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

Ulrike Neyer† Daniel Stempel‡ Alexandra Stevens§

Abstract

Households differ in their consumption baskets and inflation rates along the wealth and income distribution. We use German data to show that subsistence consumption is a main driver of these differences. Using local projections, we show that the price index associated with subsistence consumption reacts significantly more strongly to monetary policy shocks than other price indices. We then set up a HANK model that incorporates these facts. We find that heterogeneous consumption baskets across households weaken monetary policy transmission. We identify a novel indirect transmission channel of monetary policy operating through the real value of subsistence consumption.

JEL classification: E12, E21, E31, E32, E52.

Keywords: HANK model, inflation heterogeneity, inequality, monetary policy transmission, subsistence consumption.

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1 Introduction

Households differ along several dimensions such as their income and wealth. Textbook New Keynesian models do not take this into account but assume a representative household (Representative Agent New Keynesian (RANK) models). In order to shed light on the role of income and wealth heterogeneity for business fluctuations and the transmission of monetary policy, a quickly growing strand of literature develops Heterogeneous Agent New Keynesian (HANK) models. However, the well-established fact that consumption baskets also differ along the income and wealth distribution – which implies that households may experience differing inflation rates – has not yet been extensively discussed within this framework despite its potential relevance for monetary policy. To underscore this relevance, we first document some notable fundamentals regarding the heterogeneity of consumption baskets and inflation rates across households, specifically focusing on the role of subsistence consumption. We use German data to show that subsistence consumption, on average, accounts for almost 44% of households' consumption expenditures, with large heterogeneity depending on income (ranging from 21% to almost 87%). Furthermore, using local projection methods, we find that the price index associated with subsistence consumption reacts significantly more strongly to monetary policy shocks than indices associated with the average consumption basket or the one of households with relatively high income. This implies that expansionary monetary policy shocks increase the relative price of subsistence consumption, which primarily affects households at the lower end of the income distribution.

Against this background, we then analyze the impact of differing consumption baskets and inflation rates along the income and wealth distribution on the transmission of monetary policy, particularly considering subsistence consumption. We develop a HANK model that incorporates the aforementioned stylized facts and find that differing consumption baskets have a weakening effect on the transmission of monetary policy. The model includes a multi-good and -sector structure. Households consume non-essential and essential goods. We endogenously derive different household consumption baskets and, thus, inflation heterogeneity by introducing a subsistence level on essential good consumption. We compare the transmission of a monetary policy in a standard HANK model, a two-sector

HANK model with homogeneous consumption baskets (TS HANK), and a two-sector HANK model with heterogeneous consumption baskets (HB HANK).

The weakened monetary policy transmission in the HB HANK model is due to various causes. First, the subsistence level pushes up labor supply in steady state. This implies that households choose to forego parts of their additional consumption opportunities to supply relatively less labor than in the standard and the TS HANK models after an expansionary monetary policy shock. Second, a novel indirect transmission channel of monetary policy operating through the relative price of essential goods that drives a wedge between consumption and expenditures emerges: The increase in household expenditures does not fully translate into more consumption but is partly absorbed by an increase in the relative price of subsistence consumption. This implies that, third, households are affected differently by inflation. As the share of essential goods in the consumption basket of low-income/low-wealth households is particularly high, the decrease in purchasing power of these households is large. Since these are the households with the highest marginal propensity to consume (MPC), the decrease in their purchasing power has a particularly weakening effect on monetary policy transmission. Overall, these results imply that monetary policy needs to react more strongly to achieve the same effects on aggregate demand. Finally, we briefly address fiscal policy considerations. We show that a simple, purely redistributive fiscal rule that implements transfers to low-income/wealth households based on changes in the relative price of subsistence consumption can offset the effects of this transmission channel.

This paper contributes to the following strands of literature. First, we contribute to empirical literature investigating the frequency of price adjustments of different good categories and the relationship to monetary policy. Dedola et al. (2024) show that, on average, the frequency of price adjustments for food was roughly twice that of non-energy industrial goods (NEIGs) or of services in several European countries between 2015 and 2023. Gautier et al. (2024) also report a much higher frequency of food-price adjustments in comparison to NEIGs and services in euro area countries between 2010 and 2019.[1] In addition, their results indicate a larger response of prices of high-frequency good categories

[1] On average across countries they find a factor between three and ten, depending on the specification. Results depend on which categories are compared, on the use of average or median values, and on the inclusion or exclusion of sales.

to monetary policy shocks than of low-frequency categories. This is in line with Cravino et al. (2020), who show that the response of the inflation rate experienced by high-income households to a monetary policy shock is about one third smaller than the response of middle-income households' inflation rates in the United States. In particular, this is due to a larger degree of price stickiness of goods consumed by households with higher income. Ampudia et al. (2023) confirm this result for several euro-area countries.[2] We add to this literature by focusing on subsistence consumption. In particular, we use local projection methods to show that the price index associated with subsistence consumption reacts significantly more strongly to monetary policy shocks than price indices associated with the average consumption basket or the basket of high-income households.

Second, we contribute to the literature that combines the incomplete-market, heterogeneous agent model based on Bewley (1987), Hugget (1993), and Aiyagari (1994) with New Keynesian frictions. This literature includes, for instance, Oh and Reis (2012), Gornemann et al. (2016), McKay et al. (2016), McKay and Reis (2016), Kaplan et al. (2018), Luetticke (2021), and Bayer et al. (2024). The standard assumption in the HANK literature is that households face uninsurable idiosyncratic risk and borrowing constraints due to financial market incompleteness, leading to income and wealth heterogeneity. Recent studies consider further dimensions of household heterogeneity. Clayton et al. (2019) and Cravino et al. (2020) study the distributional consequences of heterogeneous sectoral price rigidities in the transmission of monetary policy. In their models, households consume different types of goods depending on their income or education levels, and sectors differ in their degree of price rigidities. Differential exposure to price rigidities then leads to inflation heterogeneity after shocks, which has distributional consequences. Olivi et al. (2025) study optimal monetary policy in a multi-sector HANK model with heterogeneous consumption baskets due to non-homothetic preferences over (necessity and luxury) sectors. They find that negative shocks to necessity sectors create new trade-offs for monetary policy, and that the optimal policy should account for differences in consumption baskets across households. Similarly, Bobasu et al. (2025) study the aggregate and distributional effects

[2]In particular, they show that differences in consumption baskets across households imply that high-income households' inflation rates respond less to monetary policy shocks. They additionally show that adjustments in shopping behavior lead inflation rates of high-income households to respond more to monetary policy shocks.

of energy price shocks where households have non-homothetic preferences over different goods (energy and non-energy goods). We contribute to this literature by specifically considering consumption basket heterogeneity along the income and wealth distribution due to subsistence consumption in a model with a multi-sector structure. This gives rise to a novel transmission channel operating through the relative price of essential goods.

The third contribution concerns the literature that studies the transmission of monetary policy in HANK models focusing on the decomposition into direct and indirect effects.[3] Respective examples are Kaplan et al. (2018) and Auclert et al. (2024). Kaplan et al. (2018) find that household heterogeneity changes the transmission mechanism and decompose the effects of monetary policy into direct and indirect effects. The authors show that the indirect effects of monetary policy outweigh the direct effects. Auclert et al. (2024) study the transmission of monetary policy in HANK using the sequence-space Jacobian method introduced by Auclert et al. (2021) and find similar results. Our paper complements these works by studying monetary policy transmission under consumption basket and inflation heterogeneity using the sequence-space Jacobian method. We find an indirect transmission channel operating through the relative price of essential goods, which is absent in standard HANK models.

The reminder of this paper is organized as follows. Section 2 provides some fundamentals on inflation heterogeneity and subsistence consumption. Section 3 states the model. Section 4 describes the solution method and the calibration strategy. Section 5 presents the steady state results and analyzes monetary policy transmission. Section 6 concludes.

2 On the Relationship between Inflation Heterogeneity, Subsistence Consumption, and Monetary Policy

There are two obvious, necessary conditions that need to be met for inflation heterogeneity to occur across households: Households need to consume different consumption baskets, and goods need to differ in their price development. Both of these phenomena are well documented in the literature, see Hobijn et al. (2009), Kaplan and Schulhofer-Wohl (2017),

[3] Direct effects of monetary policy refer to changes in output due to intertemporal substitution. Indirect effects, conversely, operate through changes in labor demand and, thus, household income.

Jaravel (2019), Argente and Lee (2021), Neyer and Stempel (2025) for the United States and Gürer and Weichenrieder (2020) for Europe. Here, we focus on the relationship between consumption patterns, inflation heterogeneity, and subsistence consumption.

Category	Subsistence	Average	> 5000€
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 One-Person Households.

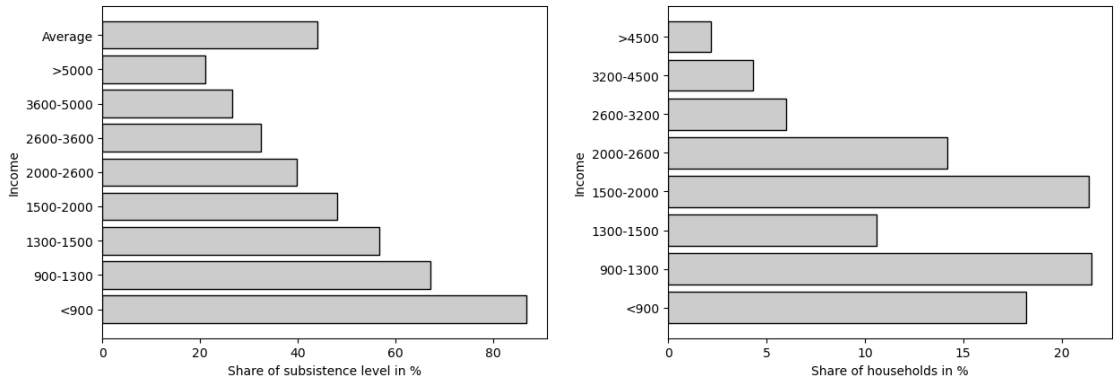
Notes. Average refers to the average consumption basket reported by one-person households. > 5000€ refers to the consumption basket of one-person households with a monthly net income of more than 5000€. Data source: German Parliament; FMLSA; SIE. See Footnote 4 for details.

Throughout this section, we refer to German data on income and consumption expenditures of one-person households in 2018. This data is particularly useful due to the availability of official data on the subsistence level of consumption and detailed data on consumption baskets of households.[4] This data allows us to compare the consumption behavior of households consuming at the subsistence level, calculated to be 9000€ per year, with that of households spending more on consumption due to a higher income (see Table 1). The subsistence consumption basket assigns a large weight to food and non-alcoholic beverages and to housing, water, electricity, gas and other fuels (over 68% of all expenditures), whereas the share of food and housing decreases and the share of goods

[4]The German parliament publishes an annual report on the subsistence level of consumption. This report provides a breakdown into baseline expenditures, costs of housing, and costs of heating. The Federal Ministry of Labour and Social Affairs (FMLSA) publishes an additional breakdown of the baseline expenditures into further categories. This breakdown is based on the survey of income and expenditure (SIE). The Federal Statistical Office publishes the SIE every five years. Currently, the SIE from 2018 is still in use to calculate the subsistence level of consumption. Thus, we refer to income and consumption data for 2018 throughout the entire section. Furthermore, we focus on the twelve main expenditure categories defined in Table 1. See Appendix A for details.

and services like transport (vehicles, travel) or restaurant and accommodation services increases in income.

This implies that the relevance of subsistence consumption decreases in income (and thereby in consumption expenditures, see Figure 1a). Figure 1b shows that a large share of households allocate a substantial part of their expenditures to subsistence consumption.[5] For instance, 18.20% of households report a net income of 900€ or less (panel b). From the SIE data on the consumption basket of households with this level of income, we can infer that 86.71% of consumption expenditures of these households are used to cover subsistence consumption (panel a).



(a) (b)

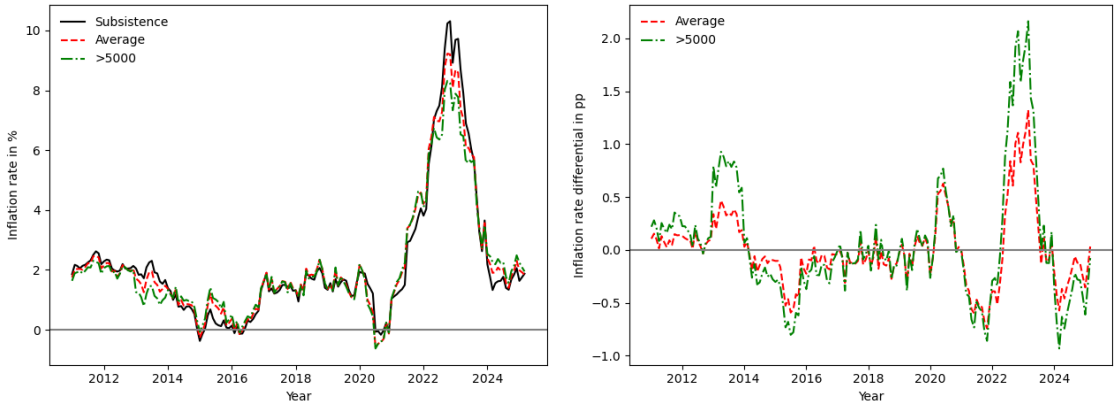
Figure 1: Subsistence Consumption Share in Overall Consumption and Distribution of One-Person Households Among Different Monthly Net-Income Levels in €.

Notes. Data sources: German Parliament; FMLSA; SIE; Micro Census. See Footnote 4 for details.

In order to relate these different consumption baskets and the differing relevance of subsistence consumption to inflation, we collect data on the inflation rate of the German consumer price index (CPI) and its subcategories from January 2010 to March 2025 from the German Federal Statistical Office. These subcategories match the twelve expenditure categories of the SIE. We calculate the monthly year-on-year inflation rate of each category and aggregate them by weighting the inflation rate of each category with the respective weight shown in Table 1. The corresponding inflation rate development is displayed in Figure 2a. Generally, there is a high positive correlation between the inflation rate implied by the subsistence consumption basket and the one calculated for the average basket (0.99)

[5]The reported income categories do not exactly match the ones from the SIE (see Footnote 4) but are fairly comparable.

and the basket of households with an income above 5000€ (0.97). There are considerable differences in the volatility of each inflation rate, however.



(a) Inflation Development of Selected Consumption Baskets.

(b) Inflation Difference between the Subsistence Consumption Basket and Selected Baskets.

Figure 2: Inflation (Difference) Development of Selected Consumption Baskets.

Notes. Data sources: consumption baskets: German Parliament; FMLSA; SIE; inflation rates of expenditure categories: Federal Statistical Office. See Footnote 4 for details.

The inflation rate implied by subsistence consumption exhibits the highest volatility of all three baskets (2.20 compared to 2.03 of the average and 1.86 of the above-5000€ baskets, respectively). This fact is underscored by (at times large) fluctuations of the inflation difference between the subsistence consumption basket's inflation rate and the average/above-5000€ baskets (see Figure 2b). The difference to the average basket's inflation rate is generally smaller than the difference to the above-5000€ basket's inflation rate. They are sizeable in both cases, however, with values up to 1.32 and 2.16 percentage points, respectively.

As we are interested in how these differences in inflation rate developments may affect monetary policy transmission, it is necessary to establish that these differences are not solely due to structural factors or shocks independent from monetary policy. Therefore, we estimate impulse responses to monetary policy shocks (mps) at different horizons h using local projections following Jordá (2005), similar to the specification in Coibion et al. (2017):

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

The variable x is defined as the variable of interest in period t, α as the constant, the estimated $\{\hat{\beta}_1^{(h)}\}_{h=0}^{H}$ as the relevant coefficients for constructing accumulated impulse responses, γ as the coefficient measuring autocorrelation, and I, J as lags. We consider data at a monthly frequency. Besides the three price indices, the variables of interest include the real production index, the unemployment rate, and the harmonized index of consumer prices (HICP), all of which are available at the German Federal Statistical Office. Furthermore, we consider the difference between the subsistence price index and the average and the above-5000€ basket's price indices, respectively. In the baseline, we use the updated monetary policy shock series from Jarociński and Karadi (2020) and consider a lag structure of $I = 20, J = 2$ and a horizon length of $H = 30$. We jointly estimate the system of equations across horizons and consider Driscoll and Kraay (1998) standard errors, as in Coibion et al. (2017).

Figure 3 shows that an expansionary monetary policy shock decreases unemployment and increases production and prices. All responses are highly statistically significant, illustrated by the p-value reported in parentheses. As in Coibion et al. (2017), this p-value refers to the null hypothesis that monetary policy is neutral over the entire horizon length. Upon comparing the impact of a monetary policy shock on the different price indices and their differences, we find that the subsistence price index exhibits a significantly stronger increase than the other price indices. This implies that expansionary monetary policy shocks increases the relative price of subsistence consumption. This primarily affects households at the lower end of the income distribution, as subsistence consumption is more prevalent in their consumption baskets.

These results are robust to different specifications of lag length and monetary policy shocks. Appendix B shows the results for lag lengths of $I = 4$ and $J = 12$, as well as to a different set of monetary policy shocks, namely to the updated series from Miranda-Agrippino and Nenova (2022).

Overall, we establish that subsistence consumption does not only have an impact on the heterogeneity of consumption baskets across households but also affects households' inflation rates. In addition, we show that the price index of subsistence consumption reacts more strongly to monetary policy shocks than other price indices. In the following Section, we present a HANK model incorporating the presented fundamentals.

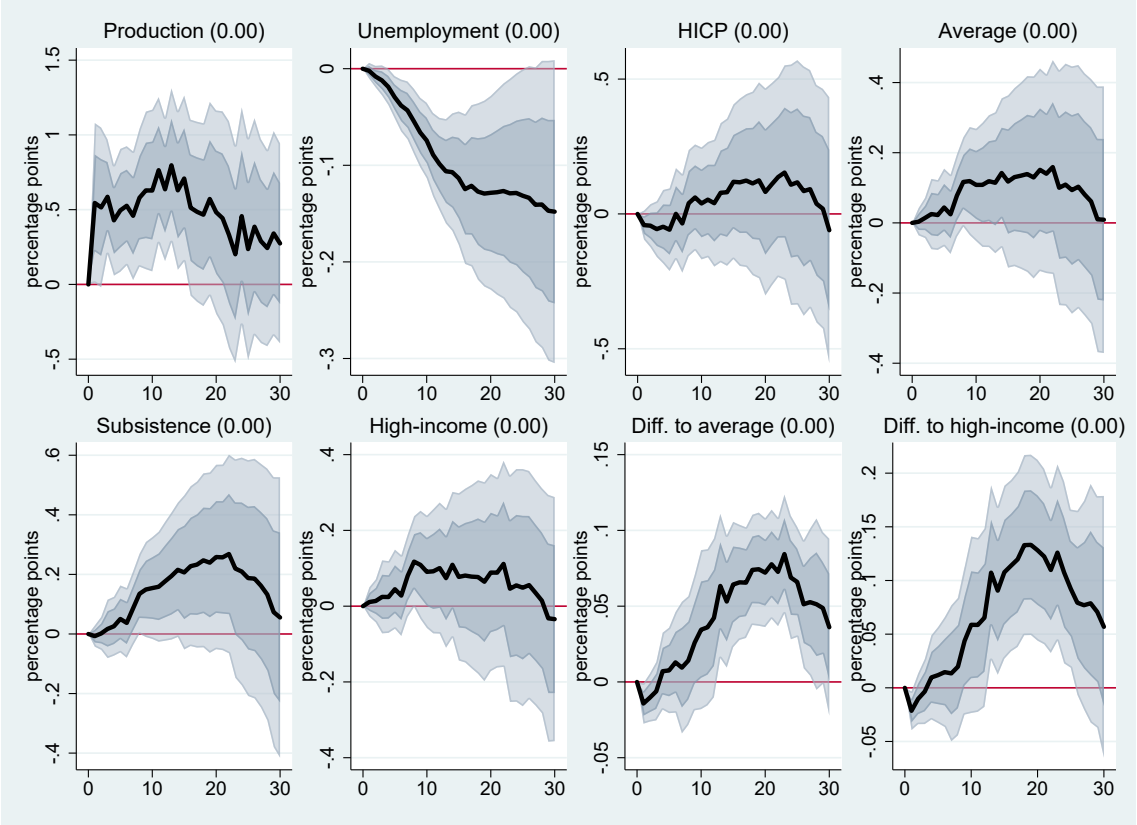


Figure 3: Impulse Responses of Variables of Interest to an Expansionary Monetary Policy Shock.

Note: The figure shows the impulse responses to a one-standard-deviation shock. The shock series is based on an updated version of the monetary policy shocks in Jarociński and Karadi (2020). The horizontal axis represents months. Dark-shaded and light-shaded areas indicate one and 1.65 standard deviation confidence intervals. Numerical value in parentheses reports the p-value for the joint test that impulse responses are zero for all months as in Coibion et al. (2017). Average refers to the price index related to the consumption basket of the average one-person household, subsistence to the price index related to the subsistence consumption basket, and high-income to the basket consumed by the households with a monthly net income above 5000€.

3 HANK Model

We extend the one-asset HANK model presented in Auclert et al. (2021). In particular, we introduce a multi-sector structure and heterogeneous consumption baskets across

households. The model economy is populated by households, intermediate good producers, retail firms, and the government. Households supply labor and consume two types of goods, essential and non-essential goods. They face a subsistence level on essential-good consumption and uninsurable idiosyncratic risk which they can self-insure through saving. Intermediate good producers use labor to produce goods in a competitive market. Monopolistically competitive retail firms aggregate intermediate goods into essential or non-essential goods and face price rigidities. The fiscal authority raises taxes and issues bonds. Monetary policy follows a standard Taylor rule. Our model allows for a tractable comparison of a standard HANK model, a two-sector HANK model, and a two-sector HANK model with heterogeneous consumption baskets across households. We present the full HB HANK model and address the necessary assumptions for the standard and TS HANK models throughout this Section.

3.1 Households

Time is discrete and indexed by $t = 0,1 \ldots$ The economy is populated by a continuum of ex-ante identical households indexed by i $\in [0, \infty]$. Households face idiosyncratic labor productivity risk. Labor productivity η_t follows an exogenous Markov process with constant transition probabilities. Financial markets are incomplete and households cannot fully insure against the idiosyncratic productivity risk. Thus, households are ex-post heterogeneous in income, wealth and, therefore, consumption baskets, depending on the history of realizations of idiosyncratic labor productivity shocks. The uninsurable idiosyncratic risk is the main source of this household heterogeneity.

The period utility function of household i is specified as

$$u(c_t^i, h_t^i) = \frac{(c_t^i)^{1-\sigma}}{1-\sigma} - \chi \frac{(h_t^i)^{1+\varphi}}{1+\varphi}, \tag{2}$$

where c_t^i denotes the consumption and h_t^i are hours worked. The parameter $\sigma \geq 1$ determines the inverse intertemporal elasticity of substitution and $\varphi \geq 0$ captures the inverse of the Frisch labor supply elasticity. $\chi \geq 0$ scales disutility of labor supply.

There are two types $h = 1,2$ of goods in our economy. Type-1 goods are interpreted as essential goods such as food or housing. Type-2 goods are non-essential goods. The

composition of the households consumption baskets varies according to the proportion of these goods, with $c^i_{h,t}$ being the consumption of type-h good. The overall consumption index is given by

$$c^i_t \equiv \left(\gamma^{\frac{1}{\upsilon_c}} \left(c^i_{1,t} - C^* \right)^{\frac{\upsilon_c - 1}{\upsilon_c}} + (1-\gamma)^{\frac{1}{\upsilon_c}} c^i_{2,t}{}^{\frac{\upsilon_c - 1}{\upsilon_c}} \right)^{\frac{\upsilon_c}{\upsilon_c - 1}}, \tag{3}$$

where γ determines the share of $c^i_{1,t}$ in the overall consumption index and υ_c determines the elasticity of substitution between essential and non-essential goods (see equation (4). C^* is a subsistence level on consumption of essential goods. The subsistence level has to be met at all times, and only excess consumption, i.e., consumption above the subsistence level (c^i_t) is relevant for household utility. Note that this index embeds both the standard HANK model as well as the TS HANK model. If $C^* = 0$ and if both types of goods exhibit the same characteristics (in particular, the same price rigidities, we will discuss this later), we will receive the standard HANK model. If $C^* = 0$ and good characteristics differ, we will arrive at the TS HANK model.

The elasticity of substitution between essential and non-essential goods is given by

$$\epsilon^i_{C,t} \equiv \begin{cases} \upsilon_C \left[1 - \dfrac{(1-\gamma)^{\frac{1}{\upsilon_C}} \frac{C^*_1}{c^i_{1,t}}}{\gamma^{\frac{1}{\upsilon_C}} \left(\frac{c^i_{1,t} - C^*_1}{c^i_{2,t}} \right)^{\frac{\upsilon_C - 1}{\upsilon_C}} + (1-\gamma)^{\frac{1}{\upsilon_C}}} \right] & \text{if } C^* > 0, \\ \upsilon_C & \text{if } C^* = 0, \end{cases} \tag{4}$$

where $0 < \epsilon^i_{C,t} \leq \upsilon_C$, based on Baumgärtner et al. (2017). For $C^* = 0$, equation (3) represents a constant elasticity of substitution (CES) index with υ_C denoting the elasticity of substitution between essential and non-essential goods. For $C^* > 0$, the elasticity of substitution decreases in the share of the subsistence level in a household's consumption basket. As the relevance of the subsistence level decreases, the elasticity of substitution increases and the household can substitute essential and non-essential goods better.

The consumption indices $c^i_{h,t}$ are constant elasticity of substitution functions over all varieties $k \in [0,\ s]$ and $j \in [s,\ 1]$, where s denotes the share of type-1 goods producing firms. The indices are given by

$$c^i_{1,t} \equiv \left(\int_0^s {c^i_{k,t}}^{\frac{\epsilon-1}{\epsilon}} dk \right)^{\frac{\epsilon}{\epsilon-1}} \quad , \quad c^i_{2,t} \equiv \left(\int_s^1 {c^i_{j,t}}^{\frac{\epsilon-1}{\epsilon}} dj \right)^{\frac{\epsilon}{\epsilon-1}}, \tag{5}$$

where ϵ is the elasticity of substitution between the varieties. The optimal consumption of a variety within each goods type is given by

$$c^i_{k,t} = \left(\frac{P_{k,t}}{P_{1,t}} \right)^{-\epsilon} c^i_{1,t} \quad , \quad c^i_{j,t} = \left(\frac{P_{j,t}}{P_{2,t}} \right)^{-\epsilon} c^i_{2,t}, \tag{6}$$

where $P_{1,t} \equiv (\int_0^s P_{k,t}^{1-\epsilon} dk)^{\frac{1}{1-\epsilon}}$ and $P_{2,t} \equiv (\int_s^1 P_{j,t}^{1-\epsilon} dj)^{\frac{1}{1-\epsilon}}$ are the price indices of type-1 and type-2 goods, respectively.

The optimal consumption of type-1 and type-2 goods is given by

$$c^i_{1,t} = \left(\frac{P_{1,t}}{P_{c,t}} \right)^{-\upsilon_c} \gamma c^i_t + C^* \quad , \quad c^i_{2,t} = \left(\frac{P_{2,t}}{P_{c,t}} \right)^{-\upsilon_c} (1-\gamma)\, c^i_t, \tag{7}$$

with $P_{c,t} \equiv (\gamma P_{1,t}^{1-\upsilon_c} + (1-\gamma) P_{2,t}^{1-\upsilon_c})^{\frac{1}{1-\upsilon_c}}$ being the price index of utility-relevant excess consumption. Note that, if $P_{1,t} = P_{2,t} = P_{c,t}$ and $C^* = 0$, we will receive the standard HANK model. If $P_{1,t} \neq P_{2,t}$ and $C^* = 0$, we will receive the TS HANK model. Price developments are determined by retail firms, which are discussed in Section 3.2.

Households are endowed with initial wealth a^i_{-1} and an initial labor productivity status η^i_0. They maximize the expected discounted lifetime utility subject to their budget and borrowing constraint by choosing consumption c^i_t, hours worked h^i_t, and savings a^i_t. The Bellman equation and constraints are given by

$$V_t\left(\eta^i_t, a^i_{t-1}\right) = \max_{c^i_t, h^i_t, a^i_t} \left\{ u(c^i_t, h^i_t) + \beta \mathbb{E}_t V_{t+1}\left(\eta^i_{t+1}, a^i_t\right) \right\}, \tag{8}$$

$$c^i_t + \frac{P_{1,t}}{P_{c,t}} C^* + a^i_t = (1+r_t) a^i_{t-1} + h^i_t w_t \eta^i_t - t^i_t\left(\eta^i_t\right) + d^i_t\left(\eta^i_t\right), \tag{9}$$

$$a_t^i \geq 0, \tag{10}$$

where $\beta \in (0,1)$ is a discount factor and r_t is the real interest rate. The variable w_t denotes economy-wide hourly real wage, η_t^i is the idiosyncratic labor productivity shock and $d_t^i\left(\eta_t^i\right)$ are dividends from the ownership of firms with $d^i_{t,\eta_t^i} > 0$. Taxes paid are given by

$$T_t \equiv \int t_t^i\left(\eta_t^i\right) l(a_{t-1}^i, \eta_t^i) di, \tag{11}$$

with $t^i_{t,\eta_t^i} > 0$ and $l(a_{t-1}^i, \eta_t^i)$ being defined as the distribution of households across productivity states. Both taxes and dividends are collected/distributed according to households' productivity.

The borrowing constraint (10) implies that savings must remain greater than an exogenous threshold normalized to zero. Real consumption expenditures ce_t^i can separately be denoted as

$$ce_t^i = c_t^i + \frac{P_{1,t}}{P_{c,t}} C^*. \tag{12}$$

Importantly, real consumption expenditures are solely defined by expenditures on excess consumption (c_t^i) in the standard and TS HANK models ($C^* = 0$). In the HB HANK model ($C^* > 0$), the subsistence level on essential-good consumption enters households' real expenditures. This is important as the relevant price index for household decisions is $P_{c,t}$. However, C^* is purchased at price $P_{1,t}$. Thus, the relative price of essential goods determines the allocation of real expenditures to excess consumption and the subsistence level (and thereby the share of C^* in the households' consumption basket).

The solution to the optimization problem of the household is given by

$$\chi(h_t^i)^\varphi = w_t \eta_t^i (c_t^i)^{-\sigma}, \tag{13}$$

$$1 = \beta \mathbb{E}_t \left[(1 + r_{t+1}) \left(\frac{c_{t+1}^i}{c_t^i} \right)^{-\sigma} \right], \tag{14}$$

Equation (13) describes the optimal labor supply of household i, Equation (14) is the Euler equation.

3.2 Firms

3.2.1 Intermediate Good Producers

A representative, competitive intermediate good firm produces goods that are sold to retail good producers. The only input is effective labor, defined as

$$N_t \equiv \int \eta_t^i h_t^i l(a_{t-1}^i, \eta_t^i) di. \tag{15}$$

The production function is given by

$$Y_{m,t} = N_t \, , \tag{16}$$

where $Y_{m,t}$ denotes output of intermediate good firm m. Perfect competition implies that the intermediate good firm sells output at real marginal costs $mc_{m,t}$. As the firm aims to maximize its real profit $\Gamma_{m,t}$, its the objective function becomes

$$\max_{Y_{m,t}} \Gamma_{m,t} = mc_{m,t} Y_{m,t} - w_t N_t, \tag{17}$$

where

$$mc_{m,t} = w_t \, . \tag{18}$$

3.2.2 Retail Firms

There are two types of retail firms $h = 1, 2$. Type-1 firms produce varieties of essential goods $b = k$, type-2 firms varieties of non-essentials $b = j$. Retail firms aggregate intermediate goods in a monopolistic-competitive environment. Each retail firm repackages

one unit of intermediate goods into one unit of final output $Y_{h,t}$. Retail firm b faces the following real total costs:

$$tc_{b,t} = mc_{m,t}Y_{b,t} + \psi_{b,t} \tag{19}$$

i.e., the costs retail firms face are determined by the price they pay for the intermediate good and real price adjustment costs $\psi_{b,t}$. Following Rotemberg (1982), we assume quadratic adjustment costs given by

$$\psi_{b,t} = \epsilon \frac{1}{2\kappa_h} \pi_{h,t}^2 Y_{b,t}, \tag{20}$$

where the parameter κ_h determines price rigidity. Each retail firm maximizes real profits given by

$$\max_{P_{b,t}} d_{b,t} = \frac{P_{b,t}}{P_{c,t}} Y_{b,t} - mc_{m,t}Y_{b,t} - \psi_{b,t} \tag{21}$$

subject to the demand function

$$Y_{b,t} = \left(\frac{P_{b,t}}{P_{h,t}}\right)^{-\epsilon} Y_{h,t}\,. \tag{22}$$

The New Keynesian Philip Curve is then given by

$$\pi_{h,t} = \kappa_h \left(mc_{m,t} - \frac{\epsilon - 1}{\epsilon} \frac{P_{h,t}}{P_{c,t}}\right) + \frac{Y_{h,t+1}}{Y_{h,t}} \pi_{h,t+1}\,. \tag{23}$$

3.3 Monetary and Fiscal Policy

The monetary authority sets the nominal interest rate according to a Taylor rule given by

$$i_t = \phi_\pi \pi_{CPI,t} + \upsilon_t, \tag{24}$$

where i_t is the nominal interest rate and υ_t is a monetary policy shock and is assumed to follow an AR(1) process. The parameter $\phi_\pi > 0$ is the reaction coefficient of the central bank to CPI inflation which is given by

$$\pi_{CPI,t} = \int \pi^i_{CPI,t} l(a^i_{t-1}, \eta^i_t) di, \tag{25}$$

where

$$\pi^i_{CPI,t} = \frac{c^i_{SS}}{C^* + c^i_{SS}} \pi_{c,t} + \frac{C^*}{C^* + c^i_{SS}} \pi_{1,t} \tag{26}$$

with c^i_{SS} being the zero inflation steady state excess consumption. CPI inflation of household i is the weighted average of the inflation rate of excess consumption ($\pi_{c,t}$) and the inflation rate of type-1 goods consumption ($\pi_{1,t}$). Importantly, in the standard and the TS HANK models, CPI inflation coincides with the inflation rate of excess consumption. In the HB HANK model, essential-good inflation is assigned a larger weight, proportional to the share of subsistence consumption in a household's consumption basket.

The Fisher equation is given by

$$i_t = r_t + \mathbb{E}\left[\pi_{c,t+1}\right]. \tag{27}$$

The Fisher equation includes inflation of excess consumption rather than the CPI as households (marginal) consumption/savings decisions depend on excess consumption only.

The government issues one-period nominal bonds B_t, which are bought by households to save, and adjusts the level of taxes T_t to balance its budget in each period according to

$$T_t = r_t B_t. \tag{28}$$

3.4 Equilibrium

The solution to the households optimization problem described by equations 8—10 is a set of policy rules which determine consumption $c^i_t(\eta^i_t, a^i_{t-1})$, labor supply $h^i_t(\eta^i_t, a^i_{t-1})$, and saving decisions $a^i_t(\eta^i_t, a^i_{t-1})$ as a function of households' idiosyncratic history with respect to labor productivity shocks and initial wealth.

The equilibrium condition on the capital market states that the sum of individual savings equals government bonds:

$$\int a_t^i l(a_{t-1}^i, \eta_t^i) di = B_t. \tag{29}$$

The goods market clearing conditions are given by

$$Y_{1,t} = C_{1,t} + \psi_{1,t} \quad ; \quad Y_{2,t} = C_{2,t} + \psi_{2,t}, \tag{30}$$

$$Y_t = Y_{1,t} + Y_{2,t}. \tag{31}$$

Labor market clearing implies

$$N_t \equiv \int \eta_t^i h_t^i l(a_{t-1}^i, \eta_t^i) di. \tag{32}$$

4 Implementation and Calibration Strategy

4.1 Implementing the HANK Model

This section describes the solution method. We first compute the steady state of the model. We discretize the level of individual asset holdings by constructing a grid for individual asset holdings. We set the size of the asset grid to $n_a = 100$, i.e., there are 100 points on the asset grid. We employ the Rouwenhorst (1995) method to discretize the households' productivity process into $n_\eta = 7$ productivity states, where 1 denotes the lowest and 7 the highest productivity state. Then, we solve the household optimization problem by backward iteration using the Endogenous Grid method proposed by Carroll (2006). Backward iteration on the marginal value of assets allows to compute the policy functions for consumption, labor supply and asset holdings. As in Auclert et al. (2021), we iterate over the discount factor and disutility of labor in order to match targeted values for the interest rate and effective labor in steady state. The steady state solution is presented in Section 5.1.

Following the computation of the steady state, we simulate the model's responses to an expansionary monetary policy shock. We apply the Sequence-Space Jacobian method from Auclert et al. (2021), which is an efficient algorithm to solve heterogeneous-agent models in general equilibrium with aggregate shocks. In this solution method the model is linearized with respect to aggregate shocks around its steady state, and then solved for the model responses to a finite sequence of shocks. We first compute the partial equilibrium Jacobians that describe how individual household consumption, savings and labor supply decisions respond to small deviations from the steady state over time. These are computed using the fake news algorithm introduced in Auclert et al. (2021). These individual responses are then aggregated across the steady-state distribution to construct the general equilibrium Jacobians. For this, we set the truncation horizon to T=300, i.e. we compute the Jacobians and impulse responses over 300 periods. Given the general equilibrium Jacobians, we then obtain the model's impulse responses to a monetary policy shock. The corresponding results are described in Section 5.2.

4.2 Calibration

The calibration of the model is summarized in Table 2. Our calibration is based on relevant literature and targeted moments. Following Kaplan et al. (2018), we set $\sigma = 1$ and $\varphi = 1$, implying log utility. The price elasticity of demand and is set to $\epsilon = 6$ and the Taylor rule coefficient to $\phi_\pi = 1.5$, as in Galí (2015).

The internally calibrated parameters are determined as follows. The discount factor and the disutility of labor supply implied by the iteration are $\beta = 0.95$ for an annual interest rate target of 2% and $\chi = 1.33$ for a target $N = 1$ in steady state (in the standard HANK model and the TS HANK model the iteration yields $\beta = 0.96$ $\chi = 0.85$). The elasticity of substitution parameter is set to $\upsilon_C = 0.75$ which implies a price elasticity of demand for essential goods ϵ_C^i (under consideration of the subsistence level) between 0.25 and 0.6 (depending on household income/wealth), which is consistent with estimates for food by United States Department of Agriculture (2012). Households with higher income/wealth can therefore substitute goods more effectively, which is in line with Gürer

and Weichenrieder (2020), and Argente and Lee (2021).

Parameter	Description	Value	Target/Source
	Households		
σ	Inverse intertemporal elasticity of substitution	1	Kaplan et al. (2018)
φ	Inverse Frisch labor supply elasticity	1	Kaplan et al. (2018)
γ	Share of type-1 goods	0.2	internally calibrated
υ_C	Elasticity of substitution parameter	0.75	United States Department of Agriculture (2012)
C^*	Subsistence level on type-1 goods	0.35	internally calibrated
ϵ	Price elasticity of demand for varieties	6	Galí (2015)
β	Discount factor	0.95	internally calibrated, $r = 0.005$
ρ_η	Autocorrelation idiosyncratic shock	0.95	internally calibrated
σ_η	Standard deviation idiosyncratic shock	0.75	internally calibrated
χ	Disutility of labor supply	1.33	internally calibrated, $N = 1$
	Firms		
κ_1	Price adjustment cost 1	0.0150	internally calibrated
κ_2	Price adjustment cost 2	0.0054	internally calibrated
	Central Bank		
ϕ_π	Reaction coefficient	1.5	Galí (2015)
	Fiscal Authority		
B	Bond supply	2	$B = 2Y$

Table 2: Model Parameters

We set the Rotemberg (1982) price adjustment cost for essential goods to $\kappa_1 = 0.015$, and for non-essential goods to $\kappa_2 = 0.0054$, implying larger volatility of essential good prices by roughly a factor of three. This is in line with the fundamentals presented in Section 2 (see also Footnote 1). In particular, the values are calibrated to match the inflation difference between the subsistence consumption basket and the average basket estimated by the local projections, see the next Section for details. These values imply an average κ of 0.01, as in Auclert et al. (2024). This value is also chosen in the standard HANK model.

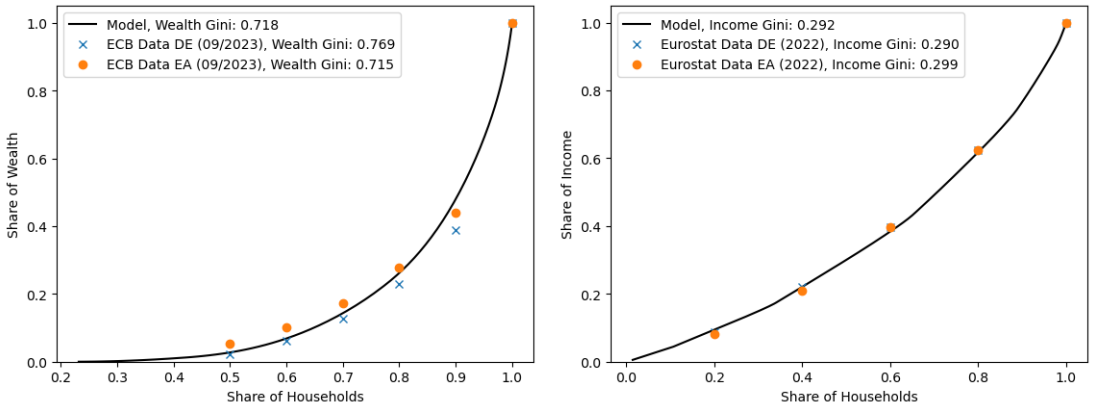
We set government bonds to $B = 2$. This implies that household wealth is twice as large as GDP, which is consistent with German data (household liquid wealth: 9.05 trillion € in 2024; GDP: 4.31 trillion € in 2024; data source: Deutsche Bundesbank 2025). The idiosyncratic risk is assumed to follow an AR(1) process with an autocorrelation $\rho_\eta = 0.95$ and standard deviation $\sigma_\eta = 0.75$. We employ the Rouwenhorst (1995) method to discretize the productivity process into seven productivity states- The corresponding productivity levels are $\eta_t \in (0.12, 0.22, 0.41, 0.76, 1.40, 2.58, 4.76)$. The values are calibrated to receive a realistic level of income and wealth inequality in steady state. The income and wealth distribution can be found in the next Section. Finally, we calibrate the subsistence

level on essential goods as $C^* = 0.35$ (or 0, for comparison in the standard HANK and TS HANK models) and the preference for essentials as $\gamma = 0.2$. The implied consumption baskets are discussed in detail in the following Section.

5 Results

5.1 Steady State

Figure 4a shows the wealth Lorenz curve resulting from our model in comparison to the data for Germany and the euro area reported by the ECB. The shape of the Lorenz curve suggests that a large proportion of total wealth is held by the richest (highly productive) households. The model produces a wealth Gini coefficient of 0.718, which is close to the ones reported for Germany and the euro area.



(a) (b)

Figure 4: Wealth Lorenz and Income Lorenz Curves.

Figure 4b illustrates the model's income Lorenz curve in comparison to the data for Germany and the euro area reported by Eurostat. A more equal distribution of income than of wealth can be observed. The model produces a realistic income Gini coefficient of 0.292.

Figure 5a illustrates that the model produces rich labor supply heterogeneity. Labor supply decreases in wealth for all productivity levels. Specifically, the wealthier households are, the lower is their incentive to work. Larger asset holdings imply that labor income becomes less relevant, as capital income is high. In general, labor supply increases in

productivity, as higher productivity implies larger labor income. However, this relation does not hold for the very lower end of the wealth distribution (where a large share of households are located). At this point of the wealth distribution, the relation between labor supply and productivity reverses, and less productive households supply more labor. This is due to the subsistence level on essential good consumption and the borrowing constraint: When asset holdings (and, thereby, capital income) are low, the most important source of income to cover expenditures is labor income. In order to meet the subsistence level and to afford some utility-relevant consumption without generating negative savings, households with low wealth and low productivity levels need to increase their labor supply.

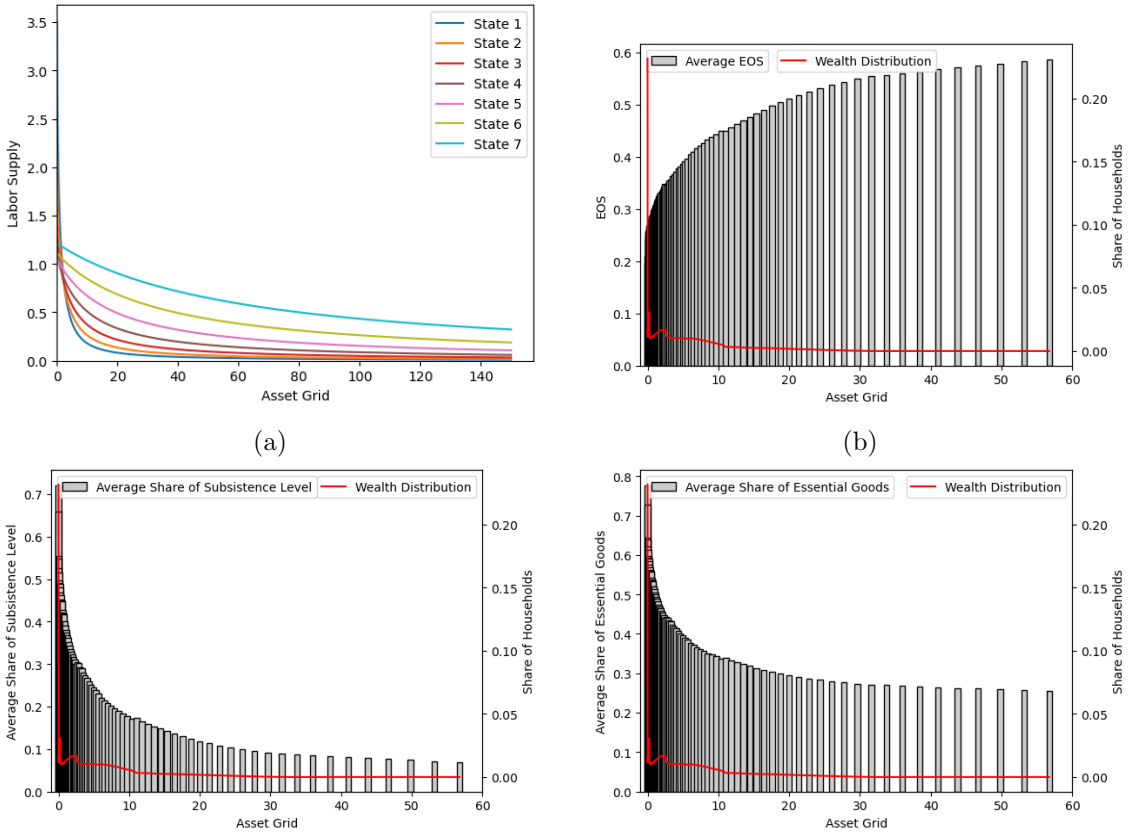


Figure 5: Labor Supply (by Productivity State), Elasticity of Substitution, Subsistence Level Share in Overall Consumption, and Essential Good Share in Overall Consumption.

Figure 5b displays the average elasticity of substitution between essential and non-essential goods, as defined by Equation 4, along the wealth distribution. The lower the wealth/income of households, the lower their consumption. Thus, the share of the sub-

sistence level in their consumption basket increases and their substitution capabilities decrease.

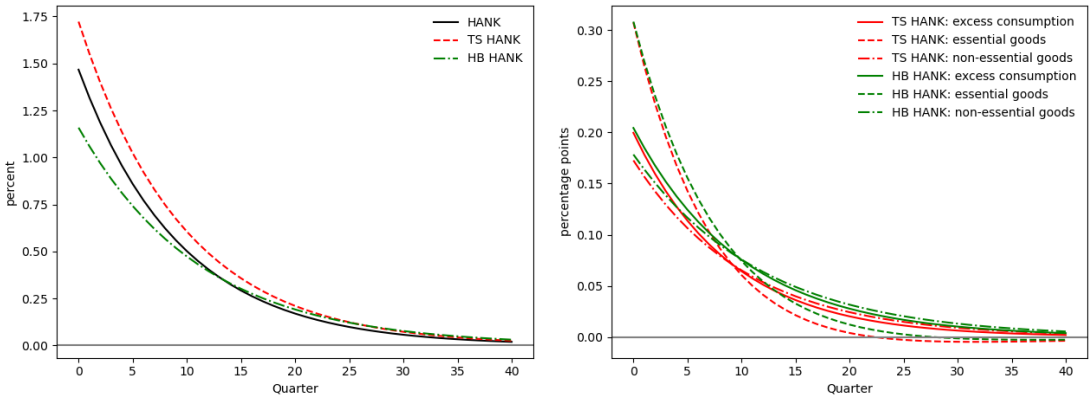
Complementary to these differences in the elasticity of substitution between households, Figure 5c reveals that the share of subsistence level consumption is around 70% for the lowest income quintile, around 30% for the highest income quintile, and at 45% on average. These values are very close to the ones reported in Section 2.

In addition to the necessary level of consumption of essential goods, households consume essential goods according to their preference. The share of essential-good consumption is, therefore, larger than the share of subsistence consumption (see Figure 5d). Importantly, the share of essential good consumption decreases in wealth/income as households have a preference for non-essential good consumption. The average share of essential good consumption is 56%, households with the highest wealth/income spend about 35% of their consumption expenditures on essential goods. These numbers are consistent with the expenditure shares of the core essential goods (food and housing) in the consumption baskets of households with average and high income, as presented in Section 2.

5.2 Transmission of Monetary Policy

Figure 6a displays the output responses of the three model specifications (standard HANK, TS HANK, and HB HANK) to a one-standard-deviation, expansionary monetary policy shock as in Section 2. The transmission of monetary policy on output is strongest in the TS HANK model: due to differing price rigidities, inflation rates differ across good types. In particular, essential-good prices adjust faster to shocks (Figure 6b), increasing the relative price of essential goods after an expansionary monetary policy shock. The relative price of non-essential goods, conversely, decreases which incentivizes consumption of non-essential goods. As these types of goods predominantly determine the consumption index in the TS HANK model, overall consumption increases more. Thus, the two-sector structure implies a stronger transmission of monetary policy in our context. The additional introduction of a subsistence level, i.e., of heterogeneous consumption baskets, weakens the transmission of monetary policy on output. There is a multitude of reasons for this outcome.

In the HB HANK model, households choose to forego parts of their shock-induced additional consumption opportunities to decrease their working hours, i.e., the MPC at the lower end of the wealth distribution is lower than in the other model specifications. Furthermore, an important transmission channel of monetary policy emerges that primarily affects real expenditures of low-income households. This transmission channel is absent in the standard HANK and the TS HANK models.

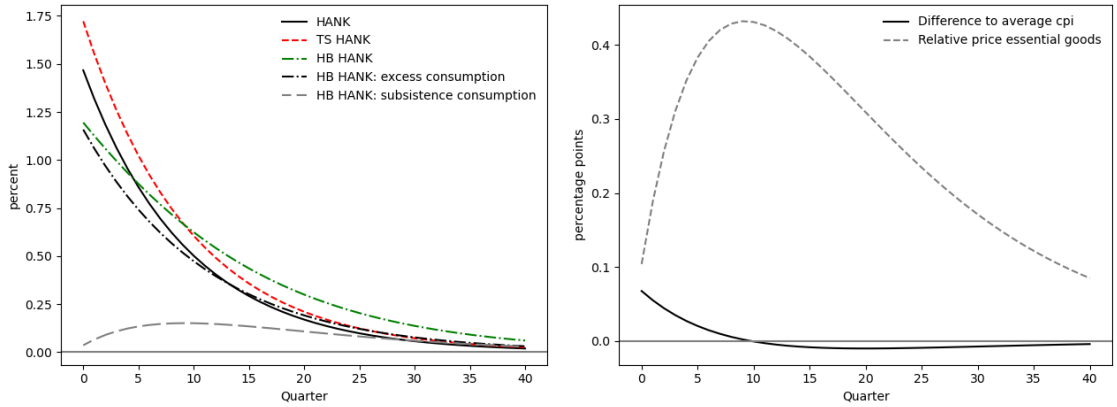


(a) Output Responses. (b) Inflation Responses.

Figure 6: Impulse Responses to an Expansionary Monetary Policy Shock.

Figure 7a illustrates this channel. In the standard HANK and the TS HANK model, the increase in expenditures mirrors the increase in consumption. In the HB HANK model, an indirect transmission channel of monetary policy, operating through the relative price of essential goods, emerges. Following an expansionary monetary impulse, the real value of subsistence consumption, $\frac{P_{1,t}}{P_{c,t}}C^*$, increases, as the price of essential goods increases more strongly than the average price level. Thus, the increase in household real expenditures does not fully translate into an increase in (excess) consumption, which determines the increase in output, but is partly absorbed by the increase in the relative price of subsistence consumption. Therefore, expenditure revaluation decreases the effectiveness of monetary policy. To further elaborate on this channel, Figure 7b shows the impulse responses of the inflation difference between the subsistence price index and the average CPI inflation rate across households as well as of the relative price of subsistence consumption. The initial response of the inflation difference is about 8 basis points, which is similar to the estimated peak response of this difference in Section 2. Notably, this increase in the difference leads

to a large increase in the relative price of subsistence consumption to over 40 basis points, implying a sizable revaluation.



(a) Expenditure Response in the Three Model Specifications.

(b) Response of Inflation Difference and Relative Price of Essential Goods, HB HANK Model.

Figure 7: Impulse Responses to an Expansionary Monetary Policy Shock.

Furthermore, this effect is underscored by the fact that households in the HB HANK model are affected differently by inflation. Figure 8 shows the average, initial CPI inflation rate response along the wealth distribution. As households at the lower end of the wealth distribution, on average, consume dis-proportionally more essential goods than wealthier households, the stronger increase in essential-good prices affects less-wealthy households more, decreasing their purchasing power.

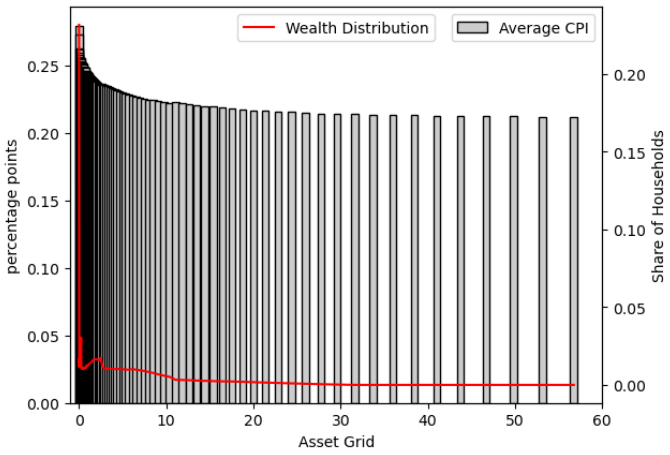
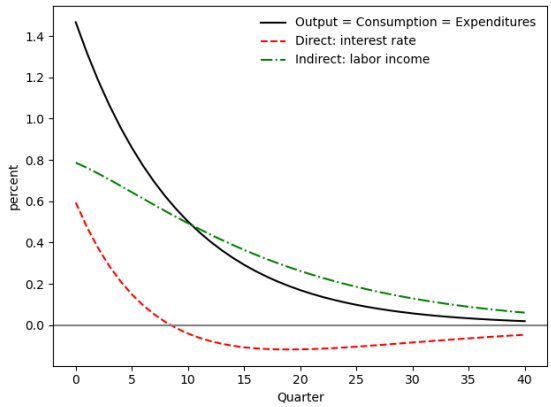
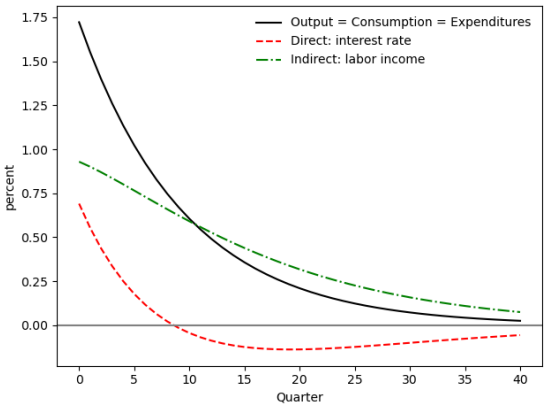


Figure 8: Initial CPI Inflation Response Along the Wealth Distribution to an Expansionary Monetary Policy Shock, HB HANK Model.

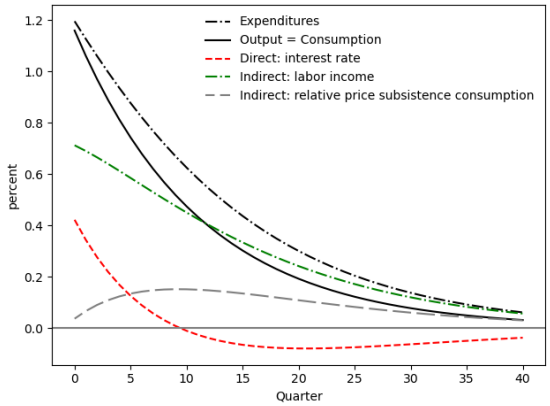
Finally, we decompose the consumption/output impulse response to a monetary policy shock into direct and indirect effects. Figure 9a illustrates the decomposition of the consumption responses for the standard HANK model. As established in the HANK literature, direct effects arising from intertemporal substitution in response to interest rate changes are smaller than indirect effects arising from the increase in labor demand and thus labor income.



(a) Output, Standard HANK Model.



(b) Output, TS HANK Model.



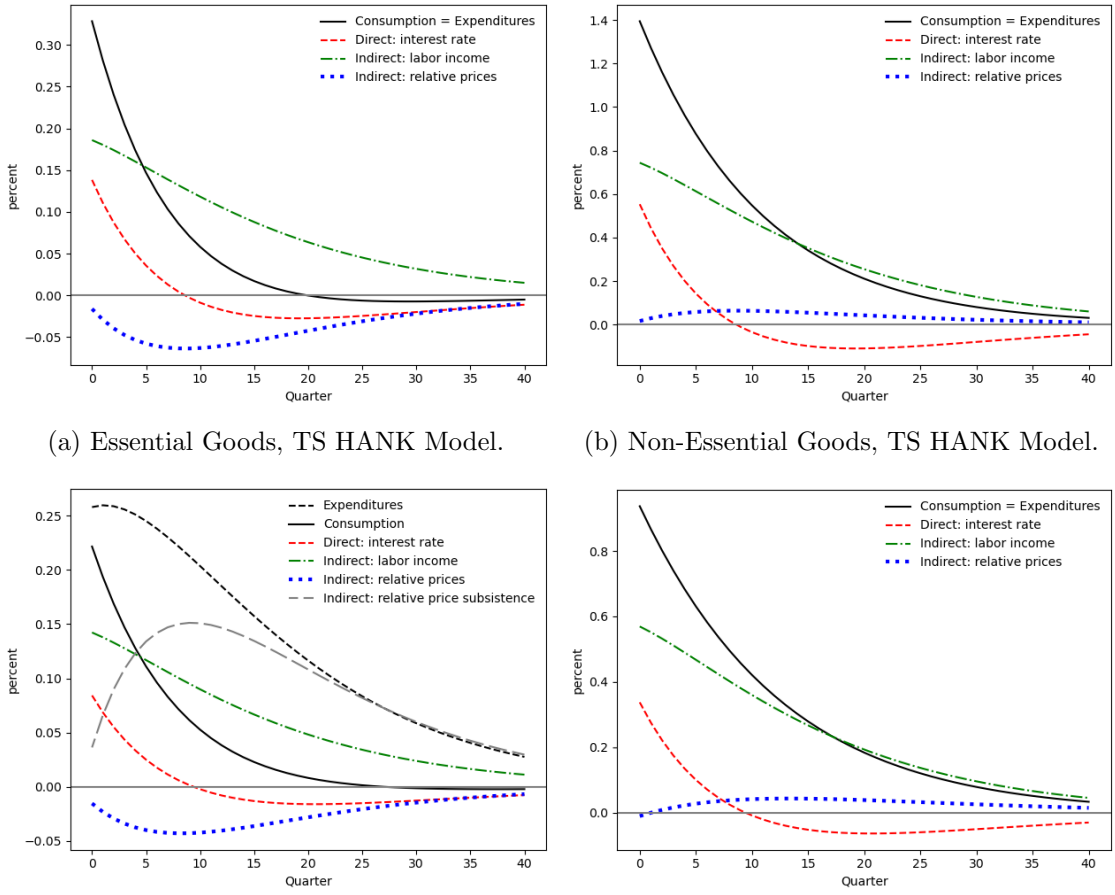
(c) Output, HB HANK Model.

Figure 9: Decomposition of Impulse Responses to an Expansionary Monetary Policy Shock.

Figure 9b shows the decomposition in the TS HANK model. Quantitatively, both direct effects via the interest rate and indirect effects via labor income are larger than in the standard HANK model but remain similarly large in relative size. Figure 9c illustrates the decomposition of the consumption/output and expenditure responses for the HB HANK model. Due to the reasons discussed before, the overall direct and indirect effects are quantitatively smaller than in the other two model specifications. In addition, the in-

crease in the relative price of subsistence consumption constitutes an additional indirect transmission mechanism that drives a quantitatively relevant wedge between expenditure and consumption responses.

In order to gain a better understanding of the transmission mechanisms, we depict the decomposition of essential and non-essential good consumption/output responses in the TS and the HB HANK models in Figure 10. Unsurprisingly, non-essential goods are the main driver of the overall consumption response as households have a greater preference for consuming them. The decomposition follows a similar pattern as overall consumption/output in both model specifications, especially considering direct effects and indirect effects via labor income.



(a) Essential Goods, TS HANK Model.

(b) Non-Essential Goods, TS HANK Model.

(c) Essential Goods, HB HANK Model.

(d) Non-Essential Goods, HB HANK Model.

Figure 10: Decomposition of Impulse Responses to an Expansionary Monetary Policy Shock.

The decomposition of the essential good consumption/expenditure response shows the main difference between the models. The wedge between consumption and expenditures

occurs only in the decomposition of the essential-good consumption response in the HB HANK model. Expenditures and consumption responses diverge substantially; expenditures stay elevated even when the consumption response is already back at steady state. Upon focussing on the role of relative prices, Figure 10a indicates that the increase (decrease) in the relative price of (non-)essential goods decreases the consumption response of essential goods and increases the response of non-essential goods substantially over time. While this effect is still relevant in the HB HANK model (Figure 10c), it is distorted: the increase in the expenditures allocated to subsistence consumption limits the extent to which households can react to relative price changes. This is especially due to low-wealth/income households as they have a particularly low elasticity of substitution, see Section 5.1.

5.3 On the Role of Fiscal Policy

So far, we have considered a fiscal authority that simply adjusts the level of taxes for the interest rate, i.e., an inactive fiscal policy. As expansionary monetary policy increases the relative price of subsistence consumption, fiscal policy may play a role in addressing these distributional effects. In particular, we consider two simple deviations from the fiscal rule defined in equations 11 and 28 in which the fiscal authority still runs a balanced budget in every period:

$$T_t = T_{B,t} + T_{C^*,t}, \tag{33}$$

with T_t denoting overall taxes, $T_{B,t} \equiv r_t B_t \equiv \int t^i_{b,t}\left(\eta^i_t\right) l(a^i_{t-1}, \eta^i_t) di$ being defined as taxes raised to cover interest payments on government bonds, and $T_{C^*,t}$ as a redistributive component to offset changes in the relative price of subsistence consumption. Note that taxes related to bonds are raised proportional to productivity, as before. The redistributive component is defined as

$$T_{C^*,t} \equiv \int t^i_{c,t}\left(\eta^i_t\right) l(a^i_{t-1}, \eta^i_t) di - \int t^i_{c,t}\left(\zeta^i_t\right) l(a^i_{t-1}, \eta^i_t) di = 0, \tag{34}$$

where $\int t^i_{c,t}\left(\eta^i_t\right) l(a^i_{t-1},\eta^i_t)di = \int t^i_{c,t}\left(\zeta^i_t\right) l(a^i_{t-1},\eta^i_t)di = \left(\frac{P_{1,t}}{P_{c,t}} - 1\right) C^*$. This rule ensures that the fiscal authority runs a balanced budget but reacts to changes in the relative price of subsistence consumption. Taxes are raised based on productivity with $t^i_{c,t,\eta^i_t} > 0$. The degree of redistribution is determined by ζ^i_t. In a first scenario we consider ζ^i_t to account for the share of households located at each productivity level. Thus, a large share of tax revenue is generated from high-productivity households ($t^i_{c,t}\left(\eta^i_t\right)$) while the majority of the transfers reaches low-productivity households ($t^i_{c,t}\left(\zeta^i_t\right)$). In a second scenario, we consider ζ^i_t to only account for the lowest productivity level. This implies a maximum of redistribution.

Figure 11 shows the output and expenditure response of the HB HANK model with inactive fiscal policy (i.e., our baseline) to an expansionary monetary policy shock compared to the output responses in the proportional and maximum redistribution regimes. Both regimes imply transfers to households that are affected most by the increase in subsistence consumption expenditures and simultaneously exhibit the highest MPC.

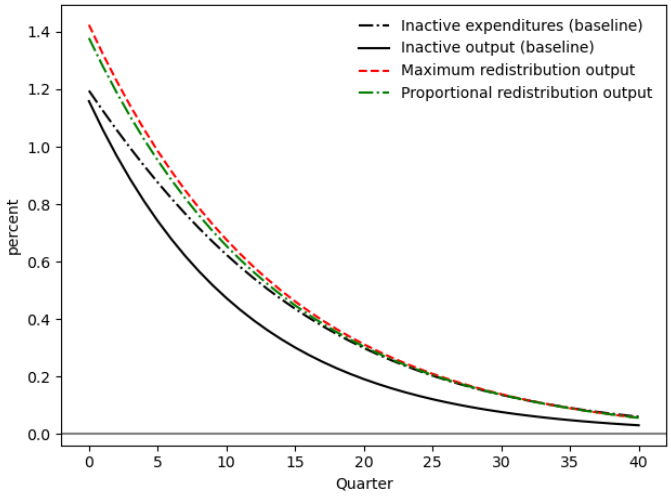


Figure 11: Output and Expenditure Responses to an Expansionary Monetary Policy Shock for Different Fiscal Policy Regimes, HB HANK Model.

Therefore, output under these regimes increases more than output and even expenditures in the inactive regime. Purely redistributive fiscal policy can, therefore, offset the increase in the relative price of subsistence consumption.

6 Conclusion

Households differ in their consumption baskets and, therefore, their inflation rates along the wealth and income distribution. In particular, we use German data to provide some stylized facts on the relevance of subsistence consumption for households' consumption baskets and inflation rates. We show that households with low income use the vast majority of their expenditures for subsistence consumption (up to 87%). This share drops to close to 21% for the richest households. We then use local projection methods to show that the price index associated with subsistence consumption reacts significantly more strongly to monetary policy shocks than the indices associated with the average consumption basket and with the basket of high-income households, implying that expansionary monetary policy increases the relative price of subsistence consumption.

We then set up a HANK model that incorporates these facts. In particular, we derive different household consumption baskets and thus inflation heterogeneity by introducing a subsistence level on essential good consumption to analyze the consequences of this heterogeneity for monetary policy transmission. Our model replicates key features of the income and wealth distribution, of elasticities of substitution, of heterogeneous consumption baskets along these distributions, and generates rich labor supply heterogeneity. We show that these properties are empirically plausible.

We compare the transmission of a monetary policy in a standard HANK model, a two-sector HANK model with homogeneous consumption baskets, and a two-sector HANK model with heterogeneous consumption baskets. We find that considering multiple sectors increases the strength of monetary policy transmission to output due to the adjustment of relative prices in our context. Heterogeneous consumption baskets across households, however, imply a weaker monetary policy transmission. This is due to the heterogeneous responses of inflation rates to monetary policy shocks across households and the labor supply heterogeneity resulting from the subsistence level. We further provide evidence for a novel indirect transmission channel of monetary policy operating through the relative price of essential goods, which determines the real value of the subsistence level of consumption.

Finally, we briefly discuss a fiscal policy reaction to the increase in the relative price of subsistence consumption. We find that a purely redistributive fiscal policy can offset

the effect of the increase in the relative price of subsistence consumption on aggregate demand. A more detailed analysis on the design of fiscal policy in this context seems like an interesting avenue for future research.

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Appendix

A Data

For 2018, the German Parliament reports the calculated annual subsistence level of consumption to be 9000€. The general breakdown assigns 4968€ to baseline expenditures, 3396€ to costs for housing, and 636€ to costs of heating. The FMLSA publishes the breakdown of baseline expenditures as shown in column 2 of Table A.1.

Category	FMLSA Breakdown	Final Subsistence Basket
Food and non-alcoholic beverages	34.74%	19.18%
Alcoholic beverages and tobacco	0.00%	0.00%
Clothing and footwear	8.31%	4.59%
Housing, water, electricity, gas and other fuels	8.49%	49.48%
Furniture, lighting equipment, appliances etc.	6.10%	3.37%
Health	3.82%	2.11%
Transport	8.98%	4.96%
Communication	8.84%	4.88%
Recreation, entertainment and culture	9.77%	5.39%
Education	0.36%	0.20%
Restaurant and accommodation services	2.61%	1.44%
Miscellaneous goods and services	7.99%	4.41%

Table A.1: Breakdown of Baseline Expenditures and Subsistence Consumption Basket of German One-Person Households.

Notes. Data source: German Parliament; FMLSA; SIE.

In order to arrive at the subsistence consumption basket (shown in column 3 for reference), the share provided by the FMLSA breakdown is multiplied by the value of baseline expenditures (4968€) and divided by the overall level of subsistence consumption (9000€). This applies to all categories except from housing, water, electricity, gas and other fuels. Here, the share of this category in baseline expenditures is multiplied by the value of baseline expenditures. The resulting value is added to the amount allocated to housing (3396€) and heating (636€), before being divided by the overall level of subsistence consumption.

The share of subsistence consumption in overall consumption at different net-income levels in calculated based on SIE data on consumption expenditures by net-income levels in 2018 reported in Table A.2. Column 3 also reports the share of households at each

net-income level based on the 2018 micro census. Where possible, the share of households is aggregated to match the net-income levels reported by the SIE.

Net Income in €	Monthly Consumption Expenditures in €	Share Subsistence Level	Share of Households
< 500			2.40%
$500 - 900$			15.80%
< 900	865	86.71%	18.20%
$900 - 1300$	1117	67.14%	21.50%
$1300 - 1500$	1325	56.50%	10.60%
$1500 - 1700$			9.80%
$1700 - 2000$			11.60%
$1500 - 2000$	1563	47.98%	21.40%
$2000 - 2600$	1881	39.87%	14.20%
$2600 - 3200$			6.00%
$2600 - 3600$	2315	32.40%	
$3200 - 4500$			4.30%
$3600 - 5000$	2822	26.58%	
> 4500			2.20%
> 5000	3565	21.04%	

Table A.2: Consumption Expenditures, Share of Subsistence Level, and Share of Households at Different Net-Income Levels .

Notes. Data source: German Parliament; FMLSA; SIE; Micro Census.

Finally, we construct price indices for the three consumption baskets outlined in the main text using CPI data from the Federal Statistical Office. We hold consumption baskets constant and calculate the inflation rate π of basket i in month t as

$$\pi_{i,t} = \sum_{j=1}^{J} \frac{p_{j,t} - p_{j,t-1}}{p_{j,t-1}} c_{i,j},$$

where j denotes the expenditure category, $\frac{p_{j,t}-p_{j,t-1}}{p_{j,t-1}}$ the inflation rate of j, and $c_{i,j}$ the expenditure share of j in i.

B Robustness of Local Projections

We check the robustness of our results with respect to lag length and the monetary policy shock series. Figure B.1 shows the impulse responses to an expansionary monetary policy shock with $J = 4$; Figure B.2 with $I = 12$. Our baseline results are robust to different lag specifications.

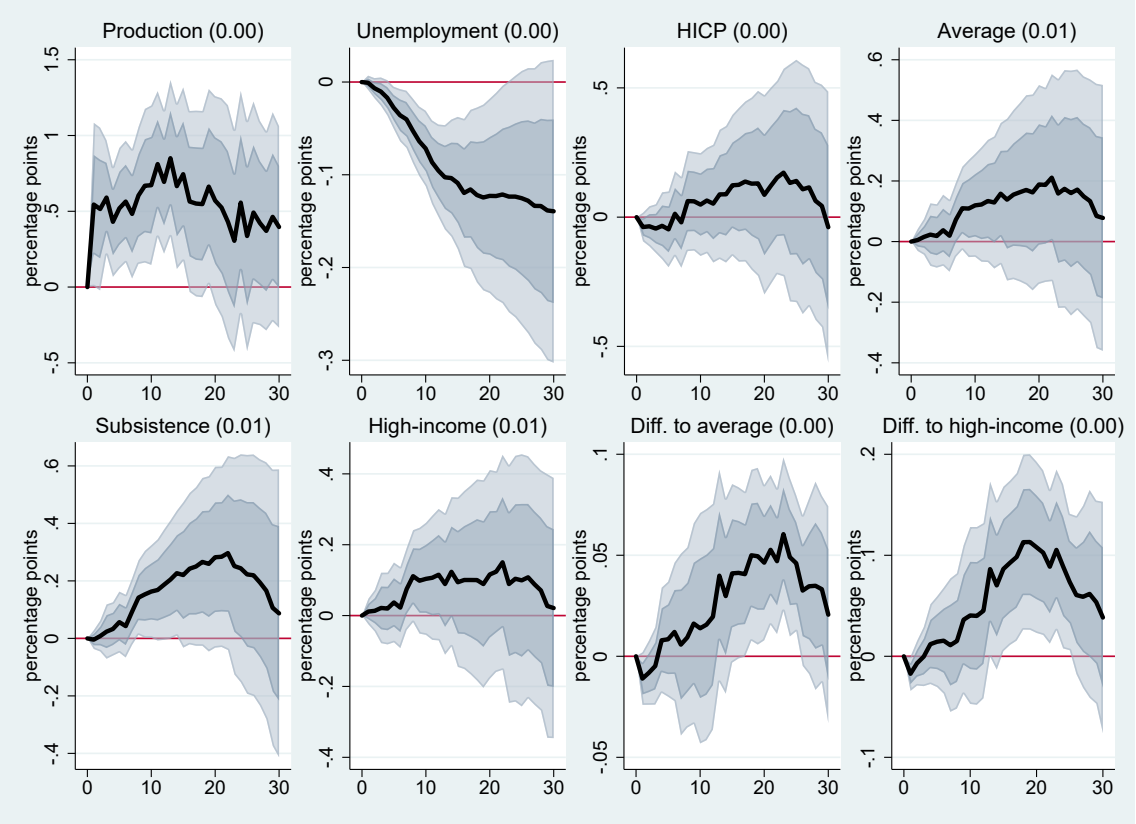


Figure B.1: Impulse responses of variables of interest to an expansionary monetary policy shock, alternative lag length $J = 4$.

Note: The figure shows the impulse responses to a one-standard-deviation shock. The shock series is based on an updated version of the monetary policy shocks in Jarociński and Karadi (2020). The horizontal axis represents months. Dark-shaded and light-shaded areas indicate one and 1.65 standard deviation confidence intervals. Numerical value in parentheses reports the p-value for the joint test that impulse responses are zero for all months as in Coibion et al. (2017). Average refers to the price index related to the consumption basket of the average one-person household, subsistence to the price index related to the subsistence consumption basket, and high-income to the basket consumed by the households with an income above 5000€.

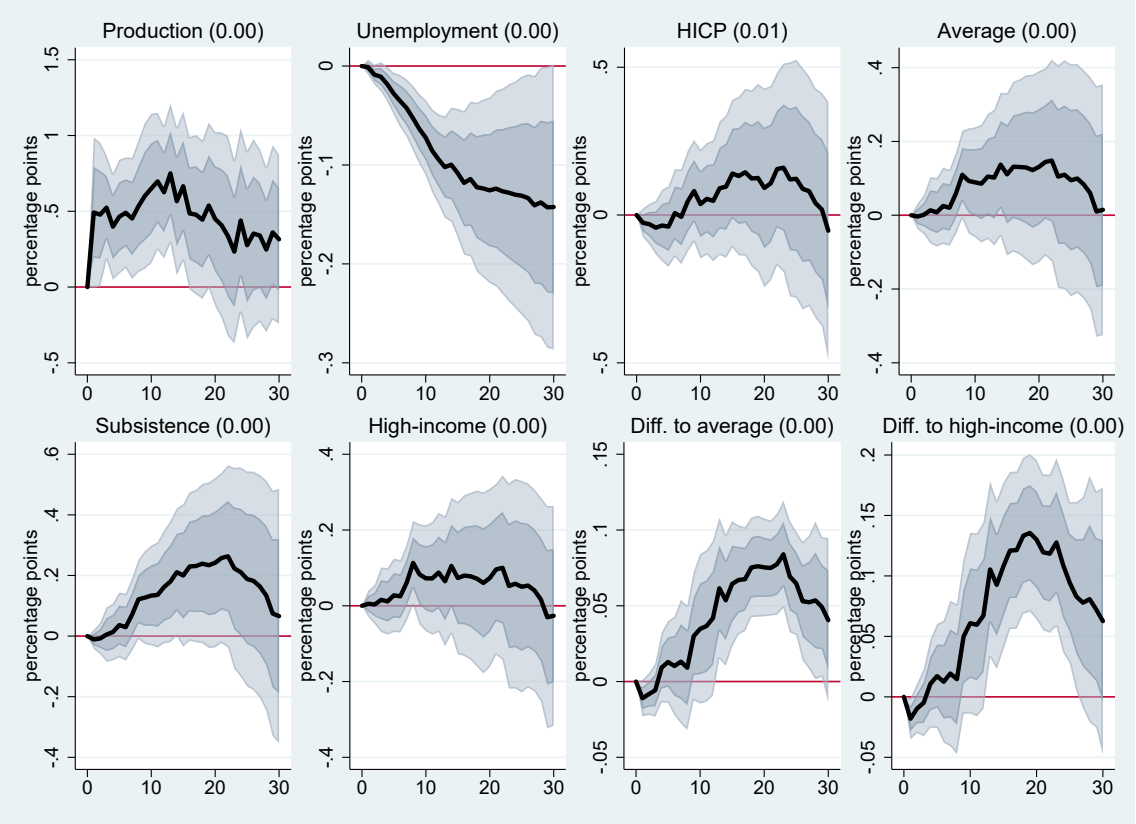


Figure B.2: Impulse responses of variables of interest to an expansionary monetary policy shock, alternative lag length $I = 12$.

Note: The figure shows the impulse responses to a one-standard-deviation shock. The shock series is based on an updated version of the monetary policy shocks in Jarociński and Karadi (2020). The horizontal axis represents months. Dark-shaded and light-shaded areas indicate one and 1.65 standard deviation confidence intervals. Numerical value in parentheses reports the p-value for the joint test that impulse responses are zero for all months as in Coibion et al. (2017). Average refers to the price index related to the consumption basket of the average one-person household, subsistence to the price index related to the subsistence consumption basket, and high-income to the basket consumed by the households with an income above 5000€.

Finally, we check the robustness of our baseline results with respect to the monetary policy shock series. Figure B.3 shows the impulse responses to an expansionary monetary policy shock, using the updated series from Miranda-Agrippino and Nenova (2022). Our baseline results hold.

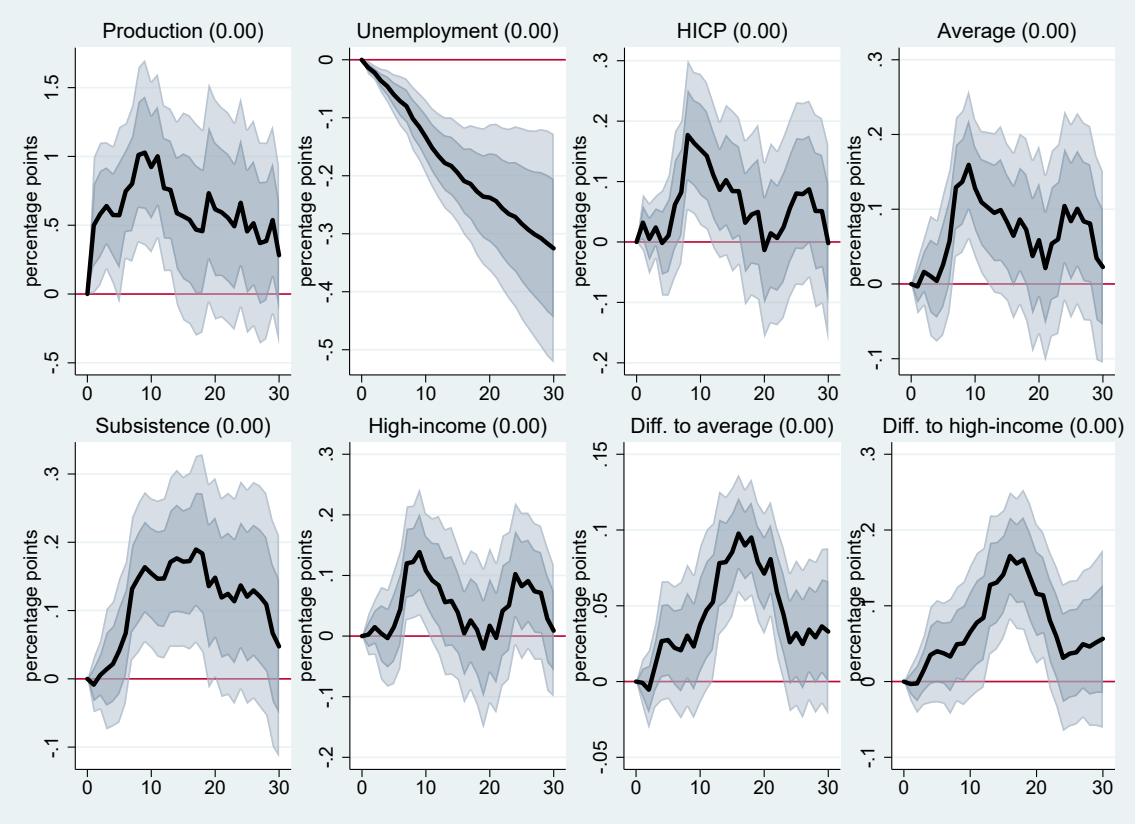


Figure B.3: Impulse responses of variables of interest to an expansionary monetary policy shock, alternative shock series.

Note: The figure shows the impulse responses to a one-standard-deviation shock. The shock series is based on an updated version of the monetary policy shocks in Miranda-Agrippino and Nenova (2022). The horizontal axis represents months. Dark-shaded and light-shaded areas indicate one and 1.65 standard deviation confidence intervals. Numerical value in parentheses reports the p-value for the joint test that impulse responses are zero for all months as in Coibion et al. (2017). Average refers to the price index related to the consumption basket of the average one-person household, subsistence to the price index related to the subsistence consumption basket, and high-income to the basket consumed by the households with an income above 5000€.