

The Micro Anatomy of Macro Consumption Adjustments

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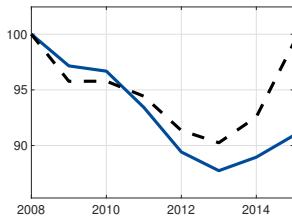
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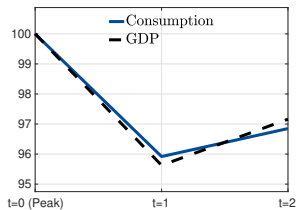
Motivation

- Main macro crises characterized by large consumption adjustments
- Salient examples:

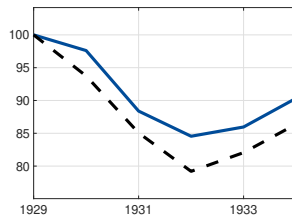
Euro Crisis



Emerging-Market Sudden Stops



International Great Depressions



Theoretical Background & Key Idea

Two main hypotheses:

1. Neoclassical view (e.g. Aguiar-Gopinath'07, Barro'06)
 - ▶ Consumption tracks permanent income
2. Credit-tightening view (e.g. Mendoza'05, Eggerston-Krugman'12)
 - ▶ Access to credit tightens during crises

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Two main hypotheses:

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 - ▶ Access to credit tightens during crises

Key Idea: Two theories have different predictions for cross-section

- Credit tightening: Income-rich households w liquid assets smooth consumption
- Permanent income: All households including income-rich adjust consumption

⇒ Micro-level anatomy of adjustment informs macro debate

What We Do

1. Empirical study **micro-level consumption responses** during crises
 - ▶ Study five episodes of large aggregate consumption adjustment
 - ▶ Document: Income-rich with liquid assets adjust consumption, generalized large consumption responses
2. Use data to evaluate **theories of macro consumption adjustment**
 - ▶ Quantitative heterogeneous-agent SOE model of consumption
 - ▶ Crises experiments capturing two views of aggregate consumption
 - ▶ CT-view: decaying patterns of consumption, not observed in data
 - ▶ PI-view: goes a long way explaining cross-sectional patterns

Implication for demand-stimulating policies: significantly less powerful

What we don't do:

- Paper does not challenge role of financial frictions for economic activity

Outline

1. **Theory**
2. Empirical Analysis
3. Quantitative Model

Preferences & Endowments

- SOE with continuum of heterogeneous agents $i \in [0, 1]$
- Preferences

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_{it}) \right]$$

- Endowment economy

$$y_{it} = h(\mu_{it}, Y_t)$$

- ▶ μ_{it} : idiosyncratic component, stochastic
- ▶ Y_t : aggregate component, deterministic (for expositional purposes)
- ▶ Mostly focus on $h(\mu_{it}, Y_t) = \mu_{it}Y_t$, study more flexible $h(\cdot)$ in quantitative analysis

Asset Markets & Financial Frictions

- Incomplete markets, budget constraint

$$c_{it} = y_{it} + (1 + r)a_{it} - a_{it+1}$$

- Borrowing constraint

$$a_{it+1} \geq -\kappa f(Y_t)$$

Examples

- ▶ $f(Y_t) = 1$: fixed debt limit Bewley models
- ▶ $f(Y_t)$ strictly increasing: captures financial amplification mechanism

Crisis Experiments

- At $t = 0$ economy experiences an unexpected contraction in aggregate income

1. PI-view crisis experiment

- ▶ Income shock permanent, $\log Y_t = \log Y_{t-1} + \rho_g^t \epsilon_Y$
- ▶ Borrowing constraint unaffected, $f(Y_t) = 1$

2. CT-view crisis experiment

- ▶ Income shock transitory, $\log Y_t = \rho_Y^t \epsilon_Y$
- ▶ Borrowing constraint tightens, $\varepsilon_{fY} \equiv \frac{\partial f(Y_t)}{\partial Y_t} \frac{Y_t}{f(Y_t)} > 0$

- Both experiments can account for the same **aggregate** income and consumption contraction during crisis
- Study **cross-sectional** responses for households with different μ_{it}

An Analytical Case

- Additional assumptions: $u(c_{it}) = ac_{it} - \frac{b}{2}c_{it}^2$, $\beta(1+r) = 1$, $h(\mu_{it}, Y_t) = \mu_{it}Y_t$
- Optimal consumption

$$c_{it} = \underbrace{ra_{it}}_{\text{flow from liq assets}} + \underbrace{\frac{r}{1+r}\mathbb{E}_t\left[\sum_{s=0}^{\infty}\frac{y_{it+s}}{(1+r)^s}\right]}_{\text{flow from permanent income}} - \underbrace{\frac{r}{1+r}\mathbb{E}_t\left[\sum_{s=0}^{\infty}\frac{\lambda_{it+s}}{(1+r)^s}\right]}_{\text{value of hitting constraint in future}}$$

- Focus on cons-to-income (C-Y) elasticities

$$\varepsilon_{cy} \equiv \lim_{r \rightarrow 0} \frac{\partial c_{it}}{\partial y_{it}} \frac{y_{it}}{c_{it}}$$

Income-Rich to Disentangle Theories

Characterization

Income-rich predicted consumption response differ across theories

1. In **PI-view**: income-rich C-Y elast is **as large as** average elast

- ▶ Constrained households: $\varepsilon_{cy} = 1$
- ▶ (Permanently) unconstrained households: If $\rho_g = 0$, $\varepsilon_{cy} = 1$

2. In **CT-view**: income-rich C-Y elast is **lower** than average elast

- ▶ Constrained households: $\varepsilon_{cy} = g(\varepsilon_{fY}) \geq 1$ with $g' > 0$
- ▶ (Permanently) unconstrained: $\varepsilon_{cy} < 1$, increasing in ρ_Y , and $\varepsilon_{cy} \rightarrow 0$ when $\rho_Y \rightarrow 0$
- ▶ If μ_{it} mean-reverting, households with low (high) enough μ_{it} are (un)constrained

Also analyze MPCs: differential quantitative predictions, not qualitative

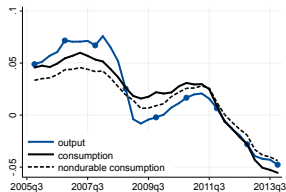
Outline

1. Theory
2. **Empirical Analysis**
3. Quantitative Model

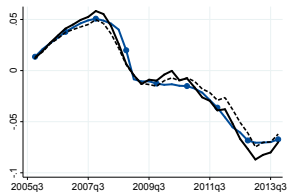
Episodes of Analysis

Euro Crisis

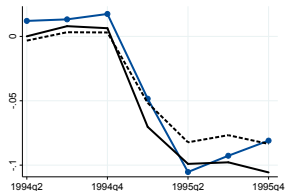
(a) Italy



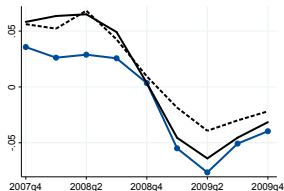
(b) Spain



(a) Mexico '94



(b) Mexico '08



(c) Peru '08



EMs Crises

Data Sources and Treatment

Sources

- Households' Expenditure and Income, Finance Surveys
- Annual/Biennial frequencies
- Repeated cross-section + panel for Italy, Peru

▶ Data Representativeness ▶ More details ▶ BPP mom

Consumption and Income: Baseline measure

- Monetary non-durable consumption
- Monetary nonfinancial after-tax income
- Residualized (e.g. Blundell, Pistaferri & Preston, 2008)

Covariates: HH size, geo region, HH head age, education, gender

Results are robust to other measures of consumption and income

Consumption-Income Elasticities

Main measure: Consumption-income (C-Y) elasticities

- C-Y elasticity of average household in decile j : $\hat{\varepsilon}_{cy}^j = \frac{\Delta \log \bar{c}_j}{\Delta \log \bar{y}_j}$
- $\bar{c}_j$ and $\bar{y}_j$: average (residualized) C and Y, households in decile j
- Italy: 2006-14, Spain: 2008-13, Mexico: 1994-96, 2006-10, Peru: 2007-10

Why focus on this measure?

- Approximates theoretical object: Avg across deciles “washes out” idiosyncratic shocks
- Useful to distinguish between theories of macro consumption adj

Discuss other measures

- Fixed groups, median individual elasticities, MPCs

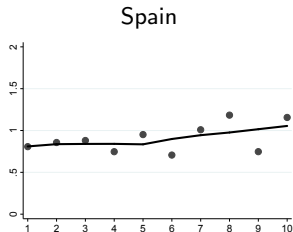
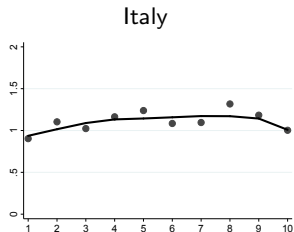
Consumption Response of Income-Rich

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
$\Delta \log Y$							
	Average	-0.15	-0.15	-0.38	-0.16	-0.09	-0.19
	Top-Y	-0.08	-0.12	-0.42	-0.19	-0.13	-0.19
$\Delta \log C$							
	Average	-0.18	-0.15	-0.29	-0.11	-0.08	-0.16
	Top-Y	-0.17	-0.08	-0.33	-0.17	-0.14	-0.17
Elasticity							
	Average	1.19	0.97	0.77	0.73	0.90	0.91
	Top-Y	1.00	1.15	0.78	0.89	1.10	0.98
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

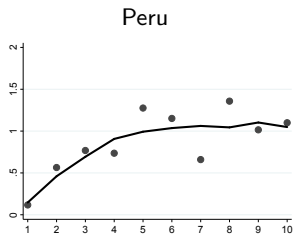
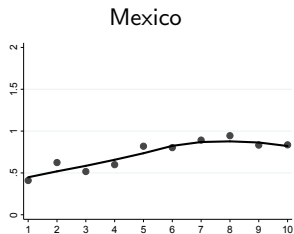
- ▶ Top-5% of income
- ▶ Alternative definitions C , Y
- ▶ Fixed groups with panel data
- ▶ MPC
- ▶ Individual Elasticities
- ▶ Distribution Y changes
- ▶ Y dynamics

Distribution of Consumption Responses

(a) Euro Crises



(b) EM Crises



Additional Empirical Exercises

1. Liquid Wealth

- Elasticities for HH with liquid assets
- Elasticities by differential wealth-to-income ratios ▶ [Wealth-to-Income](#)

2. Differential Consumption Baskets

- Elasticities by type of goods
(durables/non-durables, tradables/non-tradables, luxury/basic) ▶ [Durables/Non-durables](#) ▶ [Other Types of Goods](#)
- The role of relative prices (Cravino-Levchenko'17) ▶ [Relative Prices](#)

3. Permanent Heterogeneity

- Accounting for unobservable permanent differences (panel data) ▶ [Permanent Heterogeneity](#)

4. Business-Cycle Elasticities

- Same patterns as crisis elasticities, in contrast with US ▶ [Business Cycle](#)

Where Are the Smoothers?

High C-Y elasticities found in:

- Households across age
- Households across educational attainment
- Households working in different sectors
- Business owners / non-business owners
- House owners / renters
- Households in different regions

Outline

1. Theory
2. Empirical Analysis
3. **Quantitative Model**

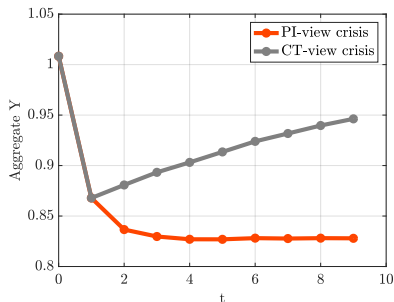
Quantitative Model

Calibration Strategy

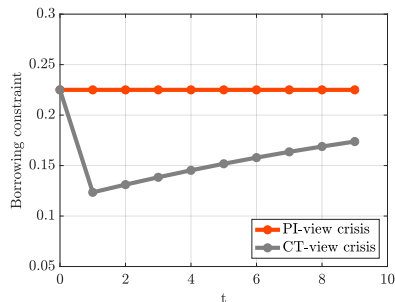
- Baseline calibration: **Italy**, later analyze **Mexico**
- 2 steps
 1. **Steady-state calibration** to match micro moments of income and wealth distribution
 - ▶ [Details](#)
 2. **2 views of crises** introduced as unexpected agg shocks
 - ▶ Results robust to economy with aggregate risk

PI and CT Experiments

(a) Aggregate Income



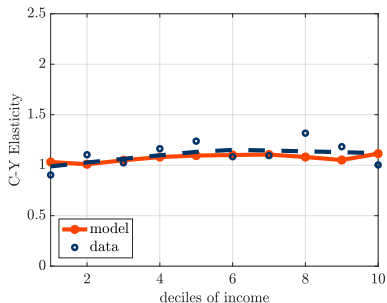
(b) Borrowing Constraint



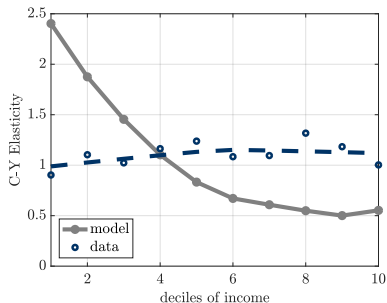
- Both crisis experiments designed to match avg C-Y elasticity ▶ [Identification](#)
 - ▶ PI-view experiment: Calibrate persistence of growth rate of income
 - ▶ CT-view experiment: Calibrate elasticity of borrowing constraint, parametrized as κY_t^ν

Consumption Adjustments: Model & Data

(a) PI-view Experiment



(b) CT-view Experiment



- CY elasticities in response to negative agg shock to Y_t

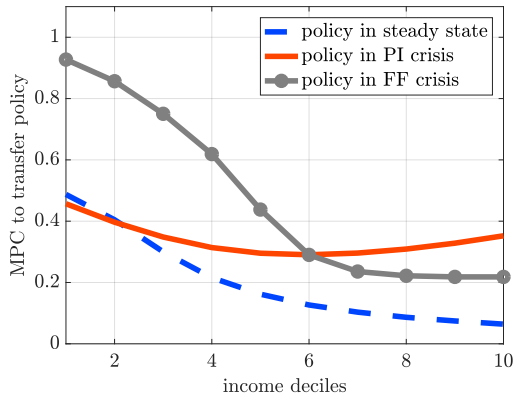
Model Extensions

1. Heterogeneous income processes ▶ [Go](#)
2. Liquid wealth revaluations ▶ [Go](#)
3. Non-homotheticities ▶ [Ita](#) ▶ [Mex](#)
4. Other shocks
 - ▶ Interest rate shock ▶ [Go](#)
 - ▶ Uncertainty shock ▶ [Go](#)

Implications for Fiscal Policies

- Assess effects of stabilization policies under crisis experiments
- Consider effects of fiscal transfer program:
 - ▶ $t = 0$: one-time transfer T_0 to HH, financed w. external public debt
 - ▶ $t \geq 1$: flat lump-sum tax to repay interest on public debt, $T_t = -T_0 r$

Policy: Consumption Response to Transfers

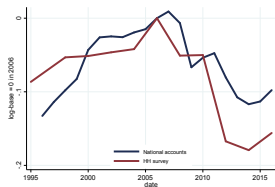


Conclusion

- Micro measurement informs debate on macro consumption crises
- Empirical patterns largely consistent with **permanent-income view** of crises
- Challenge for policies that stimulate aggregate consumption
- Analysis does not rule out financial frictions driving economic activity

Data Representativeness: Italy and Spain (1/2)

Italy Income



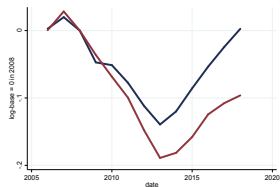
Italy Consumption



Spain Income



Spain Consumption



Data Representativeness: Mexico and Peru (2/2)

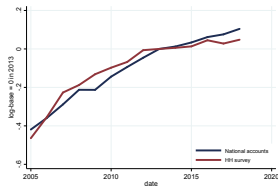
Mexico Income



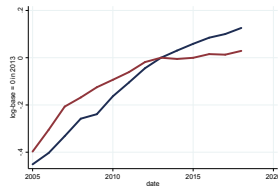
Mexico Consumption



Peru Income



Peru Consumption



Micro Data Description: Italy

- *Survey on Household Income and Wealth* (SHIW)
- Information on Italian HH's wealth, income and consumption
- Cross-section & rotating panel sub-sample
- Sample period from 1995 to 1998 (triennial) & from 1998 to 2016 (biennial)
- Sample size of 8,000 per wave
- Sample selection criteria
 1. HH head between 25 and 60 years old
 2. No missing value on characteristics (age, sex, education, HH composition & location)
 3. Remove income and consumption outliers
 4. HHs in locations with at least 5,000 residents

Micro Data Description: Spain

- *Encuesta de Presupuestos Familiares* (EPF)
- Information on Spanish HH's income and consumption
- Cross-section
- Sample period from 2006 to 2018 (annual)
- Sample Size of 24,000 per wave
- Sample selection criteria same as SHIW-Italy
- Data on wealth from *The Survey of Household Finances* (EFF)

Micro Data Description: Mexico

- *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH)
- Information on Mexican HH's income and consumption
- Cross-section
- Sample period from 1992 to 2014 (biennial, except in 2005)
- Sample Size of 18,000 per wave
- Sample selection criteria same as SHIW-Italy & EPF-Spain

Micro Data Description: Peru

- *Encuesta Nacional de Hogares* (ENAHO))
- Information on Peruvian HH's income and consumption
- Cross-section
- Sample period from 2004 to 2018 (annual)
- Sample Size of 28,000 per wave
- Sample selection criteria same as SHIW-Italy, EPF-Spain & ENAHO-Mexico

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BPP Moments

- BPP income and consumption process

$$\Delta y_{i,t} = \zeta_{i,t} + \varepsilon_{i,t} + (\theta - 1)\varepsilon_{i,t-1} - \theta\varepsilon_{i,t-2}$$

$$\Delta c_{i,t} = \phi\zeta_{i,t} + \varphi\varepsilon_{i,t} + \epsilon_{i,t}$$

- We estimate the partial insurance coefficients for permanent and transitory idiosyncratic shocks

	U.S.	ITA	PER
Persistent shocks (ϕ)	0.642	0.662	0.786
Transitory shocks (φ)	0.053	0.297	0.204

Consumption Response of Income-Rich

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
$\Delta \log Y$							
	Average	-0.15	-0.15	-0.38	-0.16	-0.09	-0.19
	Top10-Y	-0.08	-0.12	-0.42	-0.19	-0.13	-0.19
	Top5-Y	-0.07	-0.13	-0.43	-0.22	-0.15	-0.20
$\Delta \log C$							
	Average	-0.18	-0.15	-0.29	-0.11	-0.08	-0.16
	Top10-Y	-0.08	-0.14	-0.33	-0.17	-0.14	-0.17
	Top5-Y	-0.10	-0.15	-0.30	-0.21	-0.16	-0.19
Elasticity							
	Average	1.19	0.97	0.77	0.73	0.90	0.91
	Top10-Y	1.00	1.15	0.78	0.89	1.10	0.98
	Top5-Y	1.53	1.12	0.71	0.96	1.07	1.08
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

Consumption Response of Income-Rich: C and Y Definitions

Robustness

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
Non-Residual							
	Average	1.09	1.18	0.77	0.48	0.80	0.87
	Top-Y	0.89	1.54	0.88	0.65	1.08	1.04
Total Monetary							
	Average	1.52	1.18	0.76	0.88	0.86	1.04
	Top-Y	1.46	1.51	0.68	1.01	0.96	1.12
Monetary and Non-Monetary							
	Average	1.18	1.16	0.81	0.88	0.87	0.98
	Top-Y	1.35	1.41	0.71	1.07	1.01	1.11
N Observations							
		7,060	21,802	13,138	27,105	21,170	90,275

Consumption Response of Income-Rich and Wealthy: Panel Data

		Euro Crises ITA	E-M Crises PER '08	Average
$\Delta \log Y$	Average	-0.06	-0.07	-0.07
	Top-Y	-0.04	-0.09	-0.07
	Top-W	-0.05	-0.25	-0.15
$\Delta \log C$	Average	-0.08	0.11	-0.10
	Top-Y	-0.06	-0.16	-0.11
	Top-W	-0.05	-0.33	-0.19
Elasticity	Average	1.40	1.65	1.53
	Top-Y	1.34	1.75	1.55
	Top-W	1.11	1.32	1.21
N Observations		1,044	2,114	3,158

Consumption Response of Income-Rich: MPC

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
Elasticity							
	Average	1.19	0.97	0.77	0.73	0.90	0.91
	Top10-Y	1.00	1.15	0.78	0.89	1.10	0.98
	Top5-Y	1.53	1.12	0.71	0.96	1.07	1.08
MPC							
	Average	1.12	0.98	0.75	0.69	0.78	0.87
	Top10-Y	0.77	0.87	0.59	0.65	0.61	0.70
	Top5-Y	1.11	0.78	0.49	0.64	0.53	0.71
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

Consumption Responses: Individual Elasticities

		Euro Crises	EM Crises	Average
		ITA	PER '08	
Elasticity	Average	1.40	1.65	1.53
	Top-Y	1.34	1.75	1.55
Individual Elasticity	Average	0.48	0.35	0.42
	Top-Y	0.37	0.33	0.35
MPC	Average	1.30	1.43	1.37
	Top-Y	1.18	1.27	1.23
Individual MPC	Average	0.45	0.31	0.38
	Top-Y	0.31	0.23	0.27
N Observations		1,044	2,114	3,158

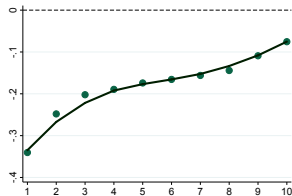
Distribution of Income Changes

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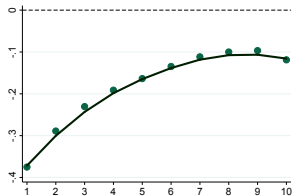
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(a) Euro Crises

Italy

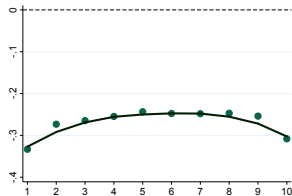


Spain

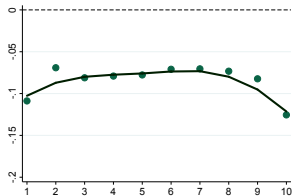


(b) Emerging-Market Crises

Mexico



Peru



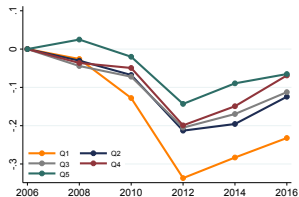
Distribution of Income Changes

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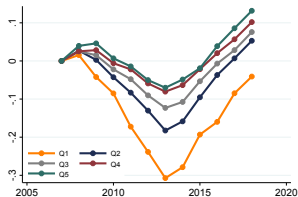
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(a) Euro Crises

Italy

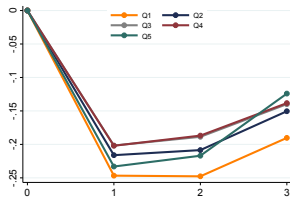


Spain

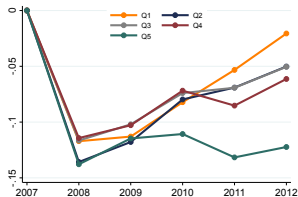


(b) Emerging-Market Crises

Mexico



Peru



Elasticity of HH with Liquid Wealth [▶ Back](#)

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
$\Delta \log Y$							
	Average	-0.11	-0.13	-0.40	-0.12	-0.30	-0.21
	Top-Y	-0.12	-0.11	-0.43	-0.18	-0.21	-0.21
$\Delta \log C$							
	Average	-0.13	-0.13	-0.33	-0.07	-0.20	-0.17
	Top-Y	-0.12	-0.16	-0.35	-0.14	-0.19	-0.19
Elasticity							
	Average	1.15	1.00	0.83	0.65	0.68	0.86
	Top-Y	1.00	1.15	0.81	0.81	0.87	1.00
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

C-to-Y Elasticity for Low and High Liquid Wealth Households

Italy - Euro Crisis					
		Liquid	Non-Liquid	Debt	Net Wealth
W/Y	Low	0.18	1.45	0.22	1.90
	High	1.75	11.26	2.48	12.53
Elasticity	Low	1.14	1.05	1.10	1.02
	High	1.48	1.39	1.23	1.47
N Observations		6,025	7,067	2,338	7,067

Income-to-Consumption Elasticity by Consumption Basket (1/2)

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
Non-Durable							
	Average	1.19	0.97	0.77	0.73	0.90	0.91
	Top-Y	1.00	1.15	0.78	0.89	1.10	0.98
Durable							
	Average	2.05	1.21	0.71	1.65	2.12	1.55
	Top-Y	3.27	1.86	0.53	1.53	1.71	1.78
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

Income-to-Consumption Elasticity by Consumption Basket (2/2)

		Euro Crises	Emerging-Market Crises		Average
		SPA	MEX '94	MEX '08	
Tradable	Average	1.19	0.60	0.41	0.73
	Top-Y	1.21	0.33	0.81	0.78
Non-Tradable	Average	1.16	0.98	1.66	1.27
	Top-Y	1.74	0.95	1.38	1.36
Luxury	Average	4.19	0.94	1.97	2.37
	Top-Y	5.24	0.69	1.73	2.55
Non-Luxury	Average	0.75	0.67	0.34	0.59
	Top-Y	0.87	0.55	0.48	0.63
N Observations		21,802	13,138	27,105	40,243

C-Y Elasticities Adjusted by Inflation Heterogeneity

		Emerging-Market Crises			Average
		MEX '94	MEX '08	PER '08	
Average - Top-Y Inflation		2.0%	0.9%	1.3%	1.4%
Elasticity					
	Average	0.77	0.73	0.90	0.80
	Top-Income	0.78	1.02	1.05	0.95
N Observations		13,138	27,105	21,170	61,413

- Calculate change in consumption using inflation specific to each income group

The Role of Permanent Heterogeneity

	Euro Crises ITA	E-M Crises PER '08	Average
Low-Elasticity			
Average	0.87	0.63	0.75
Top-Y	0.61	0.73	0.67
High-Elasticity			
Average	1.15	1.46	1.30
Top-Y	0.98	1.61	1.30
N Observations	1,463	2,537	4,000

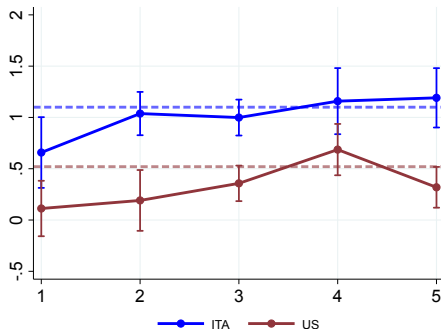
- Group households according to their consumption response to *individual* income

From Crises to Business Cycles

- Estimate C-Y elasticities for each Y-quintile for all the cycle

$$\Delta \ln c_{q,t} = \alpha_q + \beta_q \Delta \ln y_{q,t} + \varepsilon_{q,t}$$

CY Elasticity over the Business Cycle



Where Are the Smoothers? Elasticity (1/2)

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
Age	≤ 35	1.22	0.79	0.71	0.70	1.05	0.87
	$> 35, \leq 50$	1.30	0.96	0.82	0.76	0.93	0.96
	> 50	0.96	1.19	0.77	0.69	0.69	0.87
Education	Low	1.31	0.91	0.77	0.70	1.32	1.00
	High	1.10	1.02	0.70	0.75	0.76	0.87
Firm own	Yes	1.49	1.74	0.69	0.96	1.32	1.24
	No	1.13	0.93	0.79	0.59	0.83	0.86
House own	Yes	1.41	1.05	0.80	0.70	0.87	0.97
	No	0.92	0.80	0.65	0.76	0.80	0.79
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

Where Are the Smoothers? Elasticity (2/2)

		Euro Crises		Emerging-Market Crises			Average
		ITA	SPA	MEX '94	MEX '08	PER '08	
Location	Large Pop	1.43	0.87	0.82	0.78	0.81	0.94
	Low Pop	0.95	1.10	0.68	0.59	0.98	0.86
Sectors	Primary	1.10	0.92	0.71	0.68	0.77	0.87
	Industry	1.13	0.92	0.75	0.68	0.79	0.85
	Services	1.19	1.03	0.80	0.75	0.97	0.99
N Observations		7,060	21,802	13,138	27,105	21,170	90,275

Steady-State Calibration

- Functional forms
 - ▶ CRRA utility
 - ▶ Idiosyncratic income: $\ln \mu_{it}$ AR(1)
- Fix standard parameters (risk aversion, risk-free rate)
- Calibrate (ρ_μ, σ_μ) to match panel moments of income
- Calibrate (β, κ) params to match wealth-to-income ratio and HtM share

Variable	Model	Data
Wealth-to-income ratio	0.87	0.87
Hand-to-mouth share	0.23	0.23

Crisis Experiments

1. PI-view crisis experiment

- ▶ **Permanent** shock to agg income & borrowing constraint **unaffected**
- ▶ Parametrize as persistent shock to growth rate of income
- ▶ Calibrate **persistence** to match **avg C-Y elasticity**

2. CT-view crisis experiment

- ▶ **Transitory** shock to agg income & borrowing constraint **tightened**
- ▶ Parametrize borrowing constraint as κY_t^ν
- ▶ Calibrate **elasticity borr constraint** ν to match **avg C-Y elasticity**

Parametrization

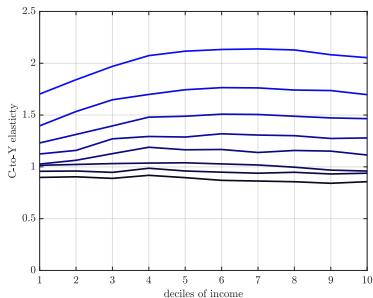
Parameter		Value
Discount factor	β	0.90
Risk-aversion coefficient	γ	2.00
Risk-free interest rate	r^*	0.02
Persistence of idiosyncratic process	ρ_μ	0.88
Volatility of idiosyncratic process	σ_μ	0.26
Financial constraints	κ	0.23

Targeted and Untargeted Moments

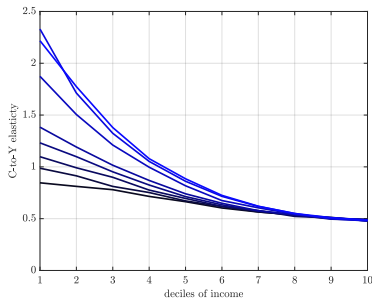
Variable	Model	Data
<i>Targeted</i>		
Wealth-to-income ratio	0.87	0.87
Hand-to-mouth share	0.23	0.23
<i>Non-Targeted</i>		
Gini index income	0.30	0.34
Income share bottom 75	0.49	0.56
Income share top 10	0.24	0.23
Income share top 5	0.15	0.13
Gini index wealth	0.58	0.74
Wealth share bottom 75	0.09	0.14
Wealth share top 10	0.59	0.65
Wealth share top 5	0.39	0.51

Identification of Crisis Persistence and Elasticity of Borrowing Constraints

(a) PI-Experiment



(b) CT-Experiment

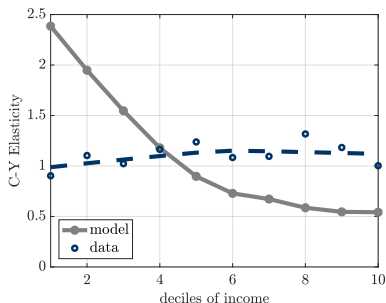


- Larger persistence of growth shocks $\rightarrow$ larger PI-elasticity
- Larger elasticity of borrowing constraint $\rightarrow$ larger CT-elasticity for low income mostly

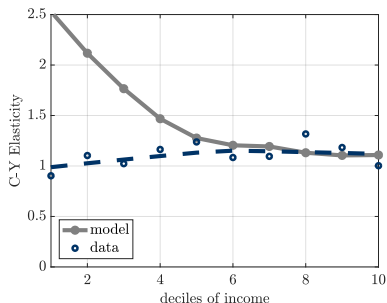
Permanent Shock to Borrowing Constraint

- Simulate episode w. permanent shock to borrowing constraint

(a) Transitory Y Shock

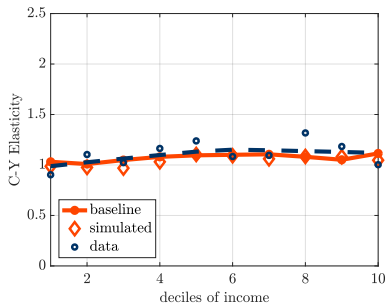


(b) Permanent Y Shock

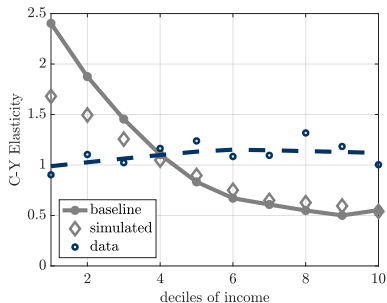


Consumption-Income Elasticities: Protracted Crisis

(a) PI-view Experiment

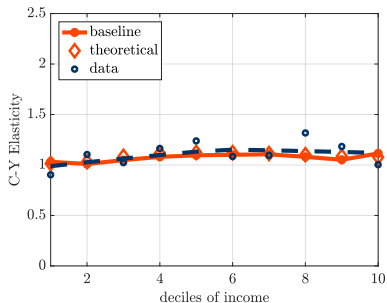


(b) CT-view Experiment

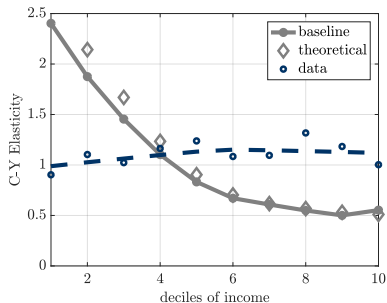


Consumption-Income Elasticities: Alternative Exercises

(a) PI-view Experiment

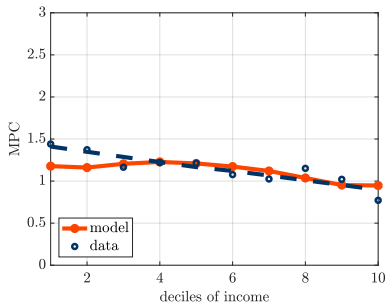


(b) CT-view Experiment

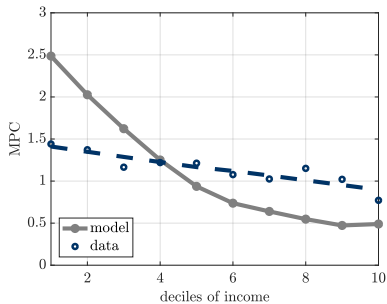


MPC: Model & Data

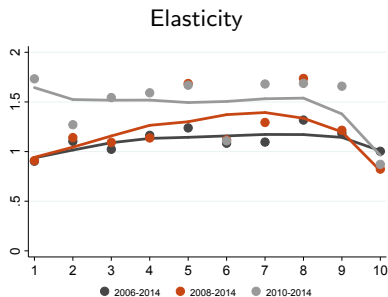
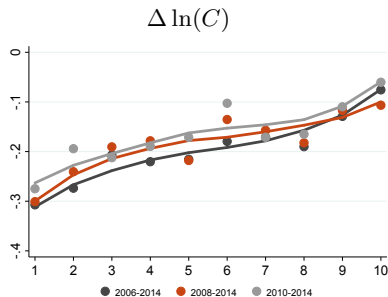
(a) PI-view Experiment



(b) CT-view Experiment



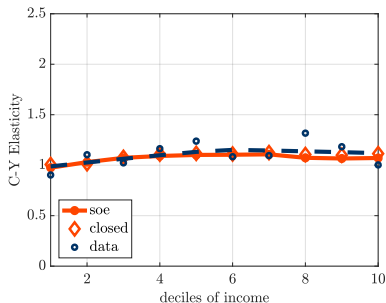
Robustness Episode Window: Italy



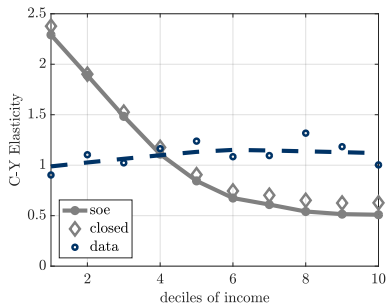
- We check robustness using 2006 (baseline), 2008 and 2010 as alternative pre-crisis peaks

Consumption Adjustments in Close Econ: Model & Data

(a) PI-view Experiment

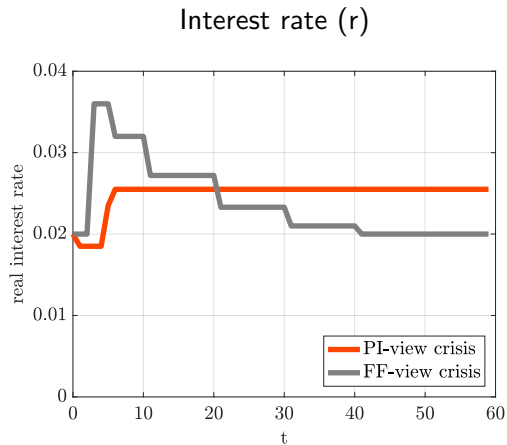


(b) CT-view Experiment



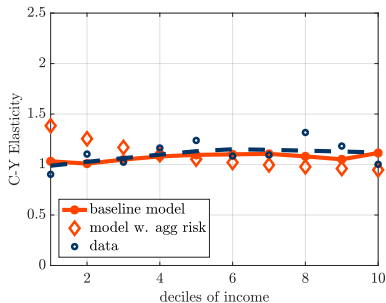
- Market clears at agg lev of initial st-st liquid assets

Consumption Adjustments in Close Econ: Interest Rate

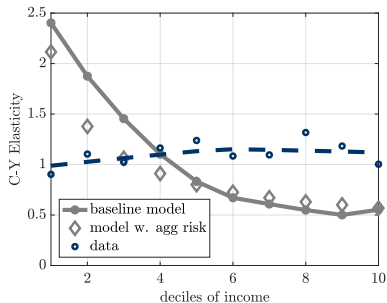


Consumption-Income Elasticities: Model with Aggregate Risk

(a) PI-view Experiment



(b) CT-view Experiment

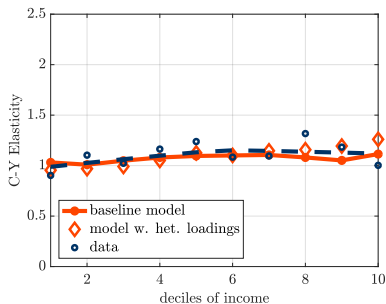


- PI: trend and transitory shocks
- FF: transitory shocks

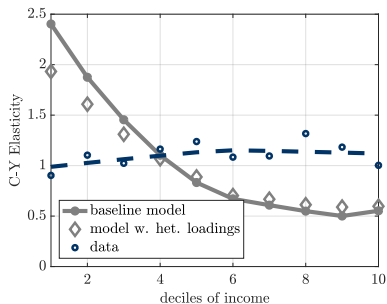
Heterogeneous Income Processes [▶ Back](#)

- Estimate heterogeneous loadings to aggregate income shock
 - ▶ Income-poor have higher loadings to shock

(a) PI-view Experiment

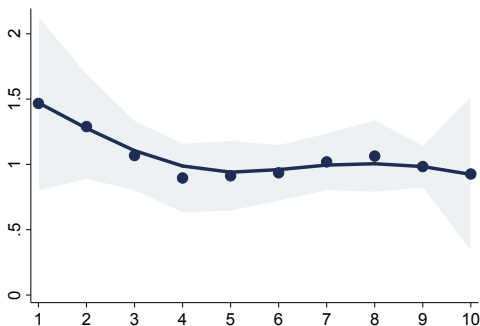


(b) CT-view Experiment



Heterogeneous Income Processes

- Estimate heterogeneous loadings to aggregate income shock
 - ▶ Assume income process $y_{it} = \mu_{it} Y_t^{\Gamma(\mu_{it})}$
 - ▶ Estimate for each income decile d : $\Delta \ln(y_{d,t}) = \Gamma_d \Delta \ln(Y_t) + \varepsilon_{d,t}$



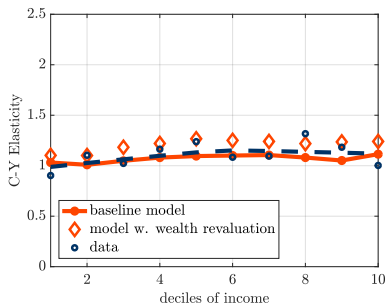
- ▶ Low-income households have higher loadings to shock
- ▶ Distribution Y changes ▶ Y dynamics

CY Elasticities with Wealth Revaluations [▶ Back](#)

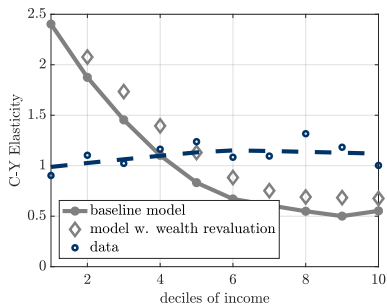
- Joint shock with wealth revaluations observed in data [▶ Data](#)

► Income-rich more affected (larger asset price drops, higher wealth)

(a) PI-view Experiment



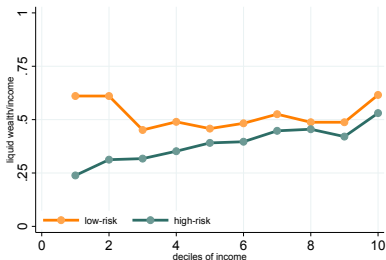
(b) CT-view Experiment



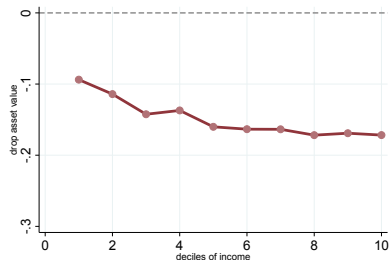
Wealth Revaluation During Euro Crisis [▶ Back](#)

- Joint shock with wealth revaluations observed in data
 - ▶ Assume wealth drop $\Delta p_{it} a_{it}$, estimate Δp_{it} from data
 - ▶ Income-rich more affected (larger asset price drops, higher wealth)

(a) Liquid Wealth Composition



(b) Liquid Wealth Revaluation



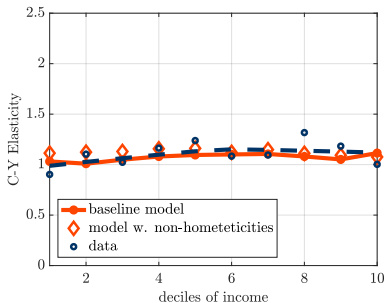
- low-risk = deposits + gov. bonds
- high-risk = stocks + other lending

CY Elasticities w Non-Homotheticities: Italy [▶ Back](#)

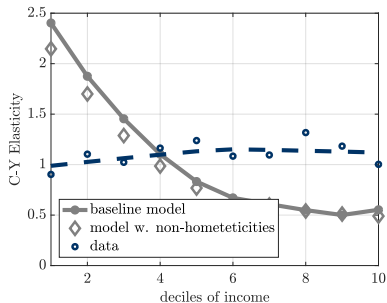
- Subsistence level of consumption (Stone-Geary preferences)

▶ Informed by poverty measures in data

(a) PI-view Experiment

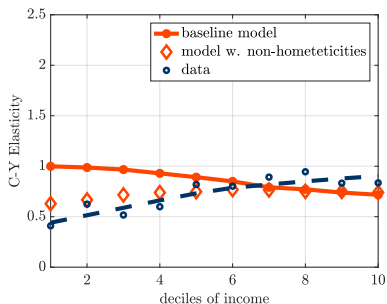


(b) CT-view Experiment

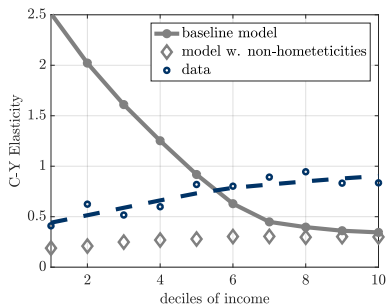


CY Elasticities w Non-Homotheticities: Mexico [▶ Back](#)

(a) PI-view Experiment

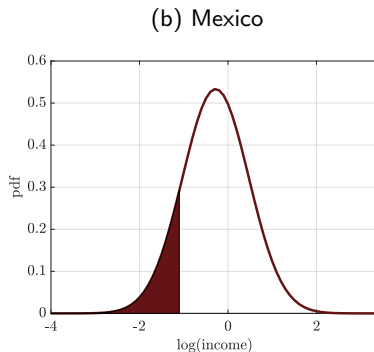
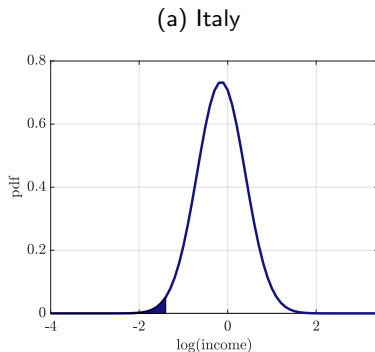


(b) CT-view Experiment

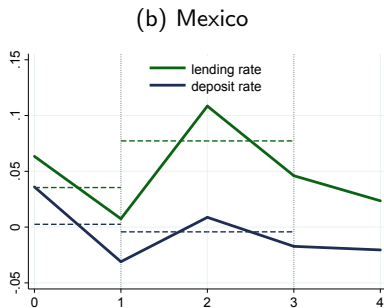
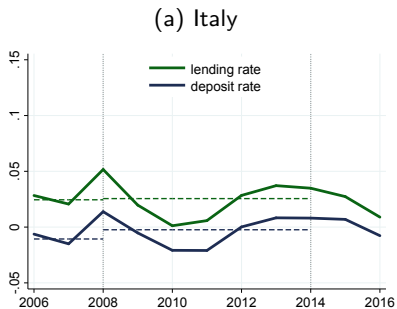


Subsistence Level of Consumption

- Subsistence level of consumption (Stone-Geary preferences)
- Choose the $\underline{c}$ to match the share of HH with income below indigence level



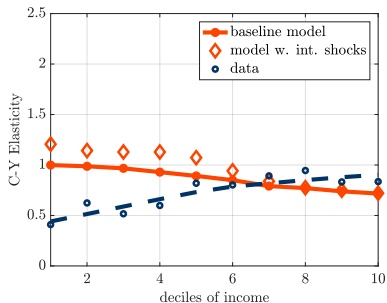
Interest Rates in Crisis Episodes



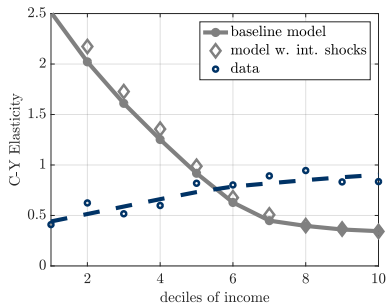
Income + Interest Rate Shock: Mexico

- Feed in asymmetric shock to saving & borrowing interest rates

(a) PI-view Experiment



(b) CT-view Experiment

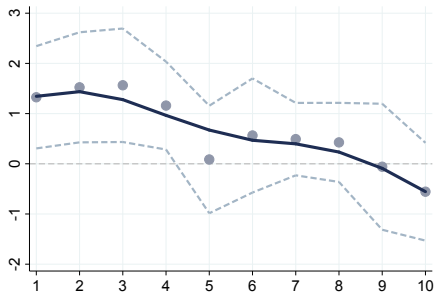


Income + Uncertainty Shock

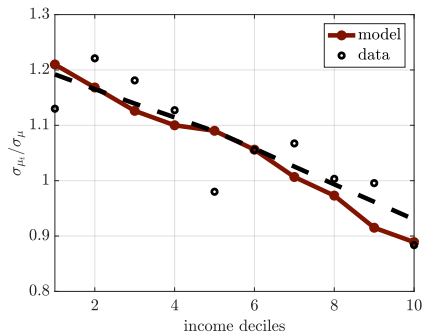
- Feed in assymetric uncertainty shock from data

$$\ln(\sigma_{d,t+1}) = \alpha_d + \Sigma_d \ln(\sigma_t) + \varepsilon_{d,t+1}$$

(a) Loadings by Decile

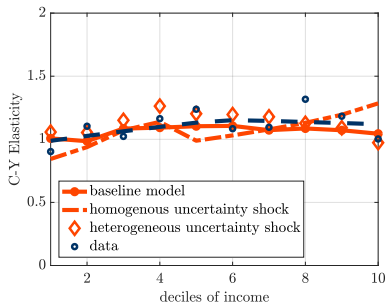


(b) Changes in Income Dispersion

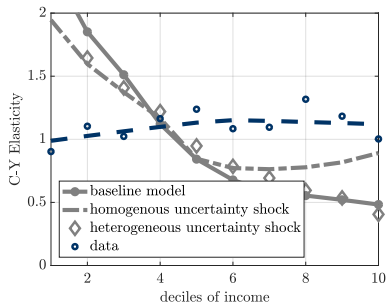


Income + Uncertainty Shock: C-Y Elasticities

(a) PI-view Experiment

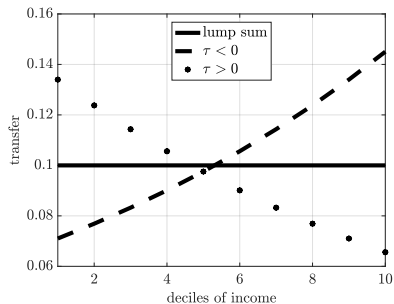


(b) CT-view Experiment

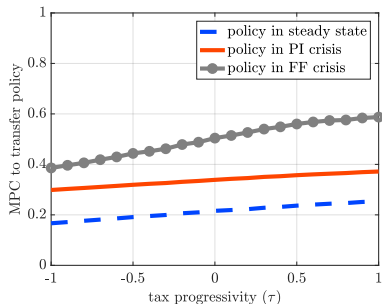


Policy Analysis: Fiscal Policies with Varying Progressivity

(a) Initial Transfers



(b) Aggregate Response



- Tax scheme progressivity indexed by τ (eg. if larger then more progressive) with initial transfer $T_0(\mu_{it}) = Xe^{\tau\mu_{it}}$