Inequality, Home Production, and Monetary Policy

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EEA Congress
26 August 2025

Research Question

Does home production have an impact on the labor income channel through which monetary policy affects consumption inequality?

Motivation

- The labor income channel. . .
  - is one out of various channels through which monetary policy affects consumption inequality.
  - refers to the finding that labor income of poor households is more sensitive to monetary policy compared to rich households (McKay and Wolf, 2023).
- Poor households may rely relatively more on home production to smooth consumption compared to savers.

Preview of main results

- Empirically, HtM households increase home production more than savers do in response to a contractionary monetary policy shock.
- In a TANK model with home production...
  - the monetary transmission mechanism is empirically relevant.
  - HtM households experience a sharper decline in labor income, but increase home production by more than savers do.
  - the resulting consumption inequality is only half the size when accounting for home production.

Related literature

- Empirical literature on consumption smoothing with home production: Aguiar & Hurst (2005), Burda & Hamermesh (2010), Been et al. (2020), Cacciatore et al. (2024).
  → My contribution: Heterogeneous effects of monetary policy.
- Inequality and home production in HANK: Boerma & Karabarbounis (2021).
  → My contribution: Transmission of economic policy.
- Home production, business cycle analysis and economic policy: Becker (1965), Benhabib et al. (1991), Greenwood et al. (1991), McGrattan et al. (1997), Olovsson (2015), Aruoba et al. (2016), Gnocchi et al. (2016).
  → My contribution: Interaction with inequality.
- Inequality and monetary policy: Kaplan et al. (2018), Broer et al. (2020), McKay & Wolf (2023), Komatsu (2023) [...].
  → My contribution: Interaction with home production.

Data

- ECB monetary policy surprises from the database in Altavilla et al. (2019), and I distinguish monetary policy and information shocks as in Jarociński and Karadi (2020).
- Yearly individual-level data from the Socio Economic Panel (SOEP) Descriptive statistics
  - Panel survey of 20,000 households in Germany since 1984 with wealth data collected every 5 years since 2002.
  - Sample selection: working individuals of working age, wealth and wage trimmed at 1st and 99th percentile and total time per day not larger than 16 hours. Observations
  - Time spent on running errands and on housework.
  - Hand-to-Mouth (HtM) individuals based on net wealth: "net wealth is less than two months of labor earnings" (Zeldes, 1989).
- Time period: 1999-2019.

Empirical strategy

$$tu_{it} = \alpha + \beta mps_t + \gamma(mps_t \times HtM_{it}) + \sum_j \delta_j X_{it} + \sum_k \psi_k Y_t + \epsilon_{it}$$

- Variables
  - tu_{it}: time use (focus on housework and running errands as consumption smoothing devices).
  - mps_t: monetary policy surprise.
  - HtM_{it}: dummy for being HtM.
  - X_{it}: age, kids, gender, marital status, month of interview, fixed effects for region, housing, occupation.
  - Y_t: GDP and CPI inflation.
- Standard errors are clustered at the individual level.

Empirical results (I): Time spent on running errands

	(1)	(2)	(3)	(4)
mps	0.345***	0.336***	0.121	0.114
	(7.75)	(7.07)	(1.50)	(1.41)
mps×HtM	0.359***	0.289***	0.280***	0.217**
	(3.80)	(2.81)	(2.72)	(2.09)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	32706	27611	27611	27417
R^2	0.00390	0.00432	0.00398	0.0108

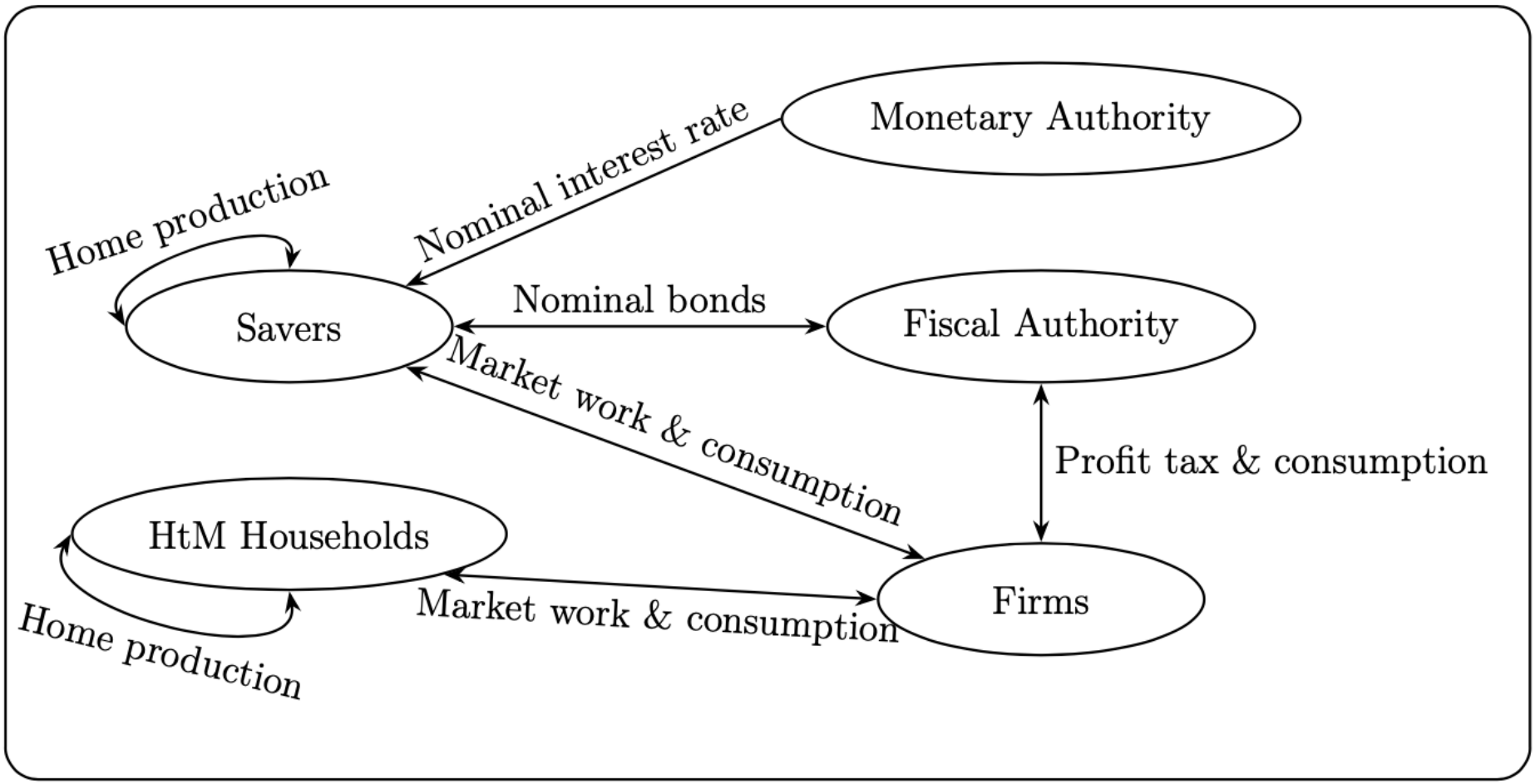
Notes: (i) t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; (ii) individual controls are gender, minor kids, marital status, years of education, month of the interview, and place of residence in the former German Democratic Republic, (iii) aggregate controls are GDP and CPI inflation.

Empirical results (II): Time spent on housework

	(1)	(2)	(3)	(4)
mps	0.683***	0.590***	0.299***	0.301***
	(10.48)	(8.76)	(2.69)	(2.69)
mps×HtM	0.0829	-0.0443	-0.0549	-0.0929
	(0.57)	(-0.30)	(-0.37)	(-0.63)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	32733	27636	27636	27442
R^2	0.00961	0.00842	0.0107	0.0175

Weekly overtime Market work Care for others Repairs

Model Overview



Households

- Continuum of households j
- Preferences as in King et al. (1988)

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{[C_t(j)^b L_t(j)^{1-b}]^{1-\sigma} - 1}{1-\sigma} \right)$$

- Consumption aggregation:
  $C_t(j) = [\alpha_1 C_{m,t}(j)^{b_1} + (1-\alpha_1) C_{n,t}(j)^{b_1}]^{(1/b_1)}$
- Home production: $C_{n,t}(j) = H_{n,t}(j)$
- Time is normalized to one: $1 = H_{n,t}(j) + H_{m,t}(j) + L_t(j)$

Households (cont.)

- Budget constraint savers

$$P_t C^s_{m,t}(j) + B^s_t(j) = B^s_{t-1}(j)(1 + i_{t-1}) - T_t + W_t(j) H^s_t(j) - \frac{\xi^s}{2} \left(\frac{W_t(j)}{W_{t-1}(j)} - 1 \right)^2 W_t(j) H^s_t(j)$$

- Budget constraint HtM households

$$P_t C^h_{m,t}(j) = W_t(j) H^h_t(j) - \frac{\xi^h}{2} \left(\frac{W_t(j)}{W_{t-1}(j)} - 1 \right)^2 W_t(j) + H^h_t(j) - T_t$$

Firms

- Continuum of monopolistically competitive firms indexed by $i \in [0, 1]$.
- Firm i ...
  - produces output according to $Y_t(i) = H_t(i)$.
    - ★ Labor input of firm i aggregated over household j is given by: $H_t(i) = \left(\int_0^1 [H_t(ij)]^{\frac{\phi-1}{\phi}} dj \right)^{\frac{\phi}{\phi-1}}$.
    - ★ Labor input of HtM households and savers is homogeneous.
  - demands labor according to $H_t(ij) = \left(\frac{W_t(j)}{W_t} \right)^{-\phi} H_t(i)$.
  - sets its price as in Calvo (1983).
  - is owned by savers.

Government

- The central bank sets the nominal interest rate according to a standard Taylor rule,

$$i_t = \rho + \phi_\pi \pi_t + \nu_t,$$

with $\nu_t = \rho_\nu \nu_{t-1} + \epsilon_t^\nu$.

- The fiscal authority taxes profits, D_t, at rate 1,

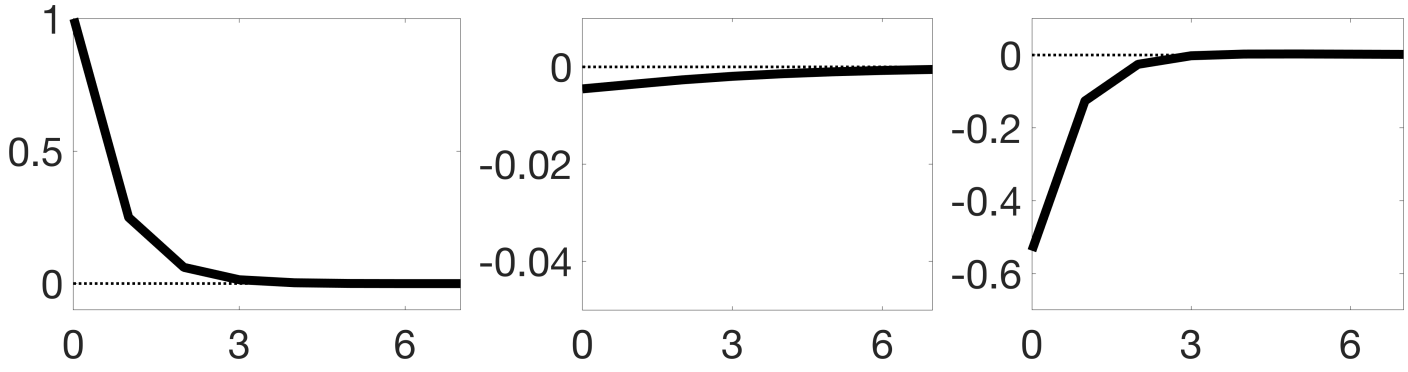
$$G_t = D_t.$$

Calibration

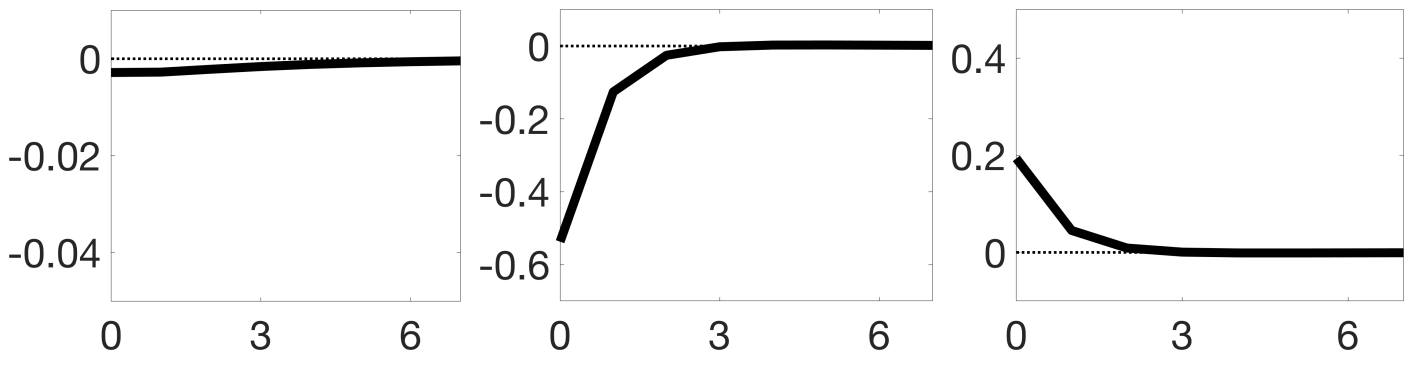
β	Discount factor	0.99
σ	Inverse of the elasticity of inter-temporal substitution	2
b_1	Inverse of the elasticity of substitution b/w market and non-market consumption goods	0.5
b	Total consumption share	0.865
α_1	Market consumption share	0.71
ψ	Share HtM households	0.25
ϵ_w	Substitutability of differentiated labor	4.5
ξ^s	Wage adjustment costs savers	740
ξ^h	Wage adjustment costs HtM households	1810
θ	Calvo parameter	0.75
ϵ_p	Elasticity of substitution b/w market consumption goods	9
ϕ_π	Inflation feedback Taylor rule	1.5
ρ_ν	Persistence of monetary policy shock	0.25

Model fit

Aggregate results



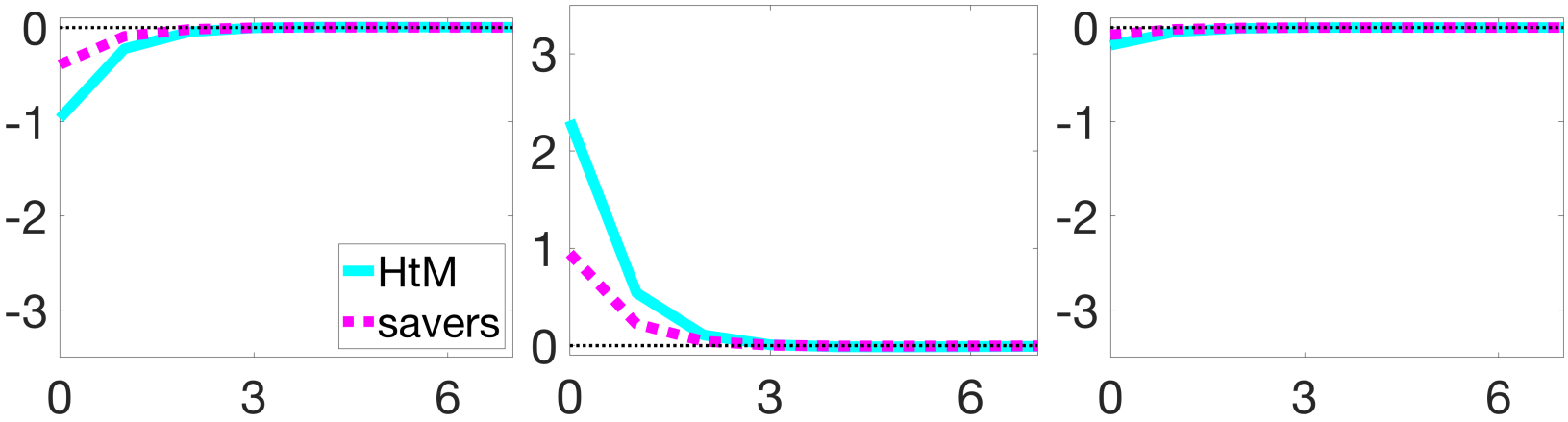
(a) Real rate (b) Price inflation (c) Output



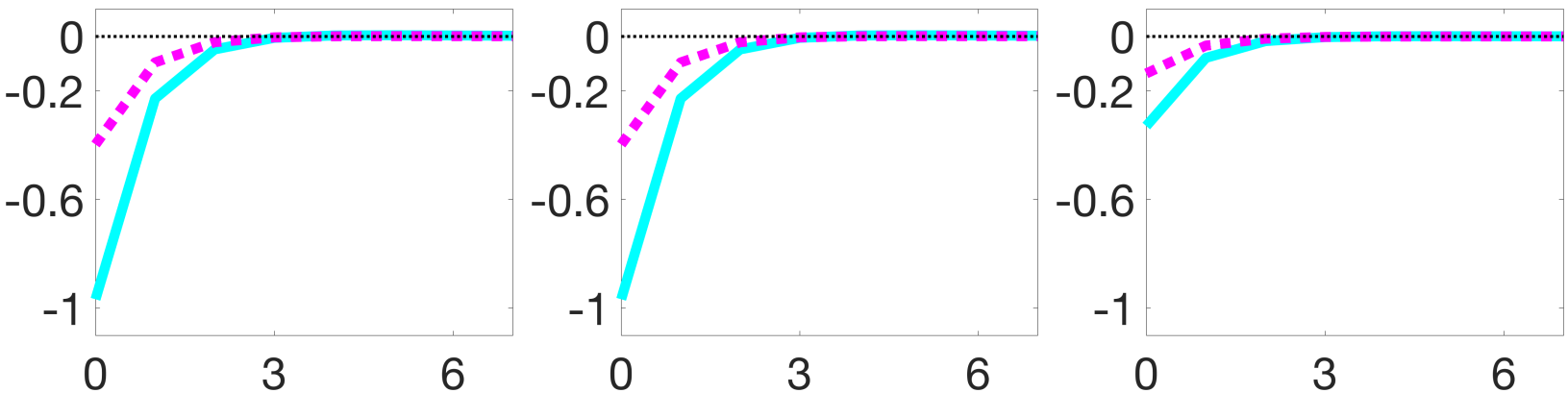
(d) Real wage (e) Market hours (f) Consumption gap

Notes: (i) shock: 100-basis-point increase in the annualized nominal interest rate, (ii) responses: quarterly, rates are in pp deviations and all other variables in % deviations from the steady state, (iii) inflation and real interest rate are annualized.

Distributional effects

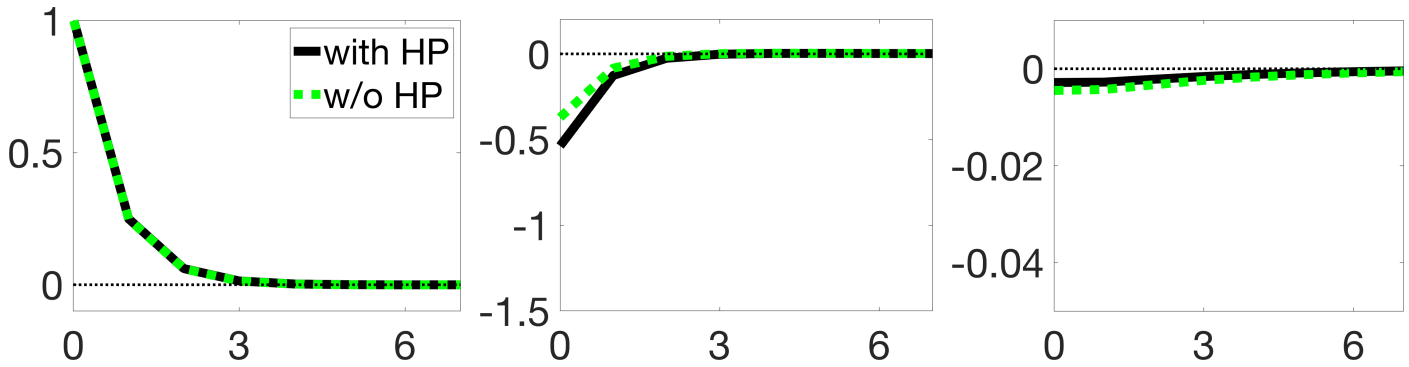


(a) Market hours (b) Home hours (c) Total hours

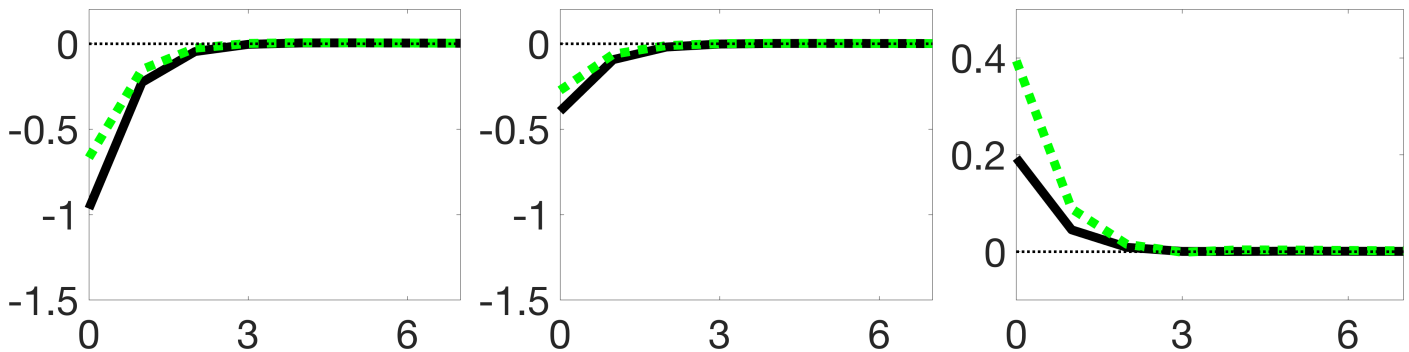


(d) Income (e) Market consumption (f) Total consumption

The role of home production



(a) Real rate (b) Output (c) Real wage



(d) Market hours HtM household (e) Market hours saver (f) Consumption difference

Model without home production Robustness

Conclusion

- Home production is quantitatively relevant consumption smoothing device, particularly for HtM households.
  - I show empirical relevance of consumption smoothing with German data on time use and wealth.
  - I quantify the effect of home production on consumption inequality using a TANK model with home production.
- Avenues for future research:
  - State dependencies of the size of the home sector for a comparison across countries.
  - The role of gender in consumption smoothing with home production.

References I

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Benhabib, J., R. Rogerson, and R. Wright (1991): "Homework in Macroeconomics: Household Production and Aggregate Fluctuations," Journal of Political Economy, 99, 1166–1187.

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King, R. G., C. I. Plosser, and S. T. Rebelo (1988): "Production, growth and business cycles: I. The basic neoclassical model," Journal of Monetary Economics, 21, 195–232.

McKay, A. and C. K. Wolf (2023): "Monetary Policy and Inequality," Journal of Economic Perspectives, 37, 121–144.

Observations in the SOEP

Back

Observations in raw dataset	525,211
Observations in processed dataset	164,888
Observations in processed dataset with HtM information	32,777

Notes: (i) source: SOEP, DOI: 10.5684/soep.v37, (ii) period: 1999-2019.

Descriptive statistics Back

	HtM		Savers	
	Mean	Median	Mean	Median
Population share	25 %	75 %		
Net wealth	-7,300	0	142,900	75,000
Net wage monthly	1,400	1,300	1,900	1,700
Market work	8.2	9	8.3	9
Weekly overtime	1.9	0	2.2	0.9
Hobbies	1.6	1	1.5	1
Sports	0.5	0	0.5	0
Housework	1.2	1	1.2	1
Running errands	0.8	1	0.8	1
Repairs	0.4	0	0.6	0
Care for others	0	0	0.1	0

Notes: (i) source: SOEP, DOI: 10.5684/soep.v37, (ii) period: average from 2002, 2007, 2012 and 2017, (iii) time use is in hours per weekday except overtime which is in hours per week, and wealth and wage is in Euro, (iv) "SD" refers to the standard deviation.

Time spent on weekly overtime

Back

	(1)	(2)	(3)	(4)
mps	-0.211	-0.0557	-2.801***	-2.629***
	(-0.74)	(-0.18)	(-5.44)	(-5.13)
mps×HtM	-1.698***	-1.575***	-1.682***	-1.740***
	(-3.08)	(-2.58)	(-2.75)	(-2.80)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	29257	24739	24739	24573
R^2	0.000213	0.00418	0.00919	0.0134

Time spent on market work Back

	(1)	(2)	(3)	(4)
mps	-0.355**	-0.130	-0.564**	-0.640***
	(-2.57)	(-0.88)	(-2.32)	(-2.62)
mps×HtM	0.168	0.233	0.202	0.262
	(0.52)	(0.68)	(0.59)	(0.78)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	32777	27673	27673	27479
R^2	0.0000317	0.0130	0.0149	0.0359

Time spent on care for others Back

	(1)	(2)	(3)	(4)
mps	-0.0506**	-0.0467*	-0.0573	-0.0704
	(-2.03)	(-1.69)	(-1.23)	(-1.49)
mps×HtM	-0.0684	-0.0334	-0.0324	0.0133
	(-1.54)	(-0.67)	(-0.65)	(0.26)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	32717	27620	27620	27426
R^2	0.000887	0.00140	0.00242	0.00910

Time spent on repairs Back

	(1)	(2)	(3)	(4)
mps	1.505***	1.521***	0.922***	0.930***
	(27.01)	(25.34)	(9.39)	(9.58)
mps×HtM	-1.126***	-1.061***	-1.087***	-0.533***
	(-10.20)	(-8.77)	(-8.95)	(-4.46)
Individual controls		✓	✓	✓
Aggregate controls			✓	✓
FE for Region, Housing & Occupation				✓
Observations	32717	27622	27622	27428
R^2	0.0270	0.0274	0.0257	0.0412

Model fit Back

	HtM		Savers	
	data	model	data	model
market work	65%	64%	64%	64%
home production	19 %	20%	21%	20%
leisure	17 %	16%	15%	16%

Model without home production

Back

- $\alpha_1 = 1$, $b_1 = 1$ and $b = 0.7$
- Total consumption: $C_{jt} = [\alpha_1 (C_{mjt})^{b_1} + (1 - \alpha_1)(C_{njt})^{b_1}]^{(1/b_1)}$
- Utility function: $U(C_{jt}, L_{jt}) = \frac{[(C_{jt})^b (L_{jt})^{1-b}]^{1-\sigma} - 1}{1-\sigma}$

Robustness Back

- The role of profit income: Savers receive three times more profit income than HtM households (as in the SOEP data).
  Details on the data IRFs

- The role of income the difference: Include a productivity wedge, ω, into the model that is calibrated to 0.76 (in line with the SOEP data). IRFs

Profit income in the data

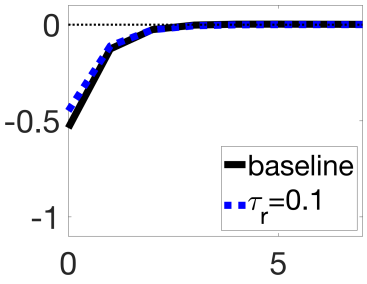
Back

	HtM		Savers	
	Mean	Median	Mean	Median
Capital income	0	0	30	0
Home repayment	310	300	210	100
Rent	300	280	340	300
Share home owners	36 %		86 %	
Share home paid	20 %		45 %	

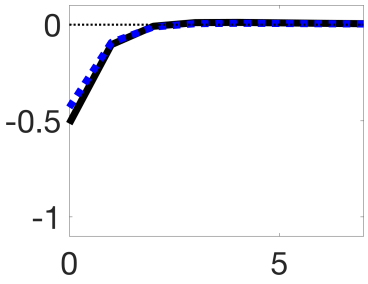
Notes: (i) source: SOEP, DOI: 10.5684/soep.v37, (ii) period: average from 2002, 2007, 2012 and 2017, (iii) capital income, home repayment and rent are monthly in Euro.

IRFs with and without profit income

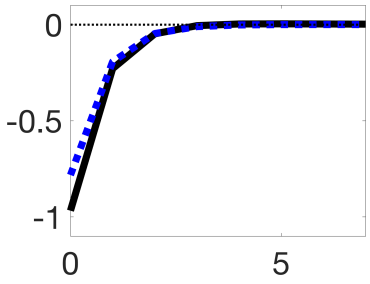
Back



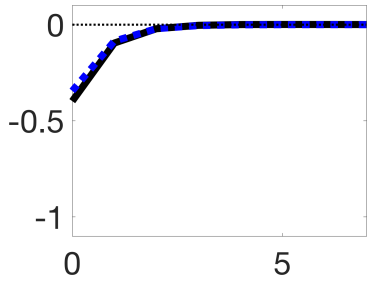
(a) Output



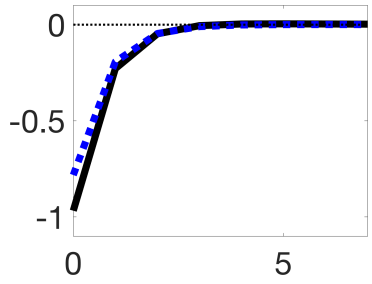
(b) Profits



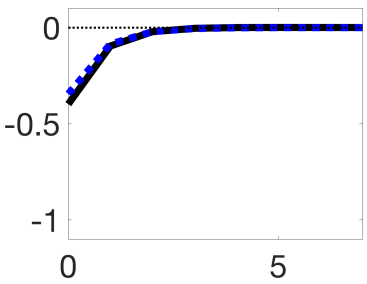
(c) Total income HtM household



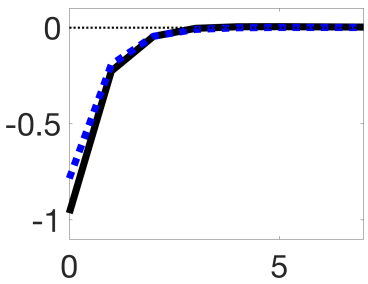
(d) Total income saver



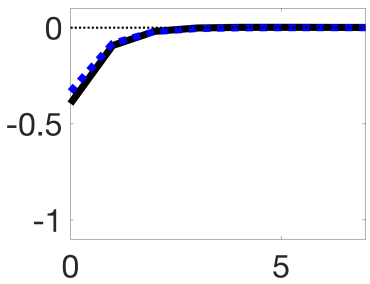
(e) Labor income HtM household



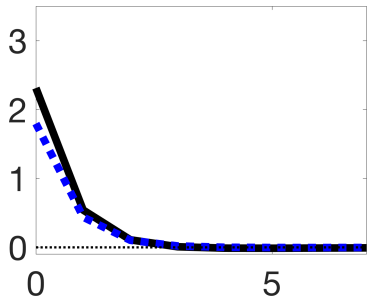
(f) Labor income hours saver



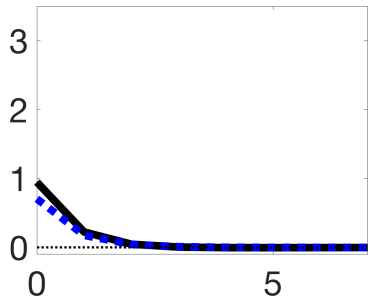
(g) Market hours HtM household



(h) Market hours saver



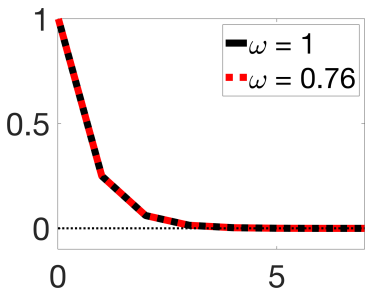
(i) Home hours HtM household



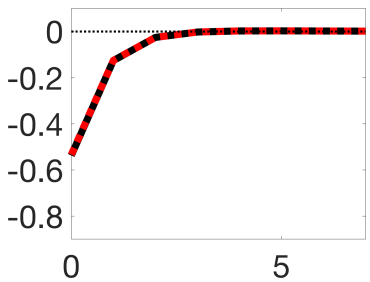
(j) Home hours saver

Different productivity wedges across households

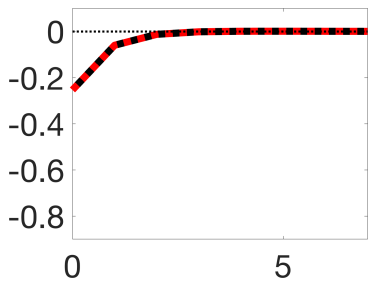
Back



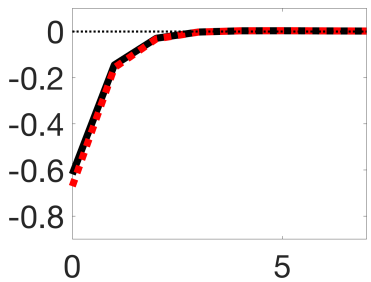
(a) Real rate



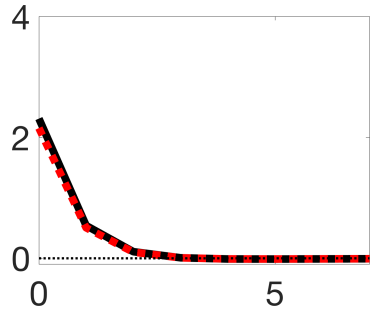
(b) Output



(c) Market hours savers

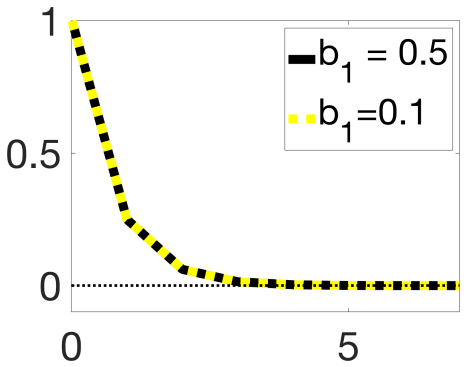


(d) Market hours HtM household

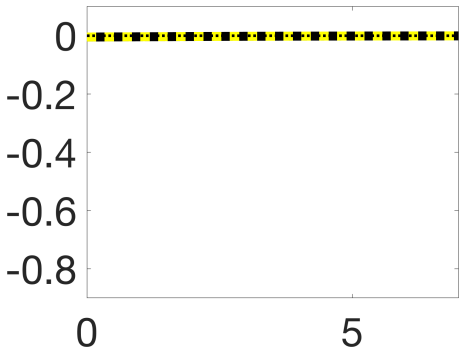


(e) Home hours HtM household

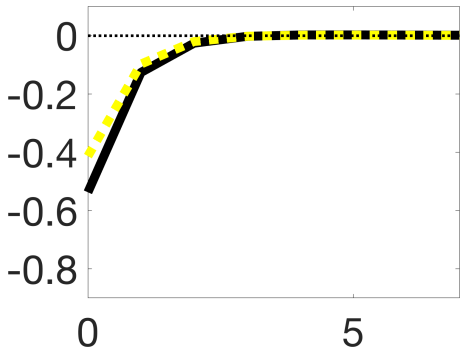
Different substitutabilities of goods bought on the market and produced at home



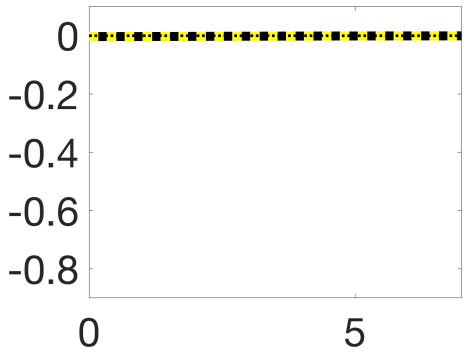
(a) Real rate



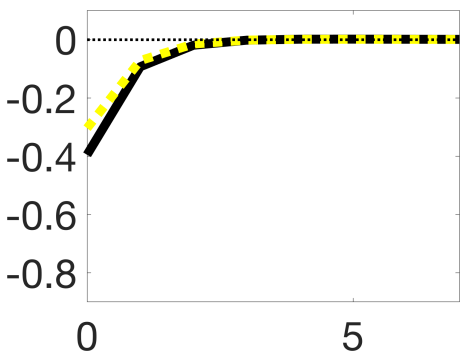
(b) Price inflation



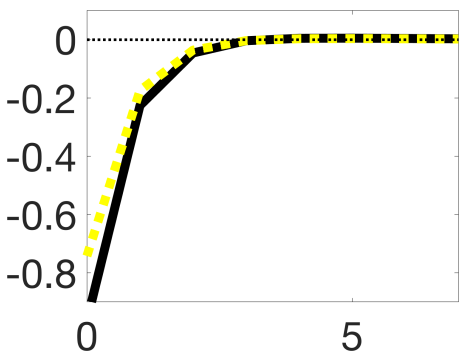
(c) Output



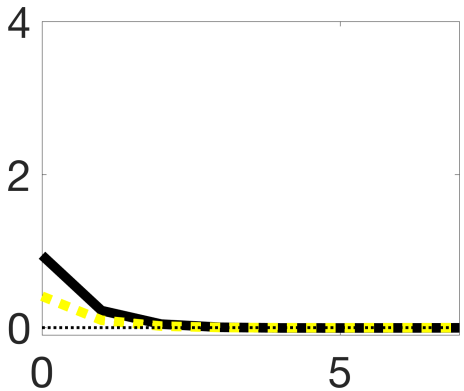
(d) Real wage



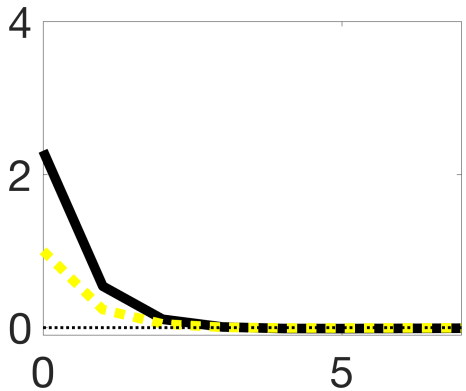
(e) Market hours savers



(f) Market hours HtM household



(g) Home hours savers



(h) Home hours HtM household