MPC Heterogeneity in Europe: Sources and Policy Implications

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Motivation

- Big Theme: Heterogeneity matters for economic policy
- Little Theme: What are the implications of heterogeneity in MPC for monetary policy?

What we do

- Build a life-cycle model with portfolio choice, participation costs, credit constraints and bequest motives.
- Take into account rich heterogeneity in income, education, wealth accumulation and portfolio allocation.
- Estimate the model using data from the HFCS for France, Germany, Italy and Spain.
- Characterize the distribution of MPC across households.
- Evaluate the effect of monetary policy on consumption through its effects on income and asset prices.

What we find

- Participation and portfolio adjustment costs are present and necessary to explain the low ownership of risky assets.
- Compared to conventional estimates, the discount factor is estimated to be lower, the risk aversion parameter is higher.
- The distributions of MPCs are country-specific. Within countries, the MPC is higher for low income, low education households.
- Consumption response to monetary innovations:
  - Shows a U-shaped along the income distribution.
  - Is larger for Spain and Italy vs Germany and France due to the importance of the income channel.

Related Literature

- Estimating LC Models with Portfolio Choice (Cooper & Zhu (2015), Fagereng et al. (2017), Calvet et al. (2016))
- Characterizing marginal propensities to consume across heterogeneous households (Carroll et al. (2014), Kaplan et al. (2014))
- Distributional Effects of Monetary Policy (Auclert (2017), Kaplan & Violante (2014), Ampudia et al. (2018), Casiraghi et al. (2018))

Some data facts

- Education is a key determinant of households' financial behaviour.
- Between and within country heterogeneity.

Table: Household Facts by Education across Countries

	Germany		**Spain**		**France**		**Italy**	
Education / Financial choice	low	high	low	high	low	high	low	high
direct participation	6.4	19.9	6.5	21.3	11.6	24.7	3.8	10.5
share	18.9	19.2	26.8	26.9	22.7	23.1	28.0	20.5
indirect participation	9.5	31.5	7.0	22.5	13.0	28.2	4.7	12.8
share	12.8	12.1	28.2	28.4	23.2	23.6	30.5	24.0
maximum participation	45.4	66.7	23.2	47.0	39.2	56.0	19.5	36.0
share	50.0	44.7	50.8	45.1	50.0	44.5	47.3	37.6
WI	0.350	0.749	0.180	0.399	0.303	0.552	0.287	0.519
WI(h)	1.038	3.133	8.039	7.650	4.113	4.794	5.563	6.064
avg. age	52.5	53.0	54.4	47.0	54.8	43.7	56.7	51.0
sample size	2085	1480	3988	2209	10833	4173	7013	938

This table displays the participation rate in stocks (defined in three different ways, row 1: direct, row 3: stocks plus mutual funds invested mainly in stocks and row 5: stocks, mutual funds invested mainly in stocks plus private pension plans), the share of stocks over total liquid assets (for participants), the median wealth income ratio, with and without housing (h) for households in each country by educational attainment, low (no college) and high (college). The moments come from the HFCS.

The model - Main features

- **Households maximize expected lifetime utility**
  - Choice variables: consumption (C), bond holdings (B), stock holdings (S), asset market participation and stock adjustment.
- **Idiosyncratic shocks to income and risky financial assets**
  - Exogenous income process: deterministic (growth) and stochastic components (persistent and transitory shock).
  - Risky asset return stochastic (R^s), bond return fixed (R^b).
- **Liquidity constraints, financial frictions, bequest motive**
  - Participation and re-balancing costs.
  - Borrowing limit.
  - Bequest motive.
- **Consumption floor** $\underline{c}$ coming from government transfer.
- Ingredients produce precautionary savings and a distribution of MPCs.

The model - Income processes

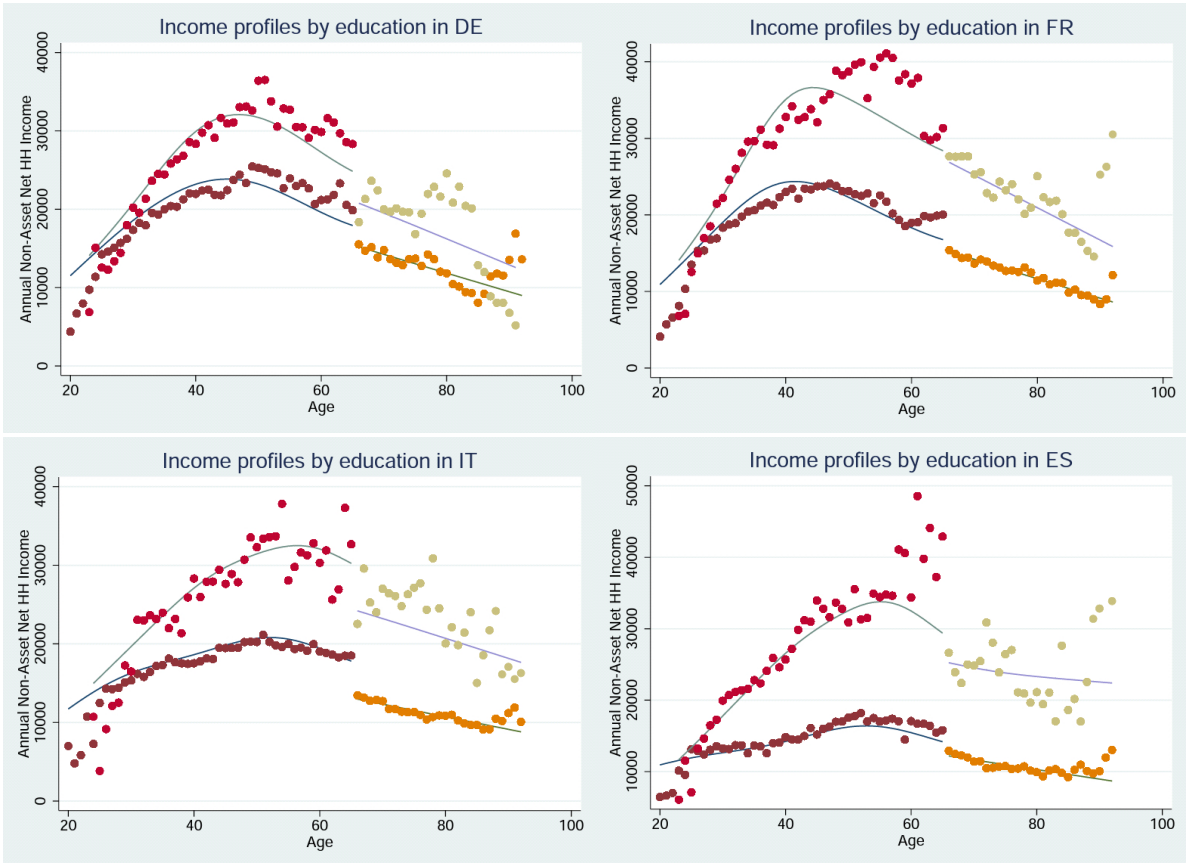
- **Deterministic income profile**
  - Estimated from ECHP, 1994-2001. Labor income net of taxes and transfers
  - $log(Y_{i,t}) = const + polynomial_{(age)} + HHComp + TimeEff$
- **Persistent and transitory income shocks**

$$\tilde{y}_{i,t} = z_{i,t} + \epsilon_{i,t}$$

$$z_{i,t} = \rho z_{i,t-1} + \eta_{i,t}$$

- **Linear fit for retirement period**

The model - Income profiles



Source: European Community Household Panel 1994–2001

The model - Asset returns

- Real return on bonds is set at 2% for all countries
- Mean and standard deviations for real stock returns taken from historical data by country

Table: Stock Return Processes

	mean return	standard deviation
Germany	0.085	0.310
Spain	0.078	0.245
France	0.092	0.291
Italy	0.046	0.290

Note: Real stock returns, 1930-2012

The model - Solution and estimation

- **Finite dynamic optimization problem solved by backward induction**
  - Discretized shocks, initial distribution of assets...
  - Value function iteration
- **Simulated method of moments estimation**

$$\Lambda = min_{\Theta}(M^s(\Theta) - M^d)W(M^s(\Theta) - M^d)'. \quad (1)$$

  - Match regression coefficient of participation rate, stock share, (liquid) wealth-to-income ratio
  - Explain moments by age and education (plus home equity controls)
- **Estimate MPC**
  - For each single household
  - Matching the liquid wealth distribution
  - In response to a transitory income shock and a stock return shock

Results

Table: Parameter Estimates

	β_0	β_1	γ	Γ	F	L	ϕ	$\underline{c}$	θ	$\underline{A}^b$	Λ
Germany	0.800	0.857	14.920	0.002	0.011	0.032	0.680	0.219	0.445	-0.123	1111.42
	(0.009)	(0.008)	(0.245)	(0.001)	(0.014)	(0.010)	(0.522)	(0.052)	(0.029)	(0.045)	
Spain	0.794	0.865	12.535	0.013	0.006	0.099	0.699	0.312	0.294	-0.062	806.04
	(0.008)	(0.021)	(0.378)	(0.004)	(0.002)	(0.044)	(1.467)	(0.035)	(0.091)	(0.638)	
France	0.792	0.864	18.522	0.008	0.016	0.027	1.55	0.150	0.401	-0.130	7617.63
	(0.006)	(0.005)	(0.023)	(0.003)	(0.004)	(0.004)	(0.155)	(0.020)	(0.009)	(0.040)	
Italy	0.808	0.881	13.947	0.008	0.0003	0.042	1.558	0.336	0.317	-0.069	2702.26
	(0.031)	(0.022)	(3.273)	(0.011)	(0.001)	(0.013)	(2.033)	(0.001)	(0.001)	(0.237)	

This table reports parameter estimates and the corresponding standard errors. The last column is model fit from (1) .

- Discount factors β_0, β_1 lower than conventional value (0.95). HH with low education have even lower β than highly educated HH
- High risk aversion coefficients γ (US around 4)
- High stock participation costs (highest in Spain, lowest in Germany)

  estimates are in terms of mean income
- Importance of bequests stronger in some countries
- Literature: β, γ estimates comparable to Fagereng et al. (2017) for Norway.

Other Properties of Solution

- 8-10% of low education HHs hit consumption floor in Italy and Spain.
- borrowing constraints rarely bind.
- local identification through derivative of moments with respect to parameters.
- Few Hand to Mouth Households are present due to portfolio adjustment costs.

MPCs by country

- given policy functions, simulate income and return shocks.
- calculate MPC distributions from responses
- heterogeneity across households due to non-linearities
  - participation
  - adjustment
  - borrowing constraint
- Moderate cross-country heterogeneity

MPCs by country

Table: MPC Distribution: Income Shock

Country		1%						10%					
		All Households			Participants			All Households			Participants		
	Ed/Inc	low	middle	high	low	middle	high	low	middle	high	low	middle	high
Germany	low	0.438	0.262	0.233	0.331	0.289	0.232	0.399	0.251	0.201	0.270	0.245	0.200
	high	0.311	0.191	0.142	0.258	0.187	0.142	0.295	0.186	0.139	0.237	0.182	0.139
Spain	low	0.647	0.213	0.139	0.272	0.174	0.142	0.658	0.178	0.139	0.203	0.158	0.138
	high	0.282	0.154	0.136	0.198	0.154	0.138	0.247	0.156	0.137	0.191	0.155	0.139
France	low	0.382	0.198	0.149	0.295	0.196	0.155	0.306	0.192	0.147	0.234	0.189	0.153
	high	0.235	0.132	0.086	0.150	0.130	0.145	0.206	0.128	0.100	0.138	0.126	0.164
Italy	low	0.675	0.137	0.115	0.453	0.136	0.115	0.653	0.136	0.113	0.400	0.134	0.113
	high	0.259	0.128	0.117	0.178	0.118	0.119	0.214	0.125	0.117	0.163	0.117	0.119

This table summarizes the distribution of MPC from transitory income shocks. The three columns (low, middle and high) represent three levels of permanent income. The rows, by country, are for low and high educational attainment for all households as well as those participating in asset markets. The left block is for a 1% shock and the right is for a 10% transitory income shock.

Literature:

- Carroll, Slacalek and Tokyoka: Germany =0.26, Spain =0.38 from income
- Other studies using regression analysis: could study in our simulated data too

Table: MPC Distribution: Return Shocks

Country	Ed \ Inc	1% Income low	1% Income middle	1% Income high	10% Income low	10% Income middle	10% Income high
Germany	low	0.311	0.246	0.202	0.311	0.250	0.202
	high	0.278	0.175	0.137	0.278	0.175	0.139
Spain	low	0.258	0.163	0.149	0.258	0.163	0.149
	high	0.164	0.149	0.152	0.164	0.149	0.153
France	low	0.202	0.185	0.162	0.202	0.185	0.162
	high	0.140	0.116	0.159	0.140	0.118	0.161
Italy	low	0.472	0.274	0.176	0.472	0.274	0.178
	high	0.249	0.193	0.153	0.249	0.193	0.155

- conditional on participation
- MPC falls with permanent income level

Hand to Mouth Households

- HANK (2017) classification: liquid assets less than half income flow
- Data
  - poor have negative illiquid assets
  - rich have positive illiquid assets
- Simulated Data from Estimated Model
  - both types exist in simulated data
  - low income HtM consumers generally have higher MPCs

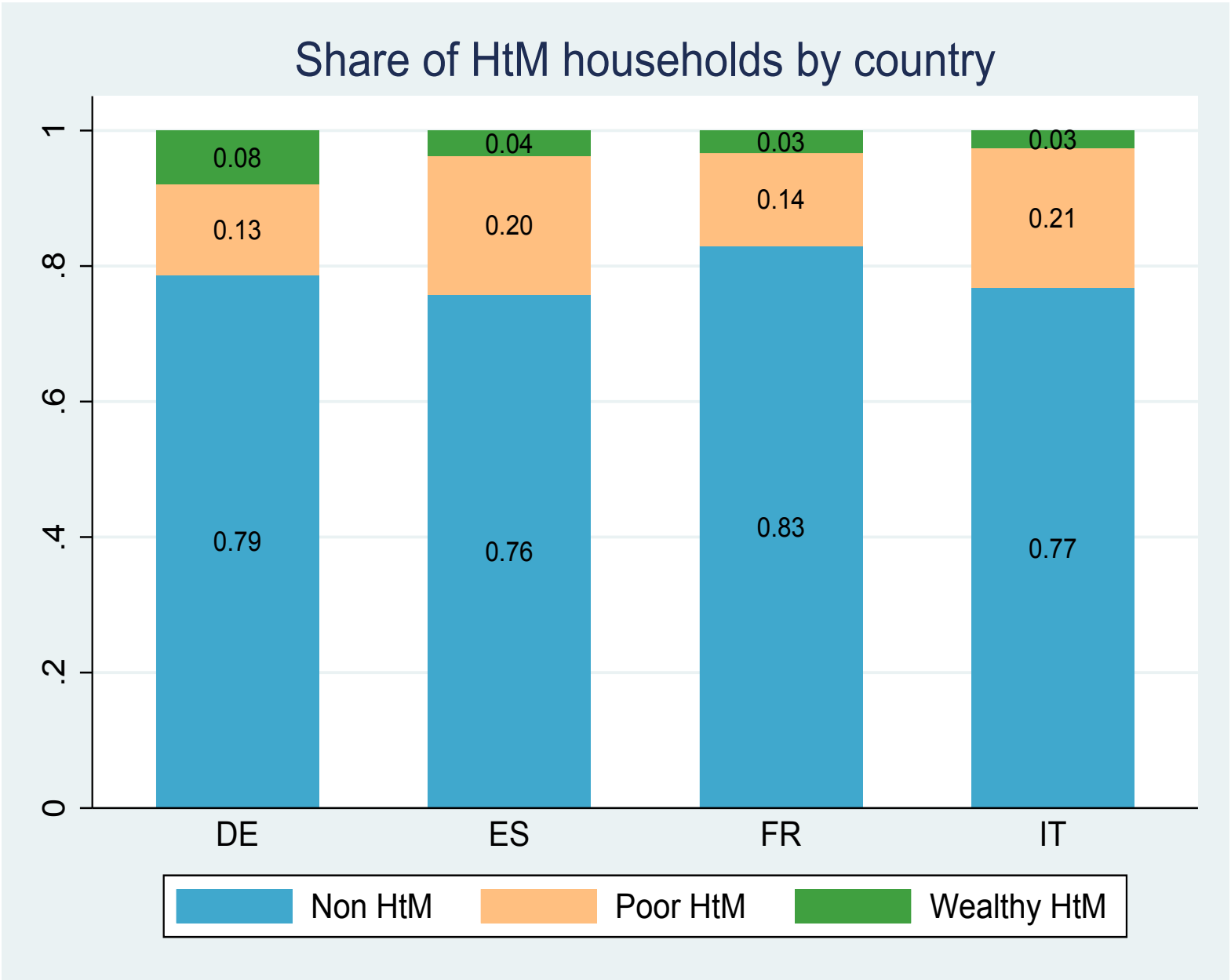


Figure: HtM Households

Table: Hand-to-Mouth Consumers: Income Shock of 1%

Country	Inc / Ed	Fraction of HtM'ers				Mean MPC of HtM'ers		
		low	middle	high	total	low	middle	high
Germany	low	0.082	0.065	0.013	0.249	0.564	0.357	0.485
	high	0.060	0.027	0.001		0.512	0.323	0.281
Spain	low	0.097	0.062	0.010	0.233	0.814	0.465	0.414
	high	0.033	0.026	0.004		0.503	0.287	0.212
France	low	0.055	0.007	0.000	0.098	0.588	0.328	0.361
	high	0.033	0.003	0.000		0.544	0.321	0.140
Italy	low	0.118	0.145	0.008	0.370	0.863	0.733	0.359
	high	0.054	0.042	0.003		0.680	0.431	0.228

- Fraction of HtM households higher among low income, low education HH
- HtM households display higher MPCs
- Further split into participants/non-participants

Table: Hand-to-Mouth Consumers: Return Shock of 1%

Country	Ed \ Inc	Fraction of HtM'ers				Mean MPC of HtM'ers		
		low	middle	high	total	low	middle	high
Germany	low	0.022	0.049	0.010	0.140	0.449	0.308	0.175
	high	0.028	0.030	0.001		0.349	0.334	0.259
Spain	low	0.014	0.036	0.010	0.110	0.508	0.203	0.136
	high	0.015	0.029	0.006		0.207	0.227	0.213
France	low	0.007	0.006	0.000	0.022	0.225	0.132	0.120
	high	0.007	0.001	0.000		0.185	0.156	0.148
Italy	low	0.009	0.035	0.009	0.098	0.704	0.347	0.195
	high	0.019	0.024	0.003		0.176	0.302	0.207

This table reports the mean MPC of stock market participants who are hand-to-mouth consumers in response to a return shock that is 1% of the stock value.

Monetary Policy Implications

- Impact of monetary policy shocks on consumption through income and asset returns.
- Use estimated elasticities of income and asset returns to monetary policy shocks and our estimates of MPCs
- Effects on bond returns and fiscal transfers not present

$$\frac{dC_{t+\tau}}{dMP_t} = \int_s \frac{dc(Y, R^s, R^b, \Omega)}{dY_{t+\tau}(\Omega)} \frac{dY_{t+\tau}(\Omega)}{dMP_t} dG_{t+\tau}(\Omega) + \int_s \frac{dc(Y, R^s, R^b, \Omega)}{dR^s_{t+\tau}(\Omega)} \frac{dR^s_{t+\tau}(\Omega)}{dMP_t} dG_{t+\tau}(\Omega) \quad (2)$$

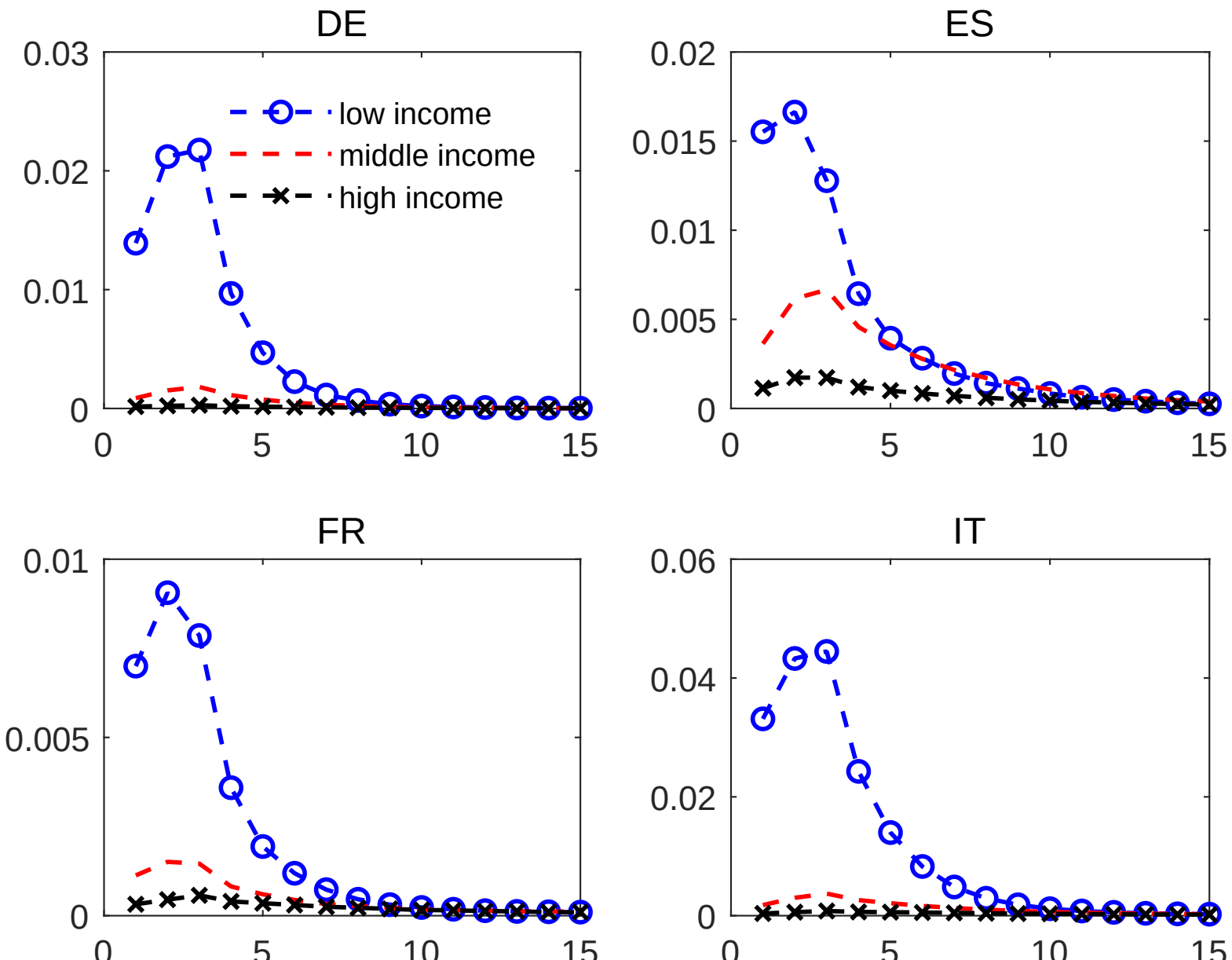
Monetary Policy Effect on Income

Table: Monetary Policy Effect on Income by Quintile, year and Country

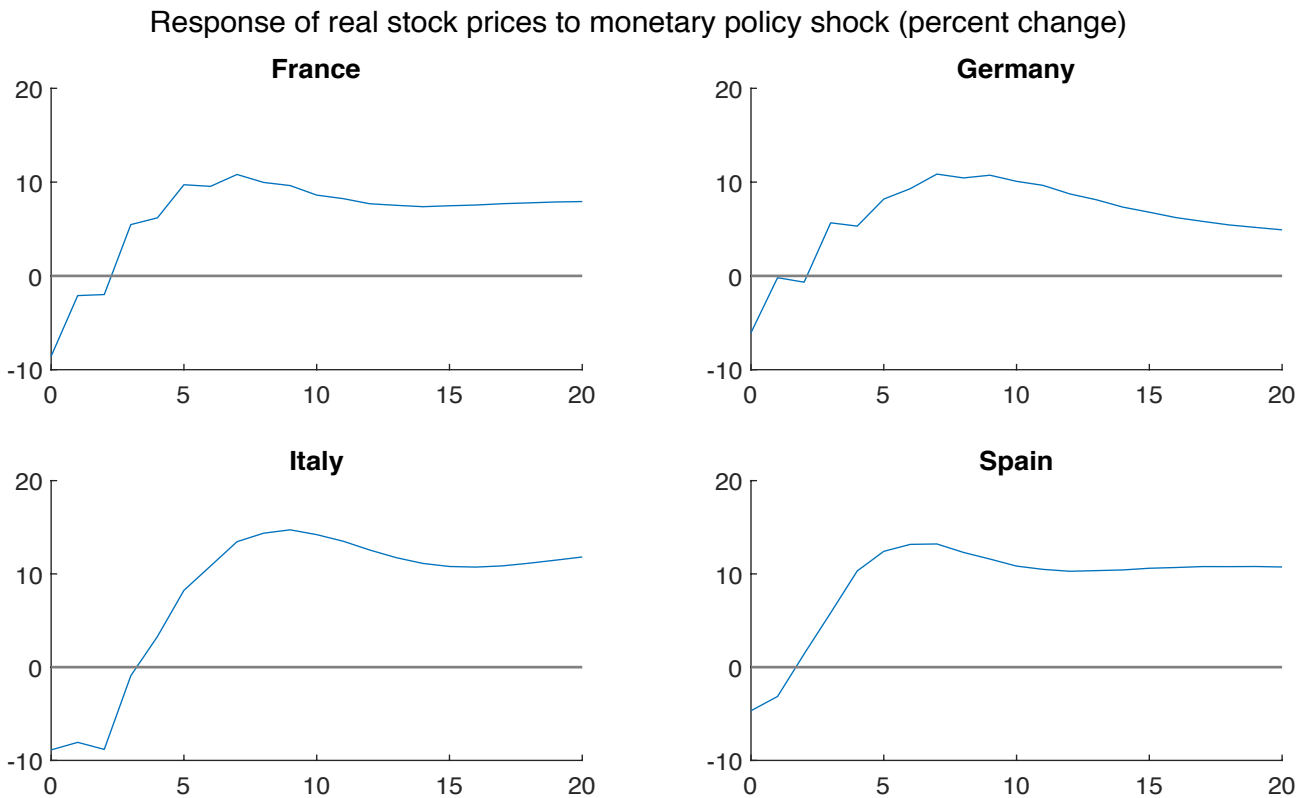
Quintile	year	GE	FR	SP	IT
1	1	3.39	1.49	8.21	3.57
	2	3.25	1.55	7.87	2.62
	3	3.17	1.25	6.70	1.26
2	1	0.87	0.94	2.35	3.15
	2	0.87	0.94	2.34	2.51
	3	0.87	0.70	1.85	1.05
3	1	0.34	0.88	1.68	2.51
	2	0.34	0.88	1.68	2.30
	3	0.34	0.64	1.52	1.05
4	1	0.29	0.45	1.01	2.09
	2	0.30	0.45	1.01	2.09
	3	0.30	0.45	1.01	1.48
5	1	0.15	0.45	0.68	1.87
	2	0.15	0.45	0.67	1.88
	3	0.15	0.45	0.68	1.05

This table reports the income response by income quintile country for a 100 basis point monetary policy rate reduction (Lenza & Slacalek, 2018).

Consumption Response due to Income Channel



Consumption Response due to Return Channel



Aggregate Consumption Response

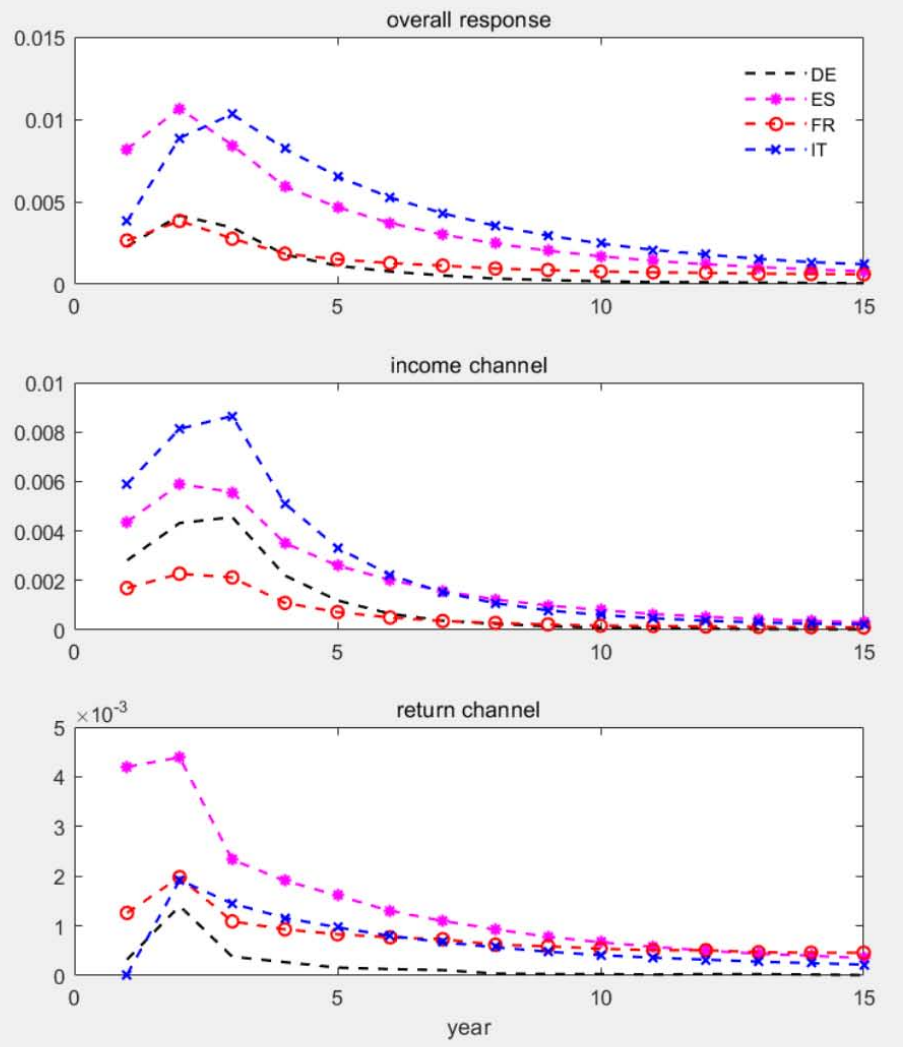


Figure: Aggregate Consumption Response by Country to a 100 basis point decrease in the target rate

Conclusion

- Life-cycle model with portfolio choice, participation costs, credit constraints and bequest motives implies significant differences in estimates of deep parameters within and across countries.
- Characterize the distribution of MPC across households and countries. Within countries, the MPC is higher for low income, low education households.
- Monetary policy effects on consumption through income and asset prices show a U shape along the income distribution.
- Overall, Spain and Italy show larger effects due to the income channel.