Heterogeneous household finances and the effect of fiscal policy

Javier Andrés[1], José E. Boscá[1,2], Javier Ferri[1,2] and Cristina Fuentes[3]

(1) University of Valencia, (2) Fedea, (3) Federal Reserve Board

13th EUROFRAME CONFERENCE ON ECONOMIC POLICY ISSUES IN THE EUROPEAN UNION

Utrecht

10 June 2016

Introduction

- Wealth inequality increased during the Great Moderation in the U.S., and other developed countries, and continued to do so during the Great Recession.
- In the U.S. the top 3 percent of the population owned 44.8 percent of the country's wealth in 1989, a share that rose to 51.8 percent in 2007 and to 54.4 percent in 2013 (Federal Reserve Board Survey of Consumer Finances, 2014), twice as much as the amount of wealth in the hands of the poorest 90 percent.
- Prior to the financial crisis, the importance of this surge in inequality was somehow overshadowed by the fact that consumption differences across households actually declined.
- The financial sector played a key role channeling funds from lenders to borrowers at acceptable rates and credit conditions.

Introduction

- The financial turmoil in 2008 brought about an important recomposition of the balance sheets of many households, with a devastating effect on the ability of some of them to obtain credit.
- Also the prices of financial and real assets plummeted and deflation increased the real value of debt.
- While these changes have had deep social and economic consequences, researchers as well as policy makers are becoming increasingly aware of their effect on the effectiveness of macroeconomic policies too.
- The recent economic literature has identified this fact as central and tries to shed some light on the links between fiscal policy, household finances and consumption.

Empirical evidence and related literature

- Looking at the assets side:
  - Kaplan, Violante, Weidner (2014):
    - ★ Identify two types of HtM households: poor hand-to-mouth (little or no liquid wealth and no illiquid wealth) and the wealthy hand-to-mouth (little or no liquid wealth,significant amounts of illiquid assets on their balance sheet)
    - ★ They find that W-HtM and P-HtM households have significantly stronger responses than N-HtM households.
  - Angrisani, Hurd, Rohwedder (2015):
    - ★ Consider both financial and housing wealth.
    - ★ Estimate a reduction in household spending of about \$7 for every \$100 loss in housing wealth and of about \$4 for every \$100 loss in financial wealth.

Empirical evidence and related literature

- Looking at the liabilities side:
  - Cloyne, Surico (2014):
    - ★ Households with mortgage debt exhibit large consumption responses to changes in their income.
    - ★ Homeowners without a mortgage, in contrast, do not appear to react.
- Looking at assets and liabilities separately:
  - Jaramillo, Chailloux (2015):
    - ★ Separate the effects on private final consumption expenditure of different categories of wealth, namely financial assets, housing assets, and household debt.
    - ★ Financial assets and housing assets are found to have a positive coefficient, while household debt is found to have a negative coefficient.

Empirical evidence and related literature

- Looking at the Net Wealth:
  - Carroll, Slacalek, Tokuoka (2014):
    - ★ Substantial heterogeneity in net wealth to income ratios both across and within countries.
    - ★ Countries with more unequal wealth distributions tend to have a higher proportion of households with little wealth and tend to respond more strongly to shocks.
  - Anderson, Inoue, Rossi (2015):
    - ★ Government spending policy shocks tend to decrease consumption inequality.

Empirical evidence and related literature

- Mian and Sufi (2016): "Our main conclusion is that housing and household debt should play a larger role in models exploring the importance of household heterogeneity on macroeconomic outcomes and policies".

- Kaplan, Moll and Violante (2016): HANK (Heterogeneous Agent New Keynesian) models vs. RANK (Representative Agent New Keynesian) models.

What we do

- First, we characterise different types of U.S. households according to their financial positions. Using the Panel Study of Income Dynamics (PSID), we identify:
  - standard Ricardian optimising households (R), HtM consumers without access to credit, but who may or may not hold real estate (HH and HNH), borrowers with either high or low capacity to access credit backed by real estate collateral (BL and BH) and, finally, what we call Eggertsson-Krugman type of consumers (EK) who do not posses collateralisable assets and borrow against their future labour income.
- Next, we analyse the aggregate economy response to a government spending shock within the confines of a DSGE-HANK model, calibrated to match the most salient features of the U.S. Economy. The model allows for novel and rich household structure including all the classes identified in the PSID.

Looking at the data

Households identification using PSID.

- The Panel Study of Income Dynamics (PSID) constitutes the longest running longitudinal household survey in the world and covers a sample of over 18,000 individuals living in 5,000 families in the United States.
- The PSID contains detailed information on income, consumption, and wealth at the household level starting from the 1999 wave. The survey is conducted in a biannual basis. Our sample has $55,105$ observations over the pooled years $1999 - 2013$.
- Following Kaplan, Violante and Weidner (2014), we classify households in terms of their wealth.
- Let lnw_t^i be the net wealth of household i (the value of checking accounts, saving accounts, money market funds, certificates of deposits, savings bonds, Treasury Bills, etc...). Therefore, our measure of liquid wealth excludes the net equity value of real estate used as main home.
- Let inc_t^i be the income of household i defined as salaries and other compensation plus private and government transfers.

Table 3: Household classification

	Wealth	Homeowner	High LTV	Low LTV	Mortgage
R	$lnw_t^i \geq 0.5 * inc_t^i$	?	?	?	?
W-HtM: HH	$lnw_t^i < 0.5 * inc_t^i$	Yes	No	No	No
W-HtM: BL	$lnw_t^i < 0.5 * inc_t^i$	Yes	No	Yes	Yes
W-HtM: BH	$lnw_t^i < 0.5 * inc_t^i$	Yes	Yes	No	Yes
P-HtM: HNH	$0 < lnw_t^i < 0.5 * inc_t^i$	No	–	–	–
P-HtM: EK	$lnw_t^i \leq 0$	No	–	–	–

Looking at the data

Households identification using PSID.

Table 4: PSID Sample Weights (in %)

	1999	2001	2003	2005	2007	2009	2011	2013
R	42.98	42.33	41.89	41.30	41.37	37.09	36.61	35.94
W-HtM: HH	5.62	5.22	5.38	4.96	4.68	4.57	5.37	5.77
W-HtM: BL	6.82	6.88	7.67	7.61	6.99	7.42	7.29	6.48
W-HtM: BH	12.99	14.24	14.23	13.95	13.24	13.84	12.55	11.95
P-HtM: HNH	17.14	16.66	16.13	16.54	17.02	17.40	17.56	18.36
P-HtM: EK	14.45	14.67	14.70	15.64	16.71	19.67	20.62	21.50

- Overall, the distribution of household types is fairly stable with two notable exceptions:
  - over time the fraction of Ricardian households in the U.S. economy has declined from 43% in 1999 to 36% in 2013.
  - over time the proportion of EK households has increased in parallel from 14.5% to 21.5%.

The model: features

- Closed economy.
- Two-level production: competitive wholesale firms and monopolistically competitive retailing firms.
- We assume two-sided market power, wage bargaining and matching frictions à la Mortensen and Pissarides.
- Households delegate the bargaining process with firms to a trade union that, after negotiation, distributes employment according to the households shares in the working-age population.
- Thus, all workers receive the same wage, work the same number of hours and have the same unemployment rates.
- The government deficit is financed by issuing public debt b_t.
- The nominal interest rate is set by a central bank following a Taylor's rule.
- Our model limits the scope of heterogeneity among households just to their balance sheet position.

The model: frictions

- REAL FRICTIONS: Capital adjustment costs, borrowing frictions, labour market frictions.

- NOMINAL FRICTIONS: Price stickiness.

The model: Households

$(i = \text{R, BL, BH, HH, HNH, EK})$ $\quad$ $(\widetilde{i} = \text{BL, BH, HH, HNH, EK})$

$$\max_{c_t^i, b_t^i, x_t^i, , d_t^R, k_t^R, j_t^R} E_t \sum_{t=0}^{\infty} (\beta^i)^t \left[\ln\left(c_t^i\right) + \phi_x^i \ln\left(x_t^i\right) + f(1 - l_t) \right] \tag{1}$$

s.t.

$$c_t^i + j_t^R + q_t(x_t^i - x_{t-1}^i) + d_t^R = (1 + r_{t-1}^n)\left(\frac{d_{t-1}^R}{1+\pi_t} - \frac{b_{t-1}^i}{1+\pi_t}\right)$$
$$+ r_t k_{t-1}^R + w_t l_1 n_{t-1} + b_t^i + trh_t^R$$

$$b_t^{\widetilde{i}} \leq \overbrace{\varphi^{\widetilde{i}}\left[m^{\widetilde{i}} E_t\left(\frac{q_{t+1}(1+\pi_{t+1})x_t^{\widetilde{i}}}{1+r_t^n}\right)\right]}^{\text{Secured debt}} \tag{2}$$
$$+ \underbrace{(1-\varphi^{\widetilde{i}})\left[m^{\widetilde{i}} E_t\left(\frac{(1+\pi_{t+1}) w_{t+1} n_t l_{1t+1}}{1+r_t^n}\right)\right]}_{\text{Unsecured debt}}$$

The model: Heterogeneous household finances

Type	*Share*	β	*LTV*	*Assets*	*Liabilities*
R	0.5	0.99	$--$	X	$--$
BL	0.1	0.95	0.73	X	X
BH	0.1	0.95	0.98	X	X
HH	0.1	0.95	0	X	$--$
HNH	0.1	0.95	0	$--$	$--$
EK	0.1	0.95	0.98	$--$	X

The model: calibration

Preferences:			
Discount factor (lenders),	0.99	Discount factor (financial constrained),	0.95
Intertemp. labour elasticity of substitution,	2	Housing weight in utility,	0.12
Leisure preference (empl.),	1.59	Leisure preference (unempl.),	1.04
Houshold's debt:			
Share of impatient consumers.	0.50	Share of patient consumers,	0.50
Low loan-to-value,	0.73	High loan-to-value,	0.98
Frictions:			
Probability of not changing prices,	0.75	Adjustment costs for investment,	5.5
Inflation indexation,	0.4	Workers bargaining power	0.5
Policy:			
Fiscal reaction to debt-to-GDP SS deviations	0.01	Fiscal reaction to debt-to-GDP growth	0.02
Interest rate smoothing,	0.73	Interest rate reaction to inflation,	1.27

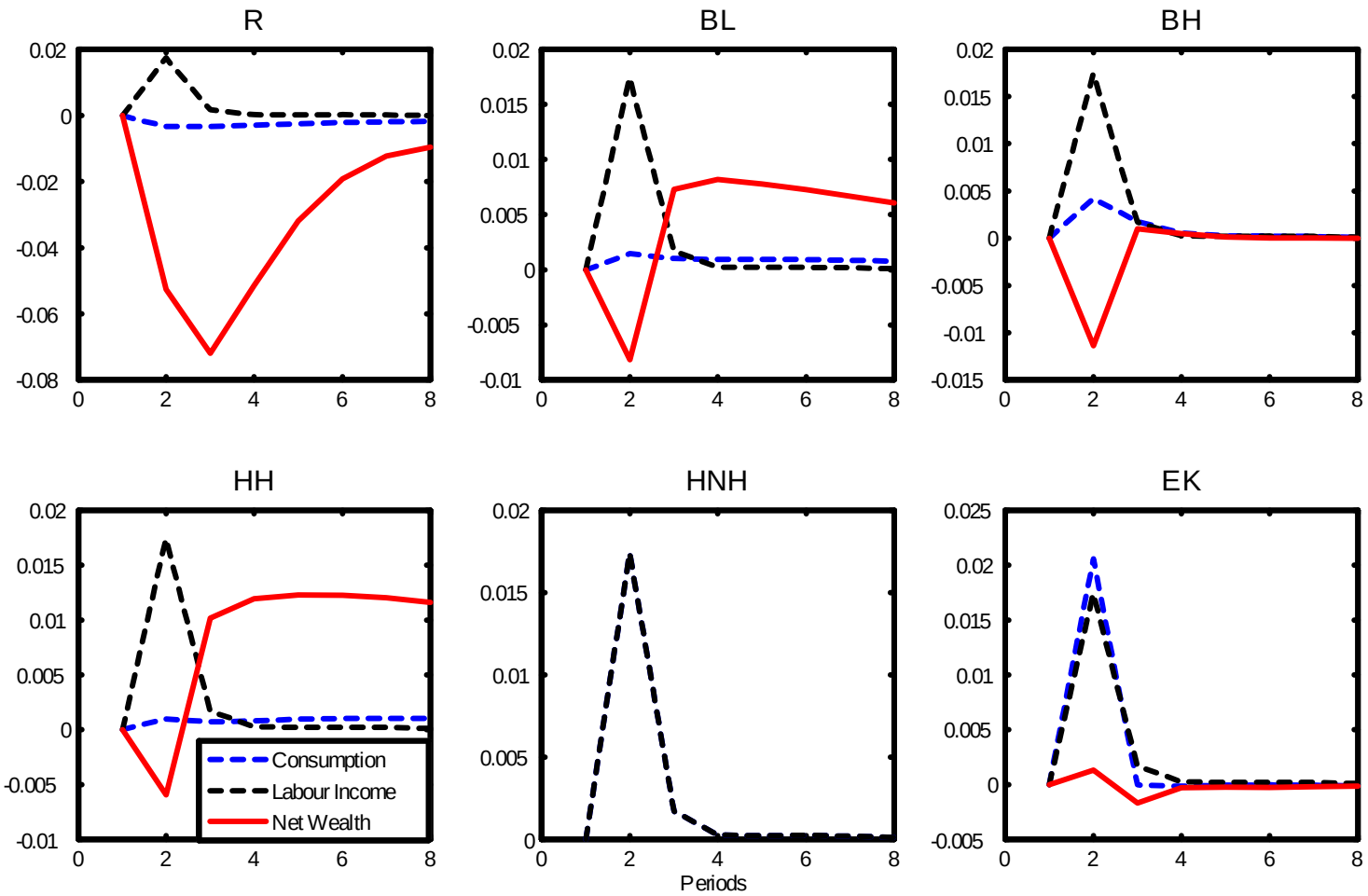
Table 7. Steady state consumption, labour income and net wealth

	Cons	Lab income	Net wealth	Assets	Liabilities	Ratio
	(1)	(2)	(3)	(4)	(5)	(3)/(2)
R	0.740	0.578	33.375	33.375	0	57.7
HNH	0.578	0.578	0	0	0	0
HH	0.578	0.578	1.415	1.415	0	2.45
BL	0.554	0.578	0.872	3.292	2.420	1.51
BH	0.519	0.578	0.090	5.995	5.905	0.16
EK	0.572	0.578	-0.569	0	0.569	-0.98

R: Ricardians; BL: Borrowers (Low m); BH: Borrowers (High m); HH: HtMs with houses; HNH: HtMs with no houses; EK: Eggertsson-Krugman.

Simulation results

Response of consumption, labour income and net-wealth to a 1% of GDP government expenditure shock (absolute variation)



Simulation results

- Consumption of Ricardians decreases after the shock.
- Consumption of impatient individuals increases the more for EK individuals, followed by HNH, BH, BL and, finally, HH. $\Longrightarrow$ The response of consumption to the shock is negatively correlated with the household net worth.
- Net Wealth decreases on impact for all households, except for EK individuals that increases.

- To understand the impact multiplier associated to a government spending shock we can make use of the implicit consumption function:

$$c_t^R = F_{Rt}\left(\underbrace{NW_t^R}_{\text{Net worth}} + \underbrace{w_t n_{t\text{-}1} l_{1t}}_{\text{Lab. Income}}\right)$$

- Thus, the response of consumption to a change in g_t is given by

$$\frac{\partial c_t^R}{\partial g_t} = \underbrace{\frac{\partial F_{Rt}}{\partial NW_t^R}}_{(+)} \underbrace{\frac{\partial NW_t^R}{\partial g_t}}_{(-)} + \underbrace{\frac{\partial F_{Rt}}{\partial (w_t n_{t-1} l_{1t})}}_{(+)} \underbrace{\frac{\partial (w_t n_{t-1} l_{1t})}{\partial g_t}}_{(+)} < 0$$

- The fiscal shock reduces both r_t (depresses the value of k_{t-1}^R) and q_t (depresses the value of $x_{t\text{-}1}$) and increases π_t (erodes the real value of their financial assets).

- To understand the impact multiplier associated to a government spending shock we can make use of the implicit consumption function:

$$c_t = F_{Bt}\left(\underbrace{q_t x_{t\text{-}1}\text{-}(1+r^n_{t-1})\left(\frac{b_{t\text{-}1}}{1+\pi_t}\right)}_{\text{Net worth: } NW_t} + \underbrace{w_t n_{t\text{-}1} l_{1t}}_{\text{Lab. Income}} + \underbrace{b_t}_{\text{Credit}}\right)$$

Inspecting the economic mechanism
Impatient households

- Response of consumption to a change in g_t is given by

Response of consumption to a change in g_t

	Assets $q_t x_{t\text{-}1}$	Liabilities $(1+r^n_{t-1})\left(\frac{b_{t-1}}{1+\pi_t}\right)$	Net wealth NW_t	Lab income $w_t n_{t\text{-}1} l_{1t}$	Fresh Credit b_t	Consumption c_t
BL	$\downarrow$	$\downarrow$	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
BH	$\downarrow$	$\downarrow$	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
HH	$\downarrow$	—	$\downarrow$	$\uparrow$	—	$\uparrow$
HNH	—	—	—	$\uparrow$	—	$\uparrow$
EK	—	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$

- The fiscal shock depresses the value of assets ($\downarrow q_t$), reduces the real value of liabilities ($\uparrow \pi_t$, Fisher effect) and increases fresh credit (increases the expected value of the collateral ($E_t q_{t+1} x^b_t$), or the expected increase in future labor income).

- The different reaction of household consumption, following a government spending shock, suggests a clear connection among the financial exposure of the population, and the aggregate consumption, income and labour effects of the shock.

Table 9. Fiscal effects

	(1) $\frac{\Delta y_t}{\Delta g_t}$	(2) $\frac{\Delta c_t}{\Delta g_t}$	(3) $\frac{\Delta(n_{t-1}l_{1t})}{nl_1}$	(4) $\frac{\Delta(n_{t-1})}{n}$
R	0.850	-0.147	1.216	0.356
R+HH	0.873	-0.084	1.249	0.335
R+HH+BL	0.875	-0.083	1.252	0.338
R+HH+BL+BH	0.892	-0.060	1.276	0.352
R+HH+BL+BH+HNH	1.011	0.089	1.448	0.315
R+HH+BL+BH+HNH+EK	1.170	0.283	1.675	0.238

Note: (1) and (2): impact multipliers. (3) and (4): relative variations (%).

- We feed our theoretical model with the evolution of observed population shares as obtained from PSID.
- We then simulate for each year the macroeconomic effects of a transitory government expenditure shock of 1 percent of output.

Table 10. The evolution of fiscal effects

		1999	2001	2003	2005	2007	2009	2011	2013
(1)	$\frac{\Delta y_t}{\Delta g_t}$	1.562	1.608	1.598	1.666	1.713	2.081	2.084	2.187
(2)	$\frac{\Delta c_t}{\Delta g_t}$	0.768	0.826	0.815	0.898	0.955	1.413	1.417	1.543
(3)	$\frac{\Delta(n_{t-1}l_{1t})}{nl_1}$	2.239	2.305	2.290	2.388	2.466	2.986	2.990	3.138
(4)	$\frac{\Delta(n_{t-1})}{n}$	0.052	0.032	0.039	0.003	-0.025	-0.219	-0.223	-0.284

Note: (1) and (2): impact multipliers. (3) and (4): relative variations (%).

- We calculate Gini coefficients using the observed population shares and the model implied steady state net wealth for each household.

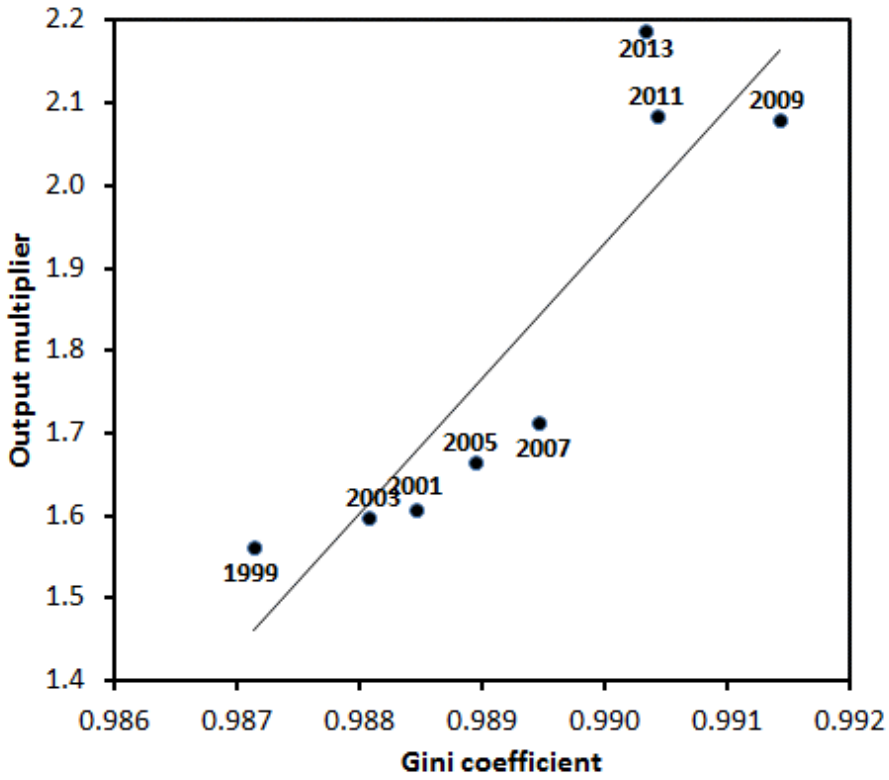


Figure 2: Output multiplier and inequality (theoretical results)

- Correlation between theoretical and actual (from observed wealth distribution in the PSID) Gini coefficients.

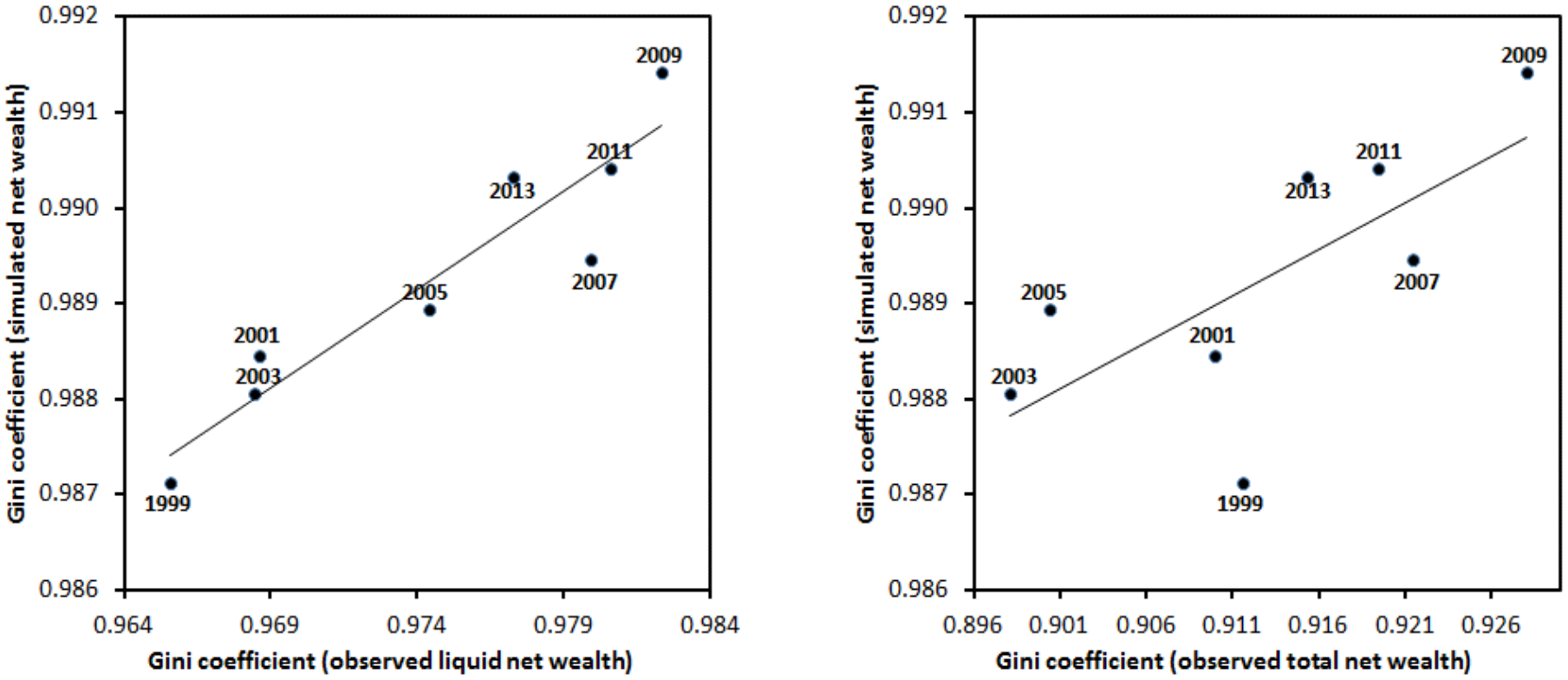


Figure 3: Theoretical and observed Gini coefficients.

- We can calculate the welfare cost Δ^i associated with a fiscal measure as the fraction of steady state consumption that a household would be willing to give up to be as well off after as before the fiscal shock. That is,

$$V^{i,s} = \sum_{t=0}^{\infty} (\beta^i)^t \left[\begin{array}{c} \ln\left[\bar{c}_t^i \left(1-\Delta^i\right)\right] + \phi_x \ln\left(\bar{x}_t^i\right) + \bar{n}_{t-1}\phi_1 \frac{(1-\bar{l}_{1t})^{1-\eta}}{1-\eta} \\ +(1-\bar{n}_{t-1})\phi_2 \frac{(1-\bar{l}_2)^{1-\eta}}{1-\eta} \end{array} \right].$$

- Thus,

$$\Delta^i = 1 - \exp\{\left(V^{i,s} - \overline{V}^i\right)\left(1-\beta^i\right)\}$$

- We also define (per capita) social welfare as a weighted sum of the individual welfare for the six different types of households

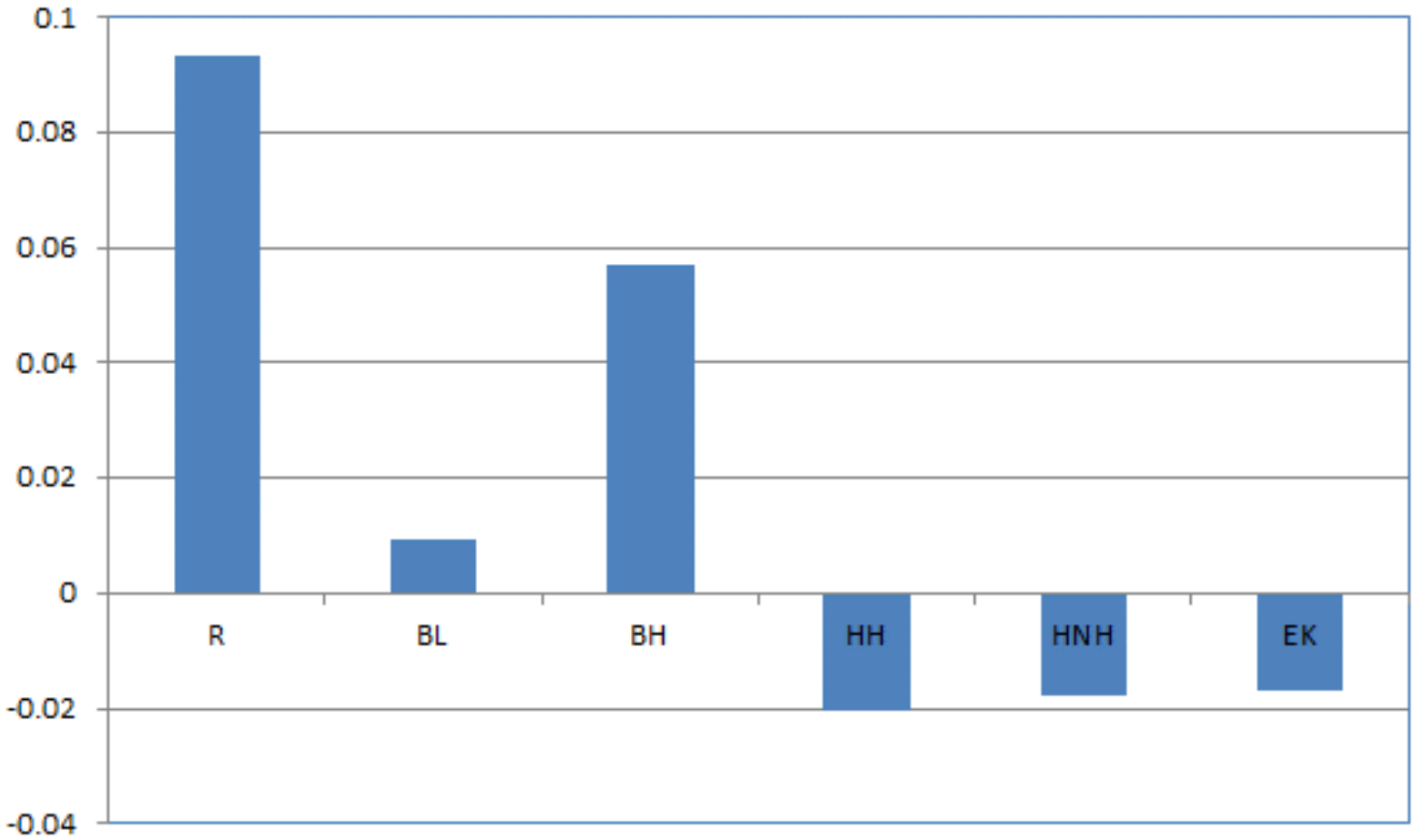
$$V^s = \sum_{i=1}^{I} \left(1-\beta^i\right) \tau^i V^i, \qquad i = \{R, HNH, HH, BL, BH, EK\}$$

- And the welfare cost in terms of consumption from the social welfare can be obtained as

$$\Delta = 1 - \exp\{\left(V^s - \overline{V}\right)\}$$

The multiplier and the distribution of wealth in the U.S.

Welfare losses/gains by household type in terms of consumption



Welfare effects by household category (theoretical model).

The multiplier and the distribution of wealth in the U.S.

Welfare losses/gains by household type in terms of consumption

Welfare effects across time by household category (PSID shares)

Conclusions

- We use a quite standard DSGE model except for heterogeneity in balance sheet composition (HANK model).
- We suggest that matching stylized facts regarding households finances is key to understand the reaction of economies to fiscal shocks.
- Key findings:

(1) The response of consumption to the shock is negatively correlated with the household net worth.

(2) The size of the fiscal multiplier critically depends on the weight of some types of consumers in total population: it might have increased after the financial crisis following the drop of Ricardians and the rise EK consumers.

(3) The employment multiplier, on the contrary, might have decreased as the upward pressure on wages (that stems from a bargaining process in which agents with reductions in the marginal utility of consumption gain importance) makes firms more reluctant on posting new vacancies and rely more on the intensive labor margin to meet the additional demand.

(4) The fiscal effect is positively correlated with wealth inequality.

(5) The welfare impact of shocks across households depends heavily on their financial position: poorer (wealthier) households are the winners (losers) of increases in public spending.