Subsistence Consumption and Inflation Heterogeneity: Implications for Monetary Policy Transmission in a HANK Model

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Motivation

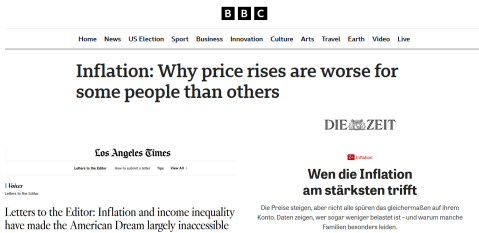


Figure 1: BBC (2022), Die Zeit (2025), LA Times (2026).

- Households with lower income experienced higher inflation rates
- 2 necessary conditions for inflation heterogeneity:
  - Differing consumption baskets across households
  - Differing inflation rates across goods
- Low-income households consume goods whose prices increased more strongly
- We focus on the transmission of monetary policy

This Paper

- What are the consequences of consumption basket and inflation heterogeneity for monetary policy transmission?
- Particular focus on subsistence consumption
- Empirical:
  - Low-income households spend 87% on subsistence consumption (high-income: 21%)
  - Price index of subsistence consumption reacts strongest to monetary policy shocks
- Theoretical:
  - Heterogeneous Agent New Keynesian (HANK) model with subsistence consumption and heterogeneous consumption baskets
  - Inflation heterogeneity along the income/wealth distribution
  - Heterogeneous consumption baskets weaken monetary policy transmission (expenditure revaluation channel)

Literature

- Inflation heterogeneity
  - Almås (2012), Kaplan and Schulhofer-Wohl (2017), Cavallo (2020), Cravino (2020), Gürer and Weichenrieder (2020), Argente and Lee (2021), Ampudia et al. (2023), ...
- Heterogeneous agents in New Keynesian models
  - Financial market incompleteness and idiosyncratic uncertainty (heterogeneity in income/wealth) (Bewley, 1977; Huggett, 1993; Aiyagari, 1994)
  - Kaplan et al. (2018), Clayton et al. (2019), Bayer et al. (2020), Cravino et al. (2020), Bobasu et al. (2025), Olivi et al. (2025), ...
- Monetary policy transmission in HANK models
  - Small direct (intertemporal substitution) and large indirect effects (labor income)
  - Kaplan et al. (2018), Auclert et al. (2024), ...

→ We add subsistence consumption, new indirect transmission channel of monetary policy

Consumption Baskets

- German data on subsistence level of consumption (2018: 9000€/year) Data

Category	Subsistence-	Share in the Average- Consumption Basket	High-Income-
Food and non-alcoholic beverages	19.18%	10.66%	6.20%
Alcoholic beverages and tobacco	0.00%	1.76%	1.29%
Clothing and footwear	4.59%	3.92%	3.79%
Housing, water, electricity, gas and other fuels	49.48%	38.76%	31.59%
Furniture, lighting equipment, appliances etc.	3.37%	4.39%	5.25%
Health	2.11%	4.22%	10.35%
Transport	4.96%	11.71%	13.55%
Communication	4.88%	2.99%	2.02%
Recreation, entertainment and culture	5.39%	10.95%	12.04%
Education	0.20%	0.47%	0.51%
Restaurant and accommodation services	1.44%	5.80%	7.52%
Miscellaneous goods and services	4.41%	4.39%	5.89%

Table 1: Consumption Baskets of German Single-Person Households.

Data: German Parliament; Federal Ministry of Labour and Social Affairs; German Federal Statistical Office.

Consumption Baskets

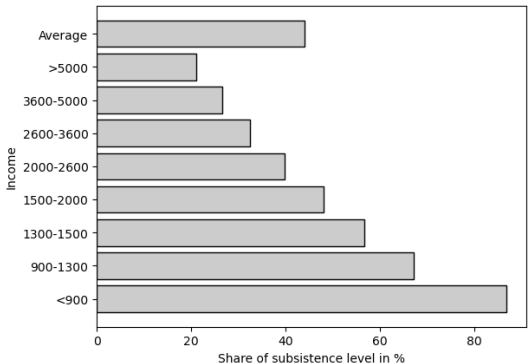


Figure 2: Subsistence Level Share in Overall Consumption of Single-Person Households by Monthly Net-Income in €.

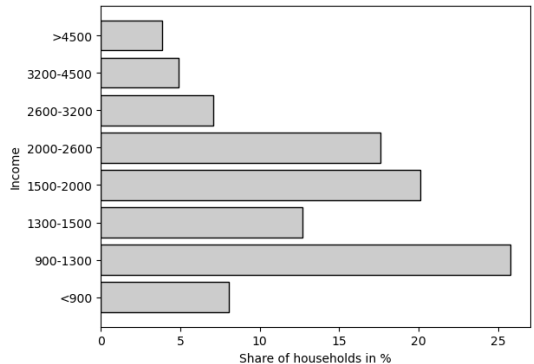
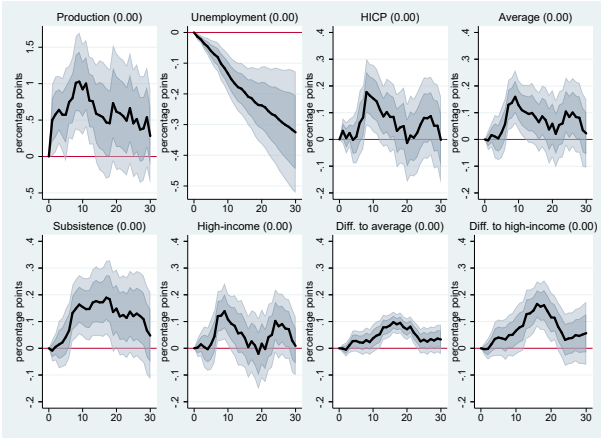


Figure 3: (Adjusted) Income Distribution of Single-Person Households by Monthly Net-Income in €.

Inflation Heterogeneity and Monetary Policy



- Subsistence price index increases more strongly than other price indices
- Monetary policy shocks increases relative price of subsistence consumption
- Primarily affects low-income households

Figure 4: Impulse Responses to an Expansionary Monetary Policy Shock. ▸ Details

HANK Model

- Households are ex-ante identical, but ex-post heterogeneous
- Idiosyncratic labor productivity shock (η_t^i) and incomplete financial markets
- Essential ($c_{1,t}^i$) and non-essential goods ($c_{2,t}^i$)
- Subsistence level in the utility function (C^*)
  - Limits the consumption of essential goods downwards
  - Only excess consumption above the subsistence level is utility relevant
- Intermediate good producer hires labor, sells output to retail firms
- Two monopolistically-competitive, representative retail firms:
  - Repackage intermediate goods (essential and non-essential goods)
  - Price adjustment costs, larger volatility of essential good prices

▸ Model equations ▸ FOCs ▸ Calibration

Households

Bellman equation:

$$V_t\left(\eta_t^i, a_{t-1}^i\right) = \max_{c_t^i, h_t^i, a_t^i} \left\{ u(c_t^i, h_t^i) + \beta \mathbb{E}_t V_{t+1}\left(\eta_{t+1}^i, a_t^i\right) \right\}, \tag{1}$$

subject to

$$c_t^i + \frac{P_{1,t}}{P_{c,t}} C^* + a_t^i = (1 + r_t) a_{t-1}^i + h_t^i w_t \eta_t^i - t_t^i\left(\eta_t^i\right) + d_t^i\left(\eta_t^i\right), \tag{2}$$

$$a_t^i \geq 0. \tag{3}$$

Consumption index:

$$c_t^i \equiv \left(\gamma^{\frac{1}{\upsilon_c}} \left(c_{1,t}^i - C^*\right)^{\frac{\upsilon_c - 1}{\upsilon_c}} + (1-\gamma)^{\frac{1}{\upsilon_c}} c_{2,t}^{i\ \frac{\upsilon_c - 1}{\upsilon_c}} \right)^{\frac{\upsilon_c}{\upsilon_c - 1}}. \tag{4}$$

Wedge between consumption expenditures (ce_t^i) and utility-relevant consumption (c_t^i):

$$ce_t^i = c_t^i + \frac{P_{1,t}}{P_{c,t}} C^*. \tag{5}$$

Wealth and Income Distribution

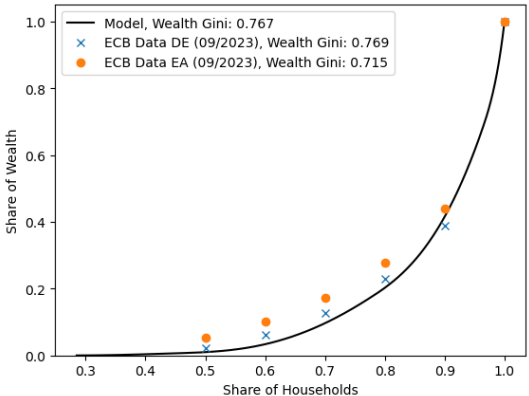


Figure 5: Wealth Lorenz Curve.

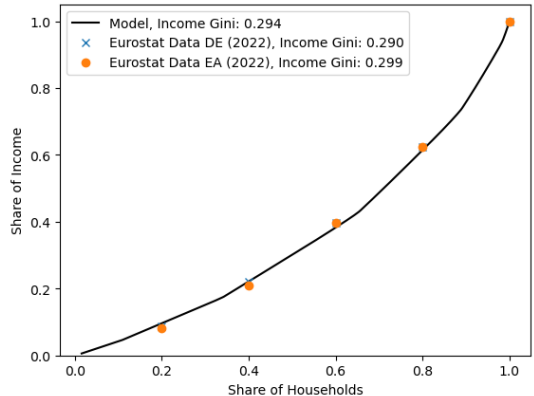


Figure 6: Income Lorenz Curve.

Consumption Baskets Along the Wealth Distribution

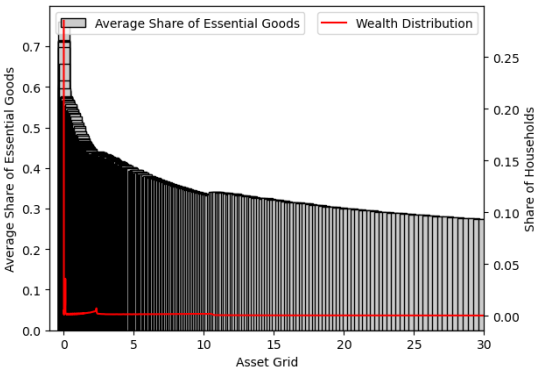


Figure 7: Essential Good Share in Overall Consumption.

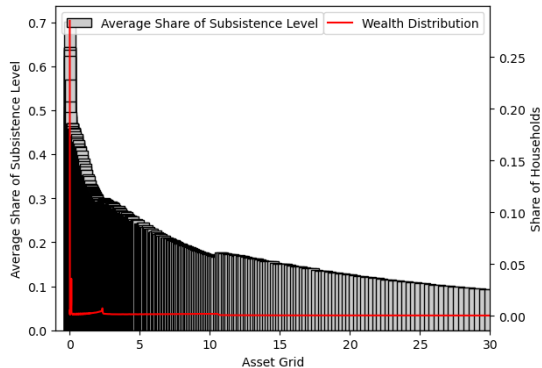


Figure 8: Subsistence Level Share in Overall Consumption.

Output Response

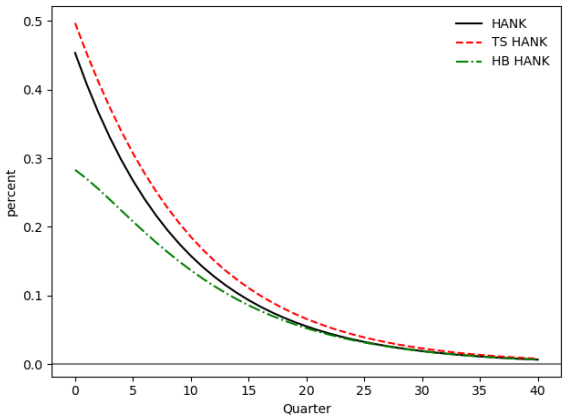


Figure 9: Expansionary Monetary Policy Shock.

HANK: standard; TS: homogenous baskets; HB: heterogeneous baskets

- Monetary policy transmission weaker in HB HANK:
  1. Lower MPC, esp. low-wealth households
  2. Expenditure revaluation channel
  3. Inflation heterogeneity

Expenditure Revaluation Channel

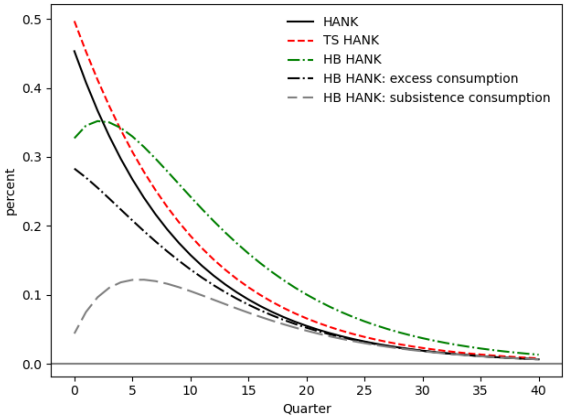
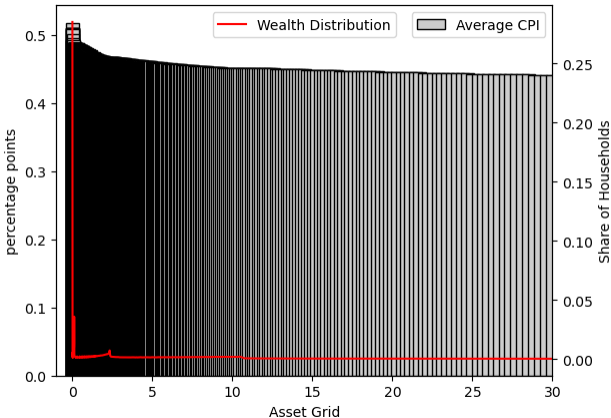


Figure 10: Expansionary Monetary Policy Shock.

HANK: standard; TS: homogenous baskets; HB: heterogeneous baskets

- TS HANK: Expenditures = consumption
- HB HANK: New transmission channel operating through relative price of essential goods
- Essential good prices increase more than average price level
- Real value of SL increases, expenditures > excess consumption, expenditure revaluation weakens MP transmission ▸ Expenditure Revaluation
- Expenditure revaluation: $\sim 50\%$

Inflation Response Along the Wealth Distribution



- Low-income households consume relatively more essential goods
- More affected by stronger increase in essential good prices
- Higher inflation rates, decreases purchasing power

Figure 11: Expansionary Monetary Policy Shock.

Conclusion

- What are the consequences of consumption basket and inflation heterogeneity for monetary policy transmission?
- Particular focus on subsistence consumption
- Empirical:
  - Subsistence consumption is a main determinant of household consumption baskets
  - Price index of subsistence consumption basket reacts strongest to monetary policy shocks
- We develop a two-sector HANK model with subsistence consumption
  - Weaker monetary policy transmission
  - Expenditure revaluation channel operating through the relative price of subsistence consumption
  - Monetary policy primarily transmits through low-income/ wealth households

Thank you!

Data

- Subsistence level of consumption (2018: 9000€/year):
  - German Parliament: annual report on the subsistence level; breakdown into baseline expenditures, costs of housing and heating
  - Federal Ministry of Labour and Social Affairs: additional breakdown of the baseline expenditures
  - German Federal Statistical Office: baseline expenditures based on income and expenditure survey (SIE)
- Income distribution:
  - Microcensus from German Federal Statistical Office
  - Adjusted for households reporting social security and retirement payments as main source of income

▸ Empirics

Local Projections

- Inflation data:
  - German Federal Statistical Office: 12 expenditure categories, January 2010 - March 2025, monthly index
  - Calculate year-on-year monthly inflation rates
- Construct price indices of three consumption baskets (subsistence/ average/ high-income consumption basket)
- Run local projections (Jordá, 2005), similar to Coibion et al. (2017):
  - Impact of monetary policy shocks on different price indices
  - Baseline: $I = 20$, $J = 2$, $H = 30$
  - Miranda-Agrippino and Nenova (2022) target shocks
  - Standard errors: Driscoll and Kraay (1998)

▸ Local Projections

Local Projections

$$x_{t+h} - x_{t+h-1} = \alpha^{(h)} + \sum_{i=1}^{I} \beta_i^{(h)} mps_{t-i} + \sum_{j=1}^{J} \gamma_j^{(h)} (x_{t-j} - x_{t-j-1}) + \varepsilon_{t+h}, h = 0, ..., H. \quad (6)$$

- x: variable of interest
- *mps*: updated monetary policy shocks from Miranda-Agrippino and Nenova (2022), robust to different shock series
- $\{\hat{\beta}_1^{(h)}\}_{h=0}^{H}$: estimated coefficients to construct impulse responses
- I, J, H: lag structure and horizon length, robust to different specifications
- α: constant
- γ: impact of lagged variable
- ε: error term

▸ Local Projections

Optimal consumption of each good type:

$$c_{1,t}^i = \left(\frac{P_{1,t}}{P_{c,t}}\right)^{-\upsilon_c} \gamma c_t^i + C^*, \;\; c_{2,t}^i = \left(\frac{P_{2,t}}{P_{c,t}}\right)^{-\upsilon_c} (1-\gamma)\, c_t^i. \tag{7}$$

Optimal labor supply:

$$\chi (h_t^i)^{\varphi} = w_t \eta_t^i (c_t^i)^{-\sigma}. \tag{8}$$

Optimal intertemporal consumption/savings path:

$$1 = \beta \mathbb{E}_t \left[(1 + r_{t+1}) \left(\frac{c_{t+1}^i}{c_t^i}\right)^{-\sigma} \frac{1}{\pi_{c,t+1}} \right]. \tag{9}$$

CPI inflation:

$$\pi_{CPI,t}^i = \frac{c_{SS}^i}{C^* + c_{SS}^i} \pi_{c,t} + \frac{C^*}{C^* + c_{SS}^i} \pi_{1,t}. \tag{10}$$

▸ HANK Model

- Intermediate goods firm:

$$Y_{m,t} = N_t \,, \tag{11}$$

$$\max \Gamma_{m,t} = mc_{m,t} Y_{m,t} - w_t N_t, \tag{12}$$

- Representative retail firms:

$$\max d_{b,t} = \frac{P_{b,t}}{P_{c,t}} Y_{b,t} - mc_{m,t} Y_{b,t} - \psi_{b,t} \tag{13}$$

$$\pi_{h,t} = \kappa_k \left(mc_{m,t} - \frac{\epsilon}{\epsilon - 1} \frac{P_{h,t}}{P_{c,t}} \right) + \frac{Y_{h,t+1}}{Y_{h,t}} \pi_{h,t+1} \,, \tag{14}$$

- Fiscal policy:

$$T_t = r_t B \tag{15}$$

- Monetary policy:

$$i_t = \phi_\pi \pi_t^{CPI} + \upsilon_t \tag{16}$$

▸ HANK Model

Calibration

Parameter	Description	Value			Target/Source
		HANK	TS HANK	HB HANK	
			Households		
$1/\sigma$	Intertemporal elasticity of substitution		0.66		Marencák and Nghiem (2025)
$1/\varphi$	Frisch labor supply elasticity		0.88		Kneip et al. (2020)
γ	Share of type-1 goods		0.20		internally calibrated
υ_C	Elasticity of substitution parameter		2.50		internally calibrated, Schulte and Heindl (2017)
C^*	Subsistence level on type-1 goods	0	0	0.35	internally calibrated
ϵ	Price elasticity of demand for varieties		6		Galí (2015)
β	Discount factor	0.958	0.958	0.947	internally calibrated, $r = 0.005$
ρ_η	Autocorrelation idiosyncratic shock		0.978		Kase and Rigato (2025)
σ_η	Standard deviation idiosyncratic shock		0.920		Kase and Rigato (2025)
χ	Disutility of labor supply	0.715	0.715	1.425	internally calibrated, $N = 1$
			Firms		
κ_1	Slope of NKPC 1	0.043	0.0921		internally calibrated, Dees et al. (2009)
κ_2	Slope of NKPC 2	0.043	0.0307		internally calibrated, Dees et al. (2009)
κ	Average slope of NKPC		0.043		internally calibrated, Dees et al. (2009)
			Central Bank		
ϕ_π	Reaction coefficient		1.5		Galí (2015)
			Fiscal Authority		
B	Bond supply		2Y		Deutsche Bundesbank (2025)

Table: Calibration.

▸ HANK Model

Isolating the Expenditure Revaluation Channel

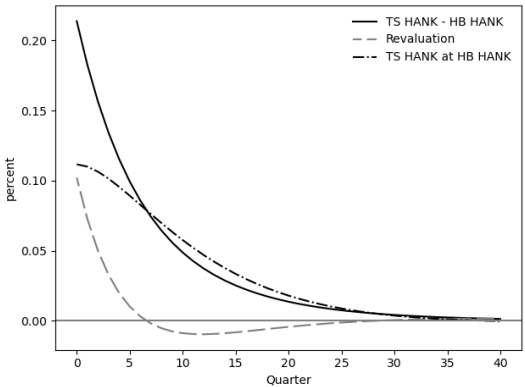


Figure: Decomposition Output Response Difference to an Expansionary Monetary Policy Shock.

- Difference transmission due to steady state labor supply/ MPC or revaluation?
- Filter out steady state effects
- TS HANK at HB HANK: Impulse responses of HB HANK at the Jacobians of TS HANK
- How would TS HANK behave in a model with subsistence level (HB HANK)?
- Expenditure revaluation channel: $\sim 50\%$

▸ Expenditure Revaluation Channel