Subjective Models of the Macroeconomy and the Transmission of Monetary Policy

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This presentation reflects the authors' personal opinions and does not necessarily reflect the views of the European Central Bank or the Eurosystem.

From "The" Model to Subjective Models

- Modern theoretical and empirical macro: "The" Model
  - Representative Agent: RBC, NK, dozens of variations
  - Heterogeneous Agents: TANK, HANK, etc.

- But, we know that economic agents hold heterogeneous subjective models of the macroeconomy:

  "Narratives agents have in mind about the functioning of the economy"

  Andre, Pizzinelli, Roth, Wohlfart (REStud 2022); Flynn, Sastry (2022)

- How to elicit subjective models while minimizing framing & priming?
- How do subjective models influence consumption choices?

This Paper

- Measure households' subjective models of effects monetary policy
- Assess if monetary policy transmits differently to consumption and how based on subjective models, ceteris paribus

Main Results

- Measure households' subjective models of effects monetary policy

  Subjective models largely heterogeneous across countries
  & by demographic characteristics

- Assess if monetary policy transmits differently to consumption and how based on subjective models, ceteris paribus

  RCT: Randomized variation in expected nominal interest rates
  & consumption plan elicitation

  Subjective models strengthen/weaken transmission $\Delta i \rightarrow \Delta C$

Plan for the Rest of the Talk

- Data and Measuring Subjective Models
- Subjective Models and Policy Transmission
- The Asymmetry of Policy Transmission
- From Consumption Plans to Actual Consumption

ECB's Consumer Expectations Survey – 1

- Panel of $\approx$ 19K households across 11 countries starting in Jan. 2020

  6 largest Euro Area countries: DE, FR, ES, IT, BE, NL

  5 countries at pilot stage: AT, FI, IE, PT, EL

  Georgarakos and Kenny, (JME 2022)

- Dimensions measured and elicited:
  - Subjective macroeconomic expectations: e.g., inflation, int. rates, house prices, GDP growth, labor markets (aggregate and individual)
  - Economic choices: households' assets (e.g., spending, portfolio allocation) and liabilities (e.g., mortgage choices)

ECB's Consumer Expectations Survey – 2

- Mixed-frequency modular approach:
  - Background, monthly, quarterly, annual topical modules, special modules & ad hoc surveys

- This paper:
  - March 2023: Elicit subjective models of the macroeconomy: effects of monetary policy tightening on the economy
  - June 2023: RCT: Elicit planned consumption adjustment after randomly assigned future interest rates
  - 2023: Measure actual consumption by categories in other waves

  → **Aim:** Minimize scope for demand effects & priming

Measuring Subjective Models: Two Approaches

- Method 1–Open-text questions: country-level & own household

  The European Central Bank (ECB) has raised interest rates since July 2022 and has indicated that it is likely that interest rates will need to be raised further in the future.

  In your own words, how do these rising interest rates affect **the economic situation in the country you currently live in** *over the next 12 months?*

  In your own words, how do the rising interest rates affect **the financial situation of your household** *over the next 12 months?*

- Advantages and Challenges We Need to Tackle:
  - Unprompted, what comes to mind. Avoid framing effects
  - National languages, need homogeneous translations
  - Extensive vs. intensive margin (ranking & intensity of channels)

Country-Level Open Text Question

Label topics as subjective models: words referring to same econ channels:

- Debt: loan, mortgag, debt, financi, hous, borrow
- Savings: invest, save
- Macro/GE: countri, compani, purchas, expens, spend, unemploy
- Prices: price, inflat, money, pay

Open Text Question: Salient Country Differences

SPAIN

GERMANY

- Southern EA countries think more about mortgages (Debt channel)
- Germany & frugal countries: think more about investments (Savings channel)

Measuring Subjective Models: Two Approaches

- Method 2–Closed-ended scale questions (Likert scale, binary)

  When the European Central Bank (ECB) increases interest rates, how likely do you think it is for each of the following to happen?

  Households earn higher returns on their saving accounts

  1 *Very unlikely,* **2** *Unlikely,* **3** *Rather unlikely,* **4** *Rather likely,* **5** *Likely,* **6** *Very likely*

  ... etc., in total: **14 channels**

- Advantages and Challenges We Need to Tackle:
  - Measure intensive margin of subjective models
  - Can compare relevance channels within individual
  - When facing actual choices might not think about all channels

Measuring Subjective Models: From Narratives to 4 Models

- **Savings**

  Households earn higher returns on their saving accounts

- **Debt**

  Households face higher mortgage and loan payments
  It is costlier to take out a new mortgage/loan

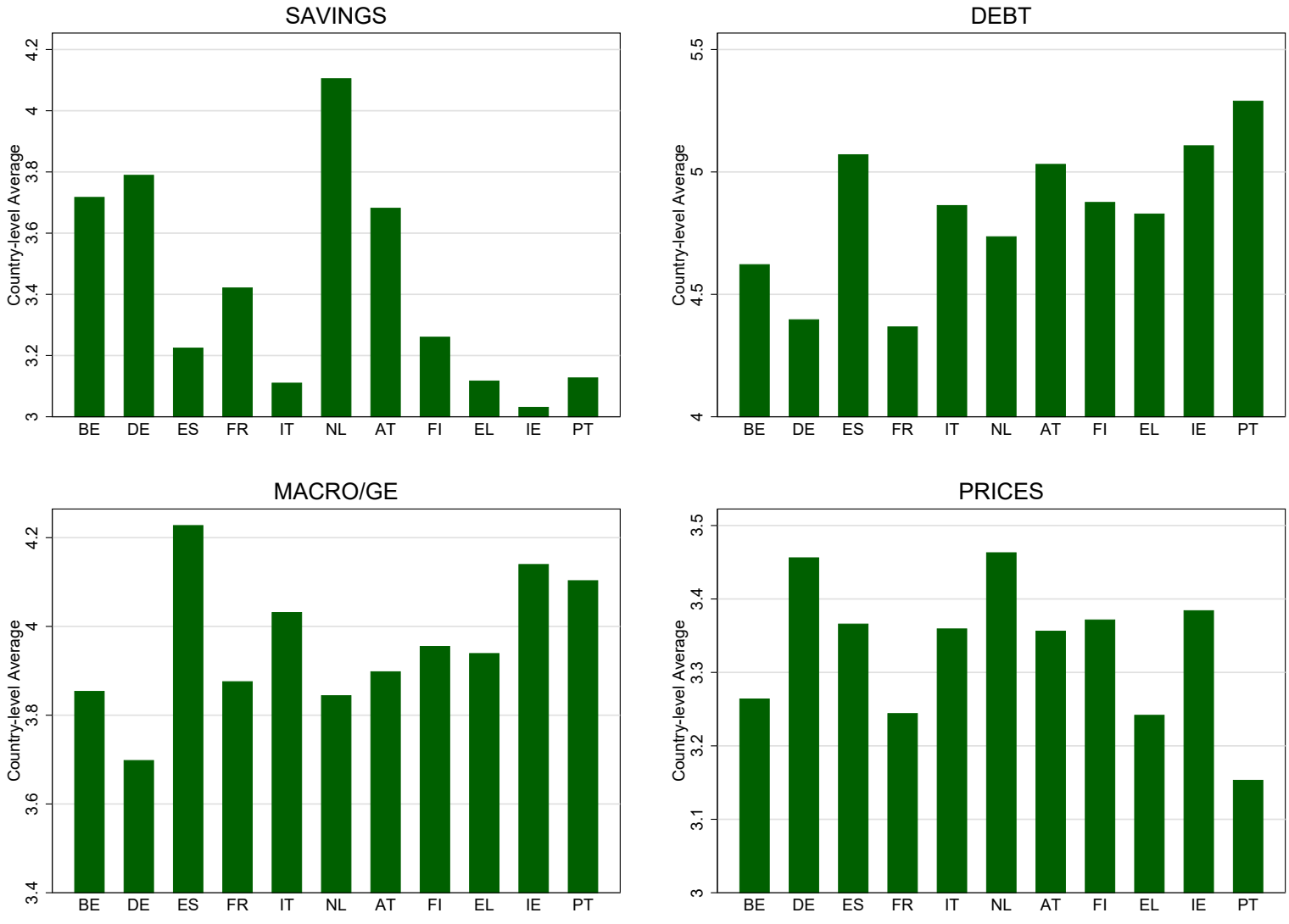
- **Macro/GE**

  More workers lose their jobs
  The stock market performs poorly
  There will be an economic downturn
  People are able to spend less on goods and services
  Businesses invest less and are not able to expand the supply of goods
  Government are able to borrow and spend less

- **Prices**

  Prices of everyday goods and services stabilize or decrease
  The prices of oil and gas stabilize or decrease
  It is cheaper to purchase foreign-produced goods
  House prices in my area decrease
  Rents

Subjective Models by EU Countries



- We will absorb country FEs in the empirical analysis to capture residual variation

Summary Statistics

	Obs.	Mean	St. Dev.	Median
Subjective Models				
Savings Channel (1-6)	16,100	3.43	1.45	4.00
Debt Channel (1-6)	16,100	4.81	1.16	5.00
Macro/GE Channel (1-6)	16,100	3.97	0.82	4.00
Prices Channel (1-6)	16,100	3.34	0.72	3.40
Demographics				
High Financial Literacy (0-1)	16,100	0.55	0.50	1.00
Has Mortgage (0-1)	16,100	0.29	0.45	0.00
Liquidity Constrained (0-1)	16,100	0.29	0.46	0.00
Short Planning Horizon (0-1)	16,100	0.25	0.43	0.00
Trust in ECB (0-1)	16,100	0.50	0.50	1.00
High School Degree (0-1)	16,100	0.33	0.47	0.00
College Degree (0-1)	16,100	0.56	0.50	0.00
Single (0-1)	16,100	0.19	0.39	0.00
Couple (0-1)	16,100	0.33	0.47	0.00
Couple, up to 2 kids (0-1)	16,100	0.42	0.49	0.00
Couple, more than 2 kids (0-1)	16,100	0.06	0.24	0.00

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Monetary Policy Tightening and Consumption

- Theoretically, $\Delta i \uparrow \rightarrow \Delta C \downarrow$, and vice versa, symmetrically
  - Intertemporal Substitution (Savings, Prices):
    $\Delta i \uparrow$, consuming today relatively more expensive, $\Delta C \downarrow$
  - Refinancing Channel (Debt):
    $\Delta i \uparrow$, less likely to refinance fixed-rate debt at lower rates, less likely to free up resources to consume, $\Delta C \downarrow$
  - Debt Repayment Channel (Debt):
    $\Delta i \uparrow$, repay debt earlier to avoid higher interest, $\Delta C \downarrow$
  - Debt Servicing Channel (Debt):
    $\Delta i \uparrow$, higher loan payments if variable-rate debt, $\Delta C \downarrow$
  - General Equilibirum Effects (Macro/GE, Prices):
    $\Delta i \uparrow$, indirect effects monetary policy (HANK), aggregate demand $\downarrow$, $\Delta C \downarrow$
    $\Delta i \uparrow$, all prices will lower, consumer confidence increases, $\Delta C \uparrow$

Experiment: Shock to Expected Nominal Rates

- June 2023: RCT: exogenous variation expected mortgage rates
  - Step 1: Elicit current perceived mortgage rates

    What do you think is the current **interest rate on a mortgage** *for someone like you and what do you think it will be at the following points in the future?*

  - Step 2: Randomly assign potential mortgage rates in 12 months

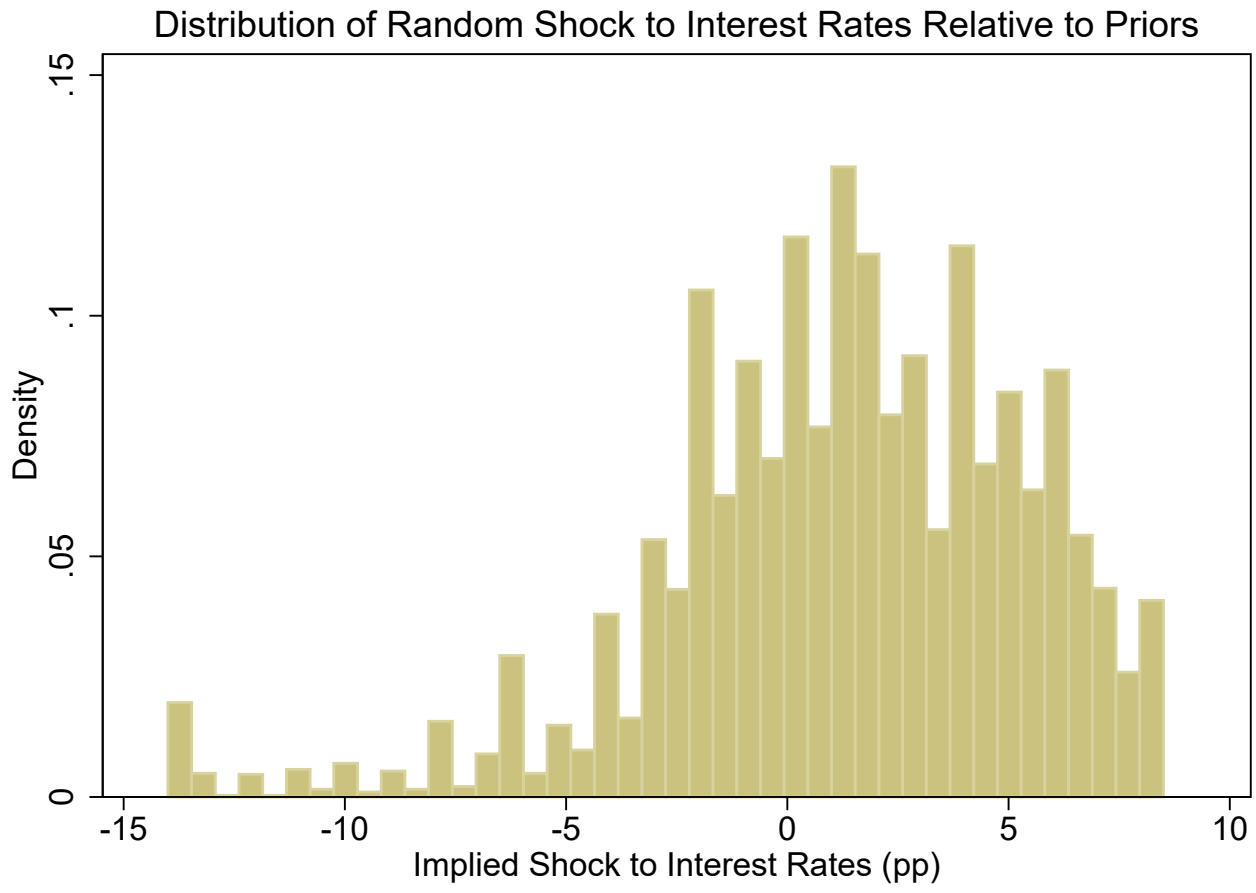
    Five possible values: 2, 4, 6, 8, 10

    You said that the current interest rate on a mortgage for someone like you is 3%. Suppose that interest rates on mortgages for someone like you will be 6% **in 12 months**.

  - Step 3: Elicit hypothetical change consumption (slider: -30% to +30%)

    How would you change your total household spending on all goods and services in response to this development **over the next 12 months**?

First Stage: Distribution Difference Random Info - Priors



- Agents face either positive or negative surprise in expected mortgage rates

Transmission to Consumption by Subjective Models

$$\Delta\ C_i = \alpha + \beta \Delta\ i_i + \sum_k \gamma_k \Delta\ i_i \times Model_{i,k} + X_i' \psi + \epsilon_i$$

	(1)	(2)	(3)
Δi	-0.37^{***}		
	(0.03)		
$\Delta i \times Savings$			
$\Delta i \times$ Debt			
$\Delta i \times$ Macro/GE			
$\Delta i \times$ Prices			
Constant	-1.23^{***}		
	(0.10)		
Models in Levels	X	X	X
Demographics		X	X
Country FEs			X
Observations	16,100	16,100	16,100
R^2	0.015	0.020	0.041

Transmission to Consumption by Subjective Models

$$\Delta\ C_i = \alpha + \beta \Delta\ i_i + \sum_k \gamma_k \Delta\ i_i \times Model_{i,k} + X_i' \psi + \epsilon_i$$

	(1)	(2)	(3)
Δi	-0.37^{***}	-0.42^{**}	-0.42^{**}
	(0.03)	(0.17)	(0.18)
$\Delta i \times Savings$		-0.04^{*}	-0.04^{*}
		(0.02)	(0.02)
$\Delta i \times$ Debt		-0.13^{***}	-0.13^{***}
		(0.03)	(0.03)
$\Delta i \times$ Macro/GE		0.11^{**}	0.11^{**}
		(0.04)	(0.04)
$\Delta i \times$ Prices		0.10^{**}	0.10^{**}
		(0.04)	(0.04)
Constant	-1.23^{***}	-1.20^{*}	0.015
	(0.10)	(0.71)	(0.90)
Models in Levels	X	X	X
Demographics		X	X
Country FEs			X
Observations	16,100	16,100	16,100
R^2	0.015	0.020	0.041

Transmission to Consumption: Magnitudes

- Baseline magnitude:
  - 1pp $\uparrow \Delta i \rightarrow$ 0.42pp $\downarrow \Delta C$
- Stronger transmission if think Debt, Savings models relevant:
  - $\uparrow$ Debt model: Transmission 31% stronger (-0.13/-0.42)
  - $\uparrow$ Savings model: Transmission 9.5% stronger (-0.04/-0.42)
- Weaker Transmission if think Macro/GE, Prices models relevant:
  - $\uparrow$ Macro/GE model: Transmission 26% weaker (0.11/-0.42)
  - $\uparrow$ Prices model: Transmission 24% weaker (0.10/-0.42)

Debt Model: Driven by Our Framing Using Mortgage Rates?

- Debt Model $\rightarrow$ Stronger transmission same size rate increase
  - Are only mortgage holders, borrowers reacting?
  - Or, are other agents also aware that when mortgage rates increase other nominal interest rates are likely to increase too?
- Policy:
  Is it enough to observe if household has debt to estimate the extent of transmission? Or do subjective models capture something else?

Debt Model: Only Relevant for Mortgage Holders?

$$\Delta\ C_i = \alpha + \beta \Delta\ i_i + \sum_k \gamma_k \Delta\ i_i \times Model_{i,k} + X_i' \psi + \epsilon_i$$

	(1)	(2)	(3)
Δi	−0.44**	−0.42**	−0.37**
	(0.18)	(0.19)	(0.18)
$\Delta i \times$ Debt	−0.13***	−0.14***	
	(0.03)	(0.03)	
$\Delta i \times$ Debt $\times$ Has Mortgage	−0.02		
	(0.06)		
$\Delta i \times$ Debt $\times$ Hand-to-Mouth		0.03	
		(0.05)	
$\Delta i \times$ Savings	−0.04*	−0.03	
	(0.02)	(0.02)	
$\Delta i \times$ Savings $\times$ Short Plan Horizon			
All Levels & Interactions	X	X	X
Demographics	X	X	X
Country FEs	X	X	X
Observations	16,100	16,100	16,100
R^2	0.042	0.042	0.043

Savings Model: Income vs. Substitution Effect

- Savings Model→Stronger transmission same size rate increase
- Theoretically, two channels in opposite directions
  - Income Effect: $\uparrow i$, earn more from savings, consume more
  - Substitution Effect: $\uparrow i$, consumption rel. more expensive, save more
- IES should drive which channel prevails. Proxy: Planning horizon
  - Short: do not consider future consumption, substitution effect weak
  - Long: optimize intertemporally, substitution effect relatively stronger

Savings Model: Income vs. Substitution Effect

$$\Delta\ C_i = \alpha + \beta \Delta\ i_i + \sum_k \gamma_k \Delta\ i_i \times Model_{i,k} + X_i' \psi + \epsilon_i$$

	(1)	(2)	(3)
Δi	−0.44**	−0.42**	−0.37**
	(0.18)	(0.19)	(0.18)
$\Delta i \times$ Debt	−0.13***	−0.14***	−0.13***
	(0.03)	(0.03)	(0.03)
$\Delta i \times$ Debt $\times$ Has Mortgage	−0.02		
	(0.06)		
$\Delta i \times$ Debt $\times$ Hand-to-Mouth		0.03	
		(0.05)	
$\Delta i \times$ Savings	−0.04*	−0.03	−0.07***
	(0.02)	(0.02)	(0.02)
$\Delta i \times$ Savings $\times$ Short Plan Horizon			0.12***
			(0.04)
All Levels & Interactions	X	X	X
Demographics	X	X	X
Country FEs	X	X	X
Observations	16,100	16,100	16,100
R^2	0.042	0.042	0.043

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Field Data and Setting

- Observe Consumption (euro values) for 4 quarters, various categories
  - Noisier due to measurement error & idiosyncratic HH-level shocks
  - Likely lower R^2 and lower statistical power
- Observe ECB's Main Refinancing Operations' (MRO) rate
  - Same change for all households (instead of individual-level shock)
- Can regress Δ *Log Actual* $C_{i,t}$ on Δ MRO_t

Transmission by Subjective Models: Actual Consumption

$$\Delta \text{ Log Actual } C_{i,t} = \alpha + \beta \Delta \text{ MRO}_t + \sum_k \gamma_k \Delta \text{ MRO}_t \times \text{Model}_{i,k} + X'_{i,t}\psi + \epsilon_{i,t}$$

	(1)	(2)	(3)
ΔMRO	−0.11	−0.11	−0.11
	(0.09)	(0.09)	(0.09)
$\Delta MRO \times Savings$	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
$\Delta MRO \times$ Debt	−0.03**	−0.04***	−0.04***
	(0.01)	(0.01)	(0.01)
$\Delta MRO \times$ Macro/GE	0.02	0.03	0.03
	(0.02)	(0.02)	(0.02)
$\Delta MRO \times$ Prices	−0.00	−0.00	−0.00
	(0.02)	(0.02)	(0.02)
Constant	0.13*	0.13*	0.14
	(0.07)	(0.07)	(0.07)
Models in Levels	X	X	X
Demographics		X	X
Country FEs			X
Observations	45,944	44,276	44,276
R^2	0.003	0.003	0.003

Conclusions

- Subjective Models of the macroeconomy:
  - Vary substantially across countries, by household characteristics
  - Conditional on observables, heterogeneous policy transmission
    - Stronger transmission if think tightening affects debts, savings
    - Weaker transmission if think thightening affects prices, macro/GE channels
- Asymmetric transmission: policy transmits more if tightening
- Subjective models and their role might be state dependent
  - Need within-consumer elicitation over time