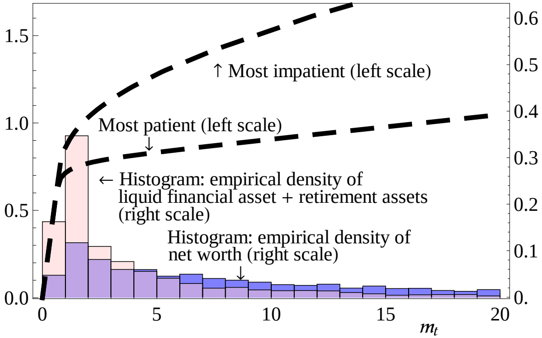
Dimension 3: Matching Net Worth vs Liquid Financial (and Retirement) Assets



Match Net Worth vs Liquid Financial Assets

- Buffer stock saving driven by accumulation of liquidity
- May make more sense to match liquid (and retirement) assets (Hall (2011), Kaplan and Violante (2011))
- Average MPC Increases Substantially: 0.19 ↑ 0.39

	β-Dist	
	Net Worth	Liq Fin and Ret Assets
Overall average	0.23	0.44
By wealth/permanent income ratio		
Top 1%	0.05	0.12
Top 20%	0.06	0.13
Top 40%	0.08	0.2
Top 60%	0.12	0.28
Bottom 1/2	0.35	0.59

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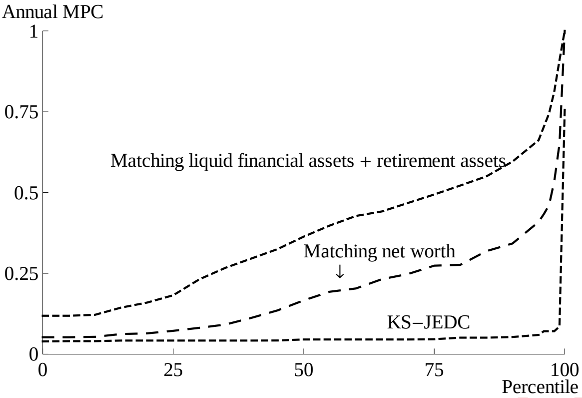
Distribution of MPCs

Wealth heterogeneity translates into heterogeneity in MPCs



Conclusions

- Definition of "serious" microfoundations: Model that matches
  - Income Dynamics
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- The model produces more plausible implications about MPC.
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