Household Balance Sheet Channels of Monetary Policy:
A Back of the Envelope Calculation for the Euro Area

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The views expressed are the authors’ and do not necessarily reflect those of the ECB.
An Emerging New Macro Framework

- **HA + NK**: Aiyagari-Krusell-Smith meets Gali-Gertler-Woodford

- What is attractive about this approach?

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G. Violante, "Household Balance Sheet Channels of Monetary Policy"
An Emerging New Macro Framework

- **HA + NK**: Aiyagari-Krusell-Smith meets Gali-Gertler-Woodford

- What is attractive about this approach?
  - **Conceptually**, unified framework to study:
    - Short-run fluctuations and long-run dynamics of distribution
    - Large MPC + precautionary saving $\Rightarrow$ AD channel salient
    - Stabilization, social insurance and redistributive policies
  - **Empirically**, unified approach to micro and macro data
  - **Technically**, now easier and faster to solve these models

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Central Banks are embracing the idea

- Fraction of speeches at Central Banks and Feds mentioning at least once the words: heterogeneous, heterogeneity, inequality

Source: BIS database of central bankers’ speeches

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Transmission mechanism of monetary policy

- Macroeconomic framework: nominal rigidities (NK)
Transmission mechanism of monetary policy

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  - RA+NK: intertemporal substitution dominates
Transmission mechanism of monetary policy

- **Macroeconomic framework**: nominal rigidities (NK)
  - RA+NK: intertemporal substitution dominates
  - HA+NK: no longer true
    - transmission mechanism is more complex
    - it mainly works through indirect GE effects on prices
    - impact differs across the income/wealth distribution

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Transmission mechanism of monetary policy

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- **Need** micro and macro data to quantify
Transmission mechanism of monetary policy in HA+NK

- How can we quantify all these channels at work?

- Two methodologies in the literature:
  1. Rich DSGE models: e.g., KMV, Bayer et al., Hagedorn et al.
     - Pros: quantitatively plausible + policy counterfactuals
     - Cons: computational complexity + ‘black box’
  2. Sufficient statistic approach: Werning, Auclert, Bilbiie, Patterson

- This paper applies this second approach to Euro Area
Approach

- One-time transitory unexpected shock to policy rate $r \rightarrow C$

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Approach

• One-time transitory unexpected shock to policy rate $r \rightarrow C$

• Household problem w/o uncertainty:
  - CES utility ($\text{IES} = 1/\gamma$)
  - Inelastic labor supply / demand-determined hours
  - FOCs + budget constraints + differentiation
  - Closed form expression for each transmission channel

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
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- Separate analysis for non-, poor- and wealthy-hand to mouth hh
  - Different portfolios, MPC, exposure to aggregate fluctuations

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Approach

- One-time transitory unexpected shock to policy rate $r \rightarrow C$

- Household problem w/o uncertainty:
  - CES utility ($\text{IES} = 1/\gamma$)
  - Inelastic labor supply / demand-determined hours
  - FOCs + budget constraints + differentiation
  - **Closed form** expression for each transmission channel

- Separate analysis for non-, poor- and wealthy-hand to mouth hh
  - Different portfolios, MPC, exposure to aggregate fluctuations

- Cross-sectional data + VAR to measure key objects

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Direct effects of a change in $r$

- **Direct effects (DIR):** keeping all other prices fixed
Direct effects of a change in $r$

- **Direct effects (DIR):** keeping all other prices fixed

\[
\begin{align*}
\text{Intertemporal substitution (IES)} & \quad dc^{DIR} = dc^{IES} + dc^{NIE} \\
\text{Net interest rate exposure (NIE)} & \\

dc^{IES} & = -\frac{1}{\gamma}(1 - \mu)c\, dr \\
\mu \quad & \\
\end{align*}
\]

- $y$: earnings, $c$: consumption, $b$: liquid assets minus liabilities,
- $\mu$: marginal propensity to consume out of transitory income

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Indirect effects through inflation

- Fisher effect (NOM)

\[ dc^{NOM} = -\mu \ m \ \frac{dp}{p} \]

- \( m \): nominal net worth (e.g., cash + bank deposits - debt)

- \( dp/p \): inflation induced by the monetary policy shock
Indirect effects through labor income $y$

- **Aggregate Demand effects** (INC)

\[ d_c^{INC} = \mu \, dy \]
\[ = \mu \varepsilon_{y,Y} \left( \frac{y}{Y} \right) dY \]

- $dY$: change in aggregate labor income induced by $dr$

- $\varepsilon_{y,Y}$: elasticity of individual income $y$ to aggregate labor income $Y$

- **Heterogeneous sensitivity** to cycle (age, industry, occupation, etc)

- Large if sensitivity is **positively correlated** with MPC and $y$ share
Indirect effects through capital gains on illiquid assets

- **Capital gains** (CAP) on real assets (e.g. housing, stocks)
- \( k \): units of the asset, \( q \): its price
- Linear transaction \( \tau \) cost to deposit/withdraw (assume action)

\[
dc^{CAP} = \mu(1 - \tau)k \ dq.
\]

- \( dq \): capital gain induced by \( dr \)
- \( \mu(1 - \tau) \): effective MPC out of the illiquid capital gain

Summary of transmission to ‘unconstrained’ households

\[
dc_{n}^{TOT} = dc_{n}^{IES} + dc_{n}^{NIE} + dc_{n}^{NOM} + dc_{n}^{INC} + dc_{n}^{CAP}
\]

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Poor hand-to-mouth households

- Small holdings of liquid assets (if positive) or close to the credit limit (if negative) and no holdings of illiquid assets

- Consumption is dictated by their budget constraint with unsecured debt limit \( b = -\underline{b} \) binding

\[
c = -r\underline{b} + y
\]
Poor hand-to-mouth households

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- Consumption is dictated by their budget constraint with unsecured debt limit \( b = -\underline{b} \) binding

  \[ c = -rb + y \]

- Total effect of monetary policy shock for poor HtM:

  \[
dc_p^{TOT} = dc_p^{NIE} + dc_p^{NOM} + dc_p^{INC}
\]

  with \( \mu = 1 \)

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Wealthy hand-to-mouth households

- Small holdings of liquid assets (if positive) or close to the credit limit (if negative), but positive holdings of illiquid assets

- On their collateral constraint: $\Delta = \theta q k$
Wealthy hand-to-mouth households

- Small holdings of liquid assets (if positive) or close to the credit limit (if negative), but positive holdings of illiquid assets

- On their collateral constraint: $\Delta = \theta q_k$

- Total effect of monetary policy shock at impact:

\[
dc_{TOT}^{w} = dc_{NIE}^{w} + dc_{INC}^{w} + dc_{NOM}^{w} + dc_{CAP}^{w}
\]

with:

\[
dc_{w}^{CAP} = \theta (1 - \tau) k dq
\]

- $1 \cdot \theta (1 - \tau)$: effective MPC out of a capital gain

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
EMPIRICAL IMPLEMENTATION
Ingredients of the decomposition

1. Shares of three types of households

2. Their balance sheet composition \((b, m, k, \ldots)\)

3. Their MPCs \((\mu)\)

4. Their earnings’ exposure to the cycle \((\varepsilon_{y,Y})\)

5. The aggregate response of prices to the monetary shock

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Shares of hand-to-mouth households

Share of hand-to-mouth in the euro area
percentages over total population, by country

Source: HFCS wave 2. Countries: DE, ES, FR, IT and Euro area.

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Shares of hand-to-mouth households

Share of hand-to-mouth in the euro area
percentages over total population, by country

Source: HFCS wave 2. Countries: DE, ES, FR, IT and Euro area.

**US**: Poor HtM: 10% and Wealthy HtM: 25%

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Shares of hand-to-mouth households by age

Source: HFCS wave 2. Countries: Euro Area countries.

Poor HtM: young
Wealthy HtM: middle age
MPCs out of income and wealth

- Calibrated from existing literature

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Income</th>
<th>Housing</th>
<th>Stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor HtM</td>
<td>0.50</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Wealthy HtM</td>
<td>0.50</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Non HtM</td>
<td>0.05</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

- Aggregate MPC out of transitory income $\approx 0.20$ (low end)
- Aggregate MPC out of housing/stocks $\approx 0.025$

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
MPCs out of income and wealth

- Calibrated from existing literature

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<th>Household Type</th>
<th>Marginal Propensity to Consume (annual)</th>
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<tr>
<td></td>
<td>Income</td>
</tr>
<tr>
<td>Poor HtM</td>
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</tr>
<tr>
<td>Wealthy HtM</td>
<td>0.50</td>
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<tr>
<td>Non HtM</td>
<td>0.05</td>
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- Aggregate MPC out of transitory income $\approx 0.20$ (low end)
- Aggregate MPC out of housing/stocks $\approx 0.025$
- IES = 0.5

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Systematic exposure to aggregate fluctuations

- From HFCS, estimate $\text{Prob}(HtM \text{ type})$ as function of observables
- Impute $\text{Prob}$ to each individual in monthly EU Labor Force Survey
- Estimate, for each group $g$:

$$e_t(g) = \alpha(g) + \beta(g) \cdot t + \varepsilon(g) \cdot E_t + \nu_t(g)$$

<table>
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<tr>
<th></th>
<th>Germany</th>
<th>Spain</th>
<th>France</th>
<th>Italy</th>
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</thead>
<tbody>
<tr>
<td>Poor HtM</td>
<td>1.7</td>
<td>2.9</td>
<td>1.3</td>
<td>2.1</td>
</tr>
<tr>
<td>Wealthy HtM</td>
<td>0.3</td>
<td>1.6</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Non HtM</td>
<td>1.0</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
VAR responses of aggregates to monetary shock

- **High-frequency identification** *(Gertler-Karadi, Altavilla et al.)*

- Responses to 100BP (60BP averaged over first year)

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<tbody>
<tr>
<td>Earnings (%)</td>
<td>0.5</td>
<td>1.6</td>
<td>0.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Inflation Rate (p.p.)</td>
<td>0.1</td>
<td>0.6</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>House Prices (%)</td>
<td>0.0</td>
<td>5.0</td>
<td>0.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Stock Prices (%)</td>
<td>27</td>
<td>21</td>
<td>24</td>
<td>26</td>
</tr>
</tbody>
</table>

- Spanish macroeconomy much more ‘sensitive’ than German one

- Huge response of stock prices (common)

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
Net interest rate exposure

Source: HFCS 2nd wave. Countries: Euro Area countries.

- Germany (DE): large liquid savings + FRMs
- Spain (ES): many homeowners + large ARMs

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
In Italy, most households are outright homeowners

Source: HFCS 2nd wave. Countries: Euro Area countries.

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Stockmarket and housing wealth

- Imputation of missing stock-market wealth
- Stocks are a smaller share of net worth in EA compared to US
- All illiquid household wealth is in housing

G. Violante, “Household Balance Sheet Channels of Monetary Policy”
DECOMPOSITION RESULTS
Decomposition for the Euro Area

- Indirect GE channels account for 2/3 of the total
- Wealthy HtM benefit the most from easing via indirect channels

Source: HFCS 2nd wave. Countries: DE, ES, FR and IT.

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Decomposition: Germany

- Traditional transmission mechanism dominated by IES
- Roughly equal impact across all groups

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Housing wealth effect is dominant

HtM households benefit the most from easing

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Decomposition: France

Direct Effects
- IES
- NIE
- income
- Fisher
- housing
- stocks

Indirect Effects

Change in consumption, percent

France

- Poor HtM
- Wealthy HtM
- Non HtM
- All

Similar to Germany

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Decomposition: Italy

Similar to Spain

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VAR responses vs HA model decomposition vs RA

- Two ‘independent’ estimates of the impact on aggregate C
- Obtained with different methodologies

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<td>VAR estimate (%)</td>
<td>0.24</td>
<td>1.8</td>
<td>0.03</td>
<td>1.5</td>
</tr>
<tr>
<td>HA Decomposition (%)</td>
<td>0.3</td>
<td>1.8</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Repr. Agent - IES (%)</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
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- VAR and HA line up, which offers some credibility to the exercise
- The HANK block amplifies the shock compared to the RA

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
TREATMENT OF BUSINESS WEALTH
Business wealth treated as stocks: EA decomposition

- Clearly an upper bound
- It doubles overall effects of the monetary shock

Source: HFCS 2nd wave. Countries: DE, ES, FR and IT.

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ZOOMING IN ON THE TOP 10%
Isolating the rich from the rest

- Separate the top 10% in net worth from the rest of the non HtM
- Same MPC as Non-HtM
- Impute to them the missing stock market wealth
- Recompute their earnings exposure to aggregate cycle

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G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Stockmarket and housing wealth

**STOCKS**

- Stock-market wealth is small even for the richest in the EA

**HOUSING**

- The wealth of the richest in the EA is all in housing

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Decomposition for the Euro Area

- Richest lose somewhat from NIE + NOM

- They gain a lot through asset prices (but small MPC)

Source: HFCS 2nd wave. Countries: DE, ES, FR and IT.

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Conclusions

- **Household balance sheet channels** of monetary policy

- Simple **back of the envelope** calculation that offers guidance on:
  - relative size of various transmission mechanisms
  - heterogeneous impact across types of households
  - heterogeneous impact across countries hit by same shock
  - how total effect changes over time
Conclusions

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- Simple *back of the envelope* calculation that offers guidance on:
  - relative size of various transmission mechanisms
  - heterogeneous impact across types of households
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- Lesson for **big DSGE models**
  - Model both the top and bottom of distribution accurately
  - Enrich HANK with *credible asset price dynamics*

G. Violante, "Household Balance Sheet Channels of Monetary Policy"
Thanks!
Monetary transmission to individual consumption

Direct effects (PE)
- Intertemporal Substitution
- Income Effects
  - RANK model
  - Standard Income Effects through Interest Rates
  - Valuation Effects from Inflation (Fisher Effects)
  - Income Effects through Mortgage Rates
  - Eichenbaum, Rebelo, Wong
  - Berger, Milbradt, Tourre, Vavra
  - Wong
  - Beraja, Fuster, Hast, Vavra
  - McKay, Wieland
  - Greenswad
  - Hedlund, Karahan, Mitman, Ozkan

Indirect effects (GE)
- Asset Prices/Returns
  - Dividends/Profits
    - Capital Gains
      - Eichenbaum, Rebelo, Wong
        - Kaplun, Moll, Violante
      - Broer, Hansen, Krusell, Oberg
      - Werning
      - Bilbie
    - Dividend/Profits
      - Gornemann, Kuester, Nakajma
      - Steinsson
      - Alves, Kaplun, Moll, Violante
      - Kekre, Lenel
      - Werning
    - Eichenbaum, Rebelo, Wong
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      - Broer, Hansen, Krusell, Oberg
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      - Bilbie
  - Fiscal Policy
    - Gornemann, Kuester, Nakajma
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    - Alves, Kaplun, Moll, Violante
    - Kekre, Lenel
    - Werning
    - Eichenbaum, Rebelo, Wong
      - Kaplun, Moll, Violante
      - Broer, Hansen, Krusell, Oberg
      - Werning
      - Bilbie
  - Labor Income
    - Level
      - Kaplun, Moll, Violante
        - Lutticke
        - Auclert
        - Wald, Tokunaga, Tenreyro
        - Doepke, Schneider
    - Risk
      - Kaplun, Moll, Violante
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