INFLATION, MONETARY POLICY, AND CAPITAL-LABOR INEQUALITY

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Abstract. This paper estimates a New Keynesian model with heterogeneous agents to study the interactions among monetary policy, macroeconomic shocks, and the distribution of income between capital and labor.

The model assumes two types of households: workers, who supply labor to firms and receive wage income, and capitalists, who own the firms and enjoy the corresponding profits. There are nominal rigidities in both the goods and labor markets.

The structural model is estimated using Bayesian methods to match U.S. data on consumption, corporate profits, wages, inflation, and nominal interest rates, on a sample spanning more than six decades.

The empirical results show that contractionary monetary policy and inflationary price-markup shocks lead to increases in inequality. Negative wage markup shocks, which proxy for declining workers' bargaining power, are major drivers of peaks in inequality over the sample; together with price markup shocks, they also account for a significant share of the changes in inequality after COVID.

Keywords: Heterogeneous-Agent New Keynesian Model, Income Distribution between Capital and Labor, Monetary Policy and Inequality, Inflation and Inequality.

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1. Introduction

The aftermath of the COVID-19 pandemic led to inflation levels unseen since the early 1980s, prompting the Federal Reserve to raise the benchmark nominal interest rate from zero to a target range of 5.25-5.5%. These shifts may not only impact the overall economy but also affect the distribution of income among different socioeconomic groups.

In the past, macroeconomic models were ill-suited to the study of income and wealth distribution. For example, the leading framework for the analysis of monetary policy, the New Keynesian model, is built on the assumption of a representative agent, preventing it from tackling meaningful questions about distribution.

In recent years, however, a new literature has developed with the aim of extending the New Keynesian model to allow for heterogeneous agents. Among them, Kaplan et al. (2018) combine the New Keynesian model with the Aiyagari-Huggett-Imrohoroglu incomplete-market approach, to introduce the HANK (Heterogeneous-Agent New Keynesian) model.

HANK models are, however, computationally complex to solve and analyze, since they require keeping track of the whole wealth distribution across households. As a way to simplify the analysis, and facilitate intuition, another option followed in the literature is to extend the New Keynesian model by introducing a more easily manageable form of heterogeneity, with two or three types of heterogeneous agents only. For example, Debortoli and Galí (2017) analyze TANK (Two-Agent New Keynesian) models and show that their aggregate dynamics closely approximates the dynamics in HANK models. Other works using two-agent models include Walsh (2017), Bilbiie (2008, 2025), and Cantore et al. (2021), among others.

In this paper, I use the framework developed by Broer et al. (2020), which similarly attempts to capture the main features of the income distribution while preserving tractability. The environment aims to account for the extreme concentration of wealth and it's particularly suited to study the dichotomy between capital and labor income.

The model features two types of heterogeneous households: workers and capitalists. Workers earn wages from labor supplied to firms. They can only imperfectly insure against idiosyncratic labor productivity shocks, as they can trade a non-state contingent, risk-free, bond, and they face a borrowing constraint. Capitalists are the owners of monopolistically-competitive firms and earn capital income from firms' profits in the form of dividends.

The main objective of this paper is to estimate a structural model based on Broer et al. (2020) to shed light on the effects of monetary policy and business cycle shocks on capital-labor inequality. I use Bayesian methods in the estimation and require the model to fit U.S. time series data on real consumption growth, real corporate profit growth, real wage growth, inflation, and the nominal interest rate.

The estimation sample spans more than sixty years of data. Therefore, besides presenting full-sample results, I analyze structural changes over different periods, which correspond to different macroeconomic environments or regimes.

1.1. **Main Results.** Broer et al. (2020) show that the effects of monetary policy on consumption by workers and capital holders depend on the responsiveness of wages in the labor market: when wages are close to flexible, the consumption levels of workers and capitalists respond in opposite directions. When they are entirely rigid, they can respond almost identically. The redistributive effects of monetary policy are very different in the two cases. Therefore, a full estimation of the model is needed to account for the joint behavior of policy, wages, and consumption of the two types of agents.

The estimation results indicate high degrees of nominal price and wage rigidity. Workers' and capitalists' consumption move in the same direction in response to policy shocks, but have different magnitudes.

The results show that inequality between capital and labor income increases in response to contractionary monetary policy shocks. Inequality increases even more substantially in response to inflationary shocks, such as price markup shocks, which can serve as proxies for time-varying market concentration in goods markets.

I investigate potential structural changes over the sample and find that the effects of monetary policy on the distribution of income are stronger in the aftermath of the Great Recession and the COVID recession. Inflationary shocks contribute to larger increases in inequality in the 1960-70s and after COVID. Another central driver of inequality is given by wage markup shocks: these shocks, which stand for exogenous changes in workers' relative bargaining power in wage-setting, can reduce inequality when they are positive, and they drive much of the business cycle variation of inequality over the sample. In particular, they account for peaks of inequality in the last two decades. Finally, both price and wage-markup shocks contribute to changes in income distribution during COVID.

For sensitivity, I then compare some of results to those that would be obtained under an alternative heterogeneous agent setup, based on Bilbiie (2025), which includes households who are savers or hand-to-mouth (in place of workers and capitalists). The responses of inequality to shocks have the same sign and remain overall comparable, except for different magnitudes in some cases.

1.2. **Related Literature.** The paper contributes to the growing literature that departs from the representative-agent assumption in macroeconomics by incorporating heterogeneous agents. Kaplan et al. (2018) introduce idiosyncratic income shocks and incomplete markets to revisit the transmission of monetary policy in a New Keynesian model with heterogeneous agents. They detail both traditional direct effects, operating through intertemporal substitution, and additional indirect effects, working through changes in labor demand and labor income originating after the initial rate change. Moreover, they show that monetary policy can have redistributive effects across agents situated in different parts of the income distribution. Auclert (2017) further concentrates on the redistribution channel. He models heterogeneity in marginal propensities to consume (MPCs) and shows that agents with higher MPCs benefit more from accommodative monetary policies.[1] The present paper shares the general focus of HANK models on the interaction between monetary policy and inequality, but it uses a simpler framework and deals with a more restricted version of inequality, aimed to capture the distribution of factor incomes.

Therefore, this work is more tightly connected to the papers that develop tractable models with heterogeneous agents. In those, heterogeneity is often limited to two main categories of agents. Debortoli and Galí (2017) develop a TANK model with heterogeneity between constrained, or rule-of-thumb, versus unconstrained, or optimizing, households. Bilbiie (2008, 2025) introduces tractable HANK models with savers and hand-to-mouth consumers, which can nevertheless capture the main channels at work in larger HANK models. Walsh (2017), Cantore et al. (2021), and Broer et al. (2020) separate economic agents, instead, into workers and capitalists. While the focus of the previous literature has typically been theoretical, the current paper provides an empirical contribution, by taking a worker-capitalist model, based on Broer et al. (2020), to the data, and showing, in a structural estimated

[1]Other papers that work with different versions of heterogeneous-agent incomplete-market models, and have different focuses of analysis, are McKay et al (2016), Guerrieri and Lorenzoni (2017), Gornemann et al. (2016), McKay and Reis (2016), among various others.

model, that inequality between capital and labor rises in response to both inflationary and contractionary monetary policy shocks. These conclusions are consistent with findings in papers that use micro-level data (e.g., Coibion et al., 2017, Ampudia et al., 2018, Mumtaz and Theophilopoulou, 2017). Therefore, the paper can also be seen as a contribution to the empirical literature on the effects of monetary policy on inequality, adding results based on a general equilibrium model, rather than a VAR. Moreover, the paper goes beyond the relationship between inequality and monetary policy shocks, since it evaluates the impact of different business cycle shocks.

This paper is also closely related to other studies that estimate DSGE models to find evidence on the structural drivers of inequality. For example, Charalampidis (2022) adds time-varying labor income and capital income inequality using data for top 10% earners to a TANK model. He shows that inequality cycles depend on heterogeneous worker skills, labor market institutions, and heterogeneous investment opportunities. Bayer et al. (2020) estimate a HANK model to match, among other things, the top U.S. income and wealth shares. Auclert et al. (2020) estimate a HANK model, using a two-step procedure (calibration plus impulse response matching) to match, at the macro level, impulse responses to a monetary policy shock and, at the micro level, households' marginal propensities to consume. Bilbiie et al. (2023) estimate a medium-scale New Keynesian model and include data on the cross-sectional standard deviations of log labor earnings and log disposable income, as measures of inequality. They find that inequality has an amplifying effect on business cycles, driven by cyclical precautionary saving behavior. Compared to them, this paper focuses specifically on inequality between capital and labor, it exploits a different framework that separates between workers and capitalists, and it highlights the central role of wage rigidity for the responses of labor, capital, income, and inequality.

At a much broader level, the paper adds to the extensive literature on estimated DSGE models (e.g., Christiano et al., 2005, Smets and Wouters, 2007), by emphasizing a dimension that is conventionally missing: the distribution of income between labor and capital.

2. Heterogeneous-Agent New Keynesian Model

The model economy is represented by a New Keynesian model (see Woodford, 2003, Galí, 2008), which is extended to include heterogeneous agents. Specifically, this paper follows the model proposed by Broer et al. (2020), which merges the baseline New Keynesian model with features of Huggett (1993)'s and Aiyagari (1994)'s incomplete markets model.

The heterogeneity across households is kept as simple as possible, while allowing us to derive implications about the distribution of income between labor and capital. Households can be of two types: *workers* and *capitalists*. Workers supply their labor to firms and receive wages. Capitalists own the firms and are assumed to be the only ones who receive dividends. The main idea is that households at the very top of the income distribution receive a large part of their income in the form of capital income (with wages representing a more trivial component the higher we move in the distribution);[2] the vast majority of households, on the other hand, receive most of their income as compensation for their labor.

The main features of the model are sketched here. A full derivation and detailed discussion can be found in Broer et al. (2020).

2.1. **Heterogeneous Households: Workers and Capitalists.** The economy is populated by a continuum of households indexed by j, including both workers, lying in the unit line $[0, 1]$, and capitalists, lying in the interval $(1, 1 + m_c]$.

Workers choose their optimal consumption C_{jt}, hours of work N_{jt}, and bond holdings B_{jt}, subject to a budget constraint and a borrowing constraint (they are prevented from borrowing for simplicity). They maximize the following utility function

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\log C_{jt} - \frac{N_{jt}^{1+\varphi}}{1+\varphi} - \vartheta \mathcal{I}_{N_{jt}>0} \right) \tag{1}$$

subject to

$$P_t C_{jt} + Q_t B_{jt} = W_{jt} N_{jt} + B_{jt-1} \tag{2}$$

$$B_{jt} \geq 0. \tag{3}$$

The parameter ϑ denotes a fixed cost of working, which all households face. However, the cost is assumed to be small enough so that all workers find it optimal to work ($\mathcal{I}_{N_{jt}>0}$ is an indicator function denoting the decision to work). The parameter φ denotes the inverse of the Frisch elasticity of labor supply, while β denotes the discount factor. The variables P_t, Q_t, and W_{jt}, denote the aggregate price level, the bond price, which is equal to the inverse of the gross nominal interest rate $(1 + i_t)^{-1}$, and the nominal wage rate, respectively.

[2] They behave as the wealthy hand-to-mouth households in Kaplan et al. (2014).

Capitalists receive dividends from firms whose shares they own and consume the profit income in hand-to-mouth fashion every period. With aggregate dividends given by D_t, each capitalist j receives a share of profit income D_t/m_c. As discussed in Broer et al. (2020), it's always possible to find a mass m_c small enough so that capitalists choose not to work for a wage in this model, and hence receive only capital income.

2.2. **Firms.** The final good Y_t is obtained by combining intermediate goods Y_{it} according to the Dixit-Stiglitz aggregator:

$$Y_t = \left(\int_0^1 Y_{it}^{\frac{\epsilon_p - 1}{\epsilon_p}} di \right)^{\frac{\epsilon_p}{\epsilon_p - 1}}, \tag{4}$$

with ϵ_p denoting the elasticity of substitution across differentiated goods. Intermediate goods firms, indexed by i, produce according to the technology $Y_{it} = N_{it}$, with labor inputs that are also imperfect substitutes and aggregated as

$$N_{it} = \left(\int_{j=0}^1 (A_{jt} N_{ijt}^{\frac{\epsilon_\omega - 1}{\epsilon_\omega}} dj \right)^{\frac{\epsilon_\omega}{\epsilon_\omega - 1}}, \tag{5}$$

where A_{jt} denotes the household-specific productivity shock for household j and ϵ_ω denotes the elasticity of substitution.

Firms are subject to nominal rigidities modeled à la Calvo. They can re-optimize their prices in any given period with probability $1 - \alpha_p$; when they are not allowed to reset their prices (with probability α_p), they are assumed to partially index their most recent price to the observed inflation rate over the previous period, with indexation coefficient γ_p.

When allowed to re-optimize, they choose the optimal price P_{it} to maximize profits

$$E_t \sum_{k=0}^{\infty} (\beta \alpha_p)^k \mathcal{Q}_{t,t+k} \left[\frac{P_{it}}{P_t} \left(\frac{P_{t+k-1}}{P_{t-1}} \right)^{\gamma_p} Y_{it+k} - \frac{W_{t+k}}{P_{t+k}} N_{it+k} \right] \tag{6}$$

subject to the demand curve for their product

$$Y_{it+k} = \left(\frac{P_{it}}{P_{t+k}} \right)^{-\epsilon_p} Y_{t+k}, \tag{7}$$

where $\mathcal{Q}_{t,t+k}$ represents the stochastic discount factor, which equals the ratio of the marginal utilities of consumption between t and $t + k$. Through (6), firms take into account the probability $(\alpha_p)^k$ that the price they set in t will not updated in the future, except for automatic indexation.

2.3. **Wage Setting.** Wages are subject to the same Calvo friction as prices, but with different Calvo coefficients. Workers can re-optimize the wage in each period with probability $(1-\alpha_w)$. I allow for partial indexation: if wages cannot be fully reset, they can be partially changed in reaction to the lagged inflation rate, with an indexation coefficient γ_w to be estimated. Each worker j, when allowed to reset the wage to the optimal level W^*_{jt}, maximizes

$$E_t \sum_{k=0}^{\infty} (\beta\alpha_\omega)^k \left(\log C_{jt+k|t} - \frac{N_{jt+k|t}^{1+\varphi}}{1+\varphi} - \vartheta \right) \tag{8}$$

subject to the budget constraint and the borrowing constraint as before

$$P_{t+k}C_{jt+k|t} + Q_{t+k}B_{jt+k|t} = W^*_{jt} \left(\frac{P_{t+k-1}}{P_{t-1}} \right)^{\gamma_\omega} N_{jt+k|t} + B_{jt+k-1} \tag{9}$$

$$B_{jt+k|t} \geq 0 \tag{10}$$

and also subject to the labor demand curve given each period by

$$N_{jt+k|t} = \frac{1}{A_{jt+k}} \left(\left(\frac{W^*_{jt} \left(\frac{P_{t+k-1}}{P_{t-1}} \right)^{\gamma_\omega}}{A_{jt+k}} \right) / W_{t+k|t} \right)^{\epsilon_\omega} N_{t+k|t}. \tag{11}$$

The main difference with the consumer's problem in (1), besides accounting for labor demand, is that the agent conditions the optimization on the possibility that the wage chosen in t may be prevented from being re-optimized between t and $t+k$ (hence the subscripts $t+k|t$). Even when wages are not re-optimized, however, they can still be subject to partial adjustments based on the inflation rates that occur between t and $t+k$.

2.4. **Monetary Policy.** Monetary policy is summarized by a Taylor rule (already expressed in linear form):

$$i_t = \rho i_{t-1} + (1-\rho)\left[\chi_\pi \pi_t + \chi_y y_t\right] + \varepsilon_t. \tag{12}$$

The policy rate, represented by a short-term nominal interest rate i_t, is changed in response to fluctuations of inflation and output. The term ε_t accounts for the unsystematic component of monetary policy.

2.5. **Log-linearized Equations.** After log-linearization of the equilibrium conditions, the economy can be summarized by the following equations[3]

$$(\pi_t - \gamma_p \pi_{t-1}) = \beta \left(E_t \pi_{t+1} - \gamma_p \pi_t \right) + \kappa_p \omega_t + \mu_t \tag{13}$$

$$c_t^w = E_t c_{t+1}^w - (i_t - E_t \pi_{t+1} - r_t^n) \tag{14}$$

$$i_t = \rho i_{t-1} + (1-\rho) \left[\chi_\pi \pi_t + \chi_y y_t \right] + \varepsilon_t \tag{15}$$

$$(\pi_t^\omega - \gamma_\omega \pi_{t-1}) = \beta \left(E_t \pi_{t+1}^\omega - \gamma_\omega \pi_t \right) - \kappa_\omega (\omega_t - (c_t^w - \varphi n_t)) + \mu_t^\omega \tag{16}$$

$$\omega_t = \omega_{t-1} + \pi_t^\omega - \pi_t \tag{17}$$

$$c_t^w = \omega_t + n_t \tag{18}$$

$$c_t^c = d_t \tag{19}$$

$$y_t = \bar{S} c_t^w + (1-\bar{S}) c_t^c. \tag{20}$$

Inequality between capitalists and workers is defined as their relative consumption gap

$$ineq_t = c_t^c - c_t^w.$$

Equation (13) is a typical New Keynesian Phillips curve with indexation, expressed in terms of marginal costs. The inflation rate π_t, in deviation from the portion due to indexation to past inflation $\gamma_p \pi_{t-1}$, is determined by expectations about future inflation deviations from the indexation component, by the marginal cost, here simply driven by real wages ω_t, and by the price-markup, or cost-push, shock μ_t. The parameter $\kappa_p \equiv \frac{(1-\alpha_p)(1-\alpha_p\beta)}{\alpha_p}$ denotes the slope of the Phillips curve and is an inverse function of price stickiness in the goods market. Equation (14) is a log-linearized Euler equation: consumption depends on expected one-period-ahead consumption and on the deviation of the ex-ante real interest rate $(i_t - E_t \pi_{t+1})$ from the real natural rate of interest r_t^n. Equation (15) describes a Taylor rule, which serves as an approximation of historical U.S. monetary policy. Equation (16) represents a Phillips curve for wage inflation. Nominal wage inflation is a function of expected wage inflation and of the markup of the real wage with respect to the marginal rate of substitution between consumption and labor. The equation allows for partial indexation of nominal wages to past inflation through the terms $\gamma_\omega \pi_{t-1}$ and $\gamma_\omega \pi_t$. The parameter $\kappa_\omega \equiv \frac{(1-\alpha_\omega)(1-\alpha_\omega\beta)}{\alpha_\omega(1+\varphi)\epsilon_\omega}$, which governs the slope of the wage Phillips curve, is an inverse function of wage stickiness. The

[3]Lower-case letters denote variables that are expressed as log-deviations from steady state. For example, $c_t^w = \ln C_t^w - \ln \bar{C}^w$.

term μ_t^ω represents a wage-markup disturbance. Equation (17) simply defines the growth rate of real wages as the difference between nominal wage inflation and aggregate price inflation. Equation (18) relates consumption by workers to their labor income, which they consume entirely each period since they are not allowed to borrow. Equation (19) refers to consumption by capitalists: they consume their profit income, in the form of dividends d_t every period. Finally, equation (19) provides a market clearing condition, with output equal to total consumption, and with $\bar{S} = \frac{\epsilon_p - 1}{\epsilon_p}$ and $(1 - \bar{S})$ indicating the labor and profit shares in steady-state (the steady-state labor share here is equal to the inverse of the steady-state price markup over marginal costs).

Four disturbances can perturb the equilibrium: the real natural rate disturbance, the price-markup disturbance, the wage-markup disturbance, and the monetary policy shock. The first three are assumed to evolve as AR(1) processes as

$$r_t^n = \rho_r r_{t-1}^n + \varepsilon_t^r \tag{21}$$

$$\mu_t = \rho_\mu \mu_{t-1} + \varepsilon_t^\mu \tag{22}$$

$$\mu_t^\omega = \rho_\omega \mu_{t-1}^\omega + \varepsilon_t^\omega, \tag{23}$$

whereas the monetary policy shock ε_t is *i.i.d.*

3. Data and Structural Bayesian Estimation

I estimate the structural model using full-information Bayesian methods. The model is estimated to match the following observable variables: real consumption growth (using the Personal Consumption series from FRED,[4] with acronym 'PCE', deflated using the Personal Consumption Expenditures deflator with acronym 'PCEPI'), GDP Implicit Price Deflator inflation (acronym 'GDPDEF'), the Federal Funds rate (acronym 'FEDFUNDS'), the growth rate in real wages (acronym 'COMPRNFB', using real hourly compensation for all workers in the non-farm business sector), and the growth rate of real corporate profits (acronym 'CPROFIT', deflated using the GDP Implicit Price Deflator 'GDPDEF'). To account for the Zero-Lower Bound in the policy rate between 2009 and 2015, and in 2020, and to account for the adoption of unconventional monetary policy tools, I use Wu and Xia (2016)'s shadow rate series for periods of binding ZLB.[5] I allow for measurement error, modeled as AR(1)

[4]The Federal Reserve Economic Data set maintained by the Federal Reserve Bank of St. Louis.

[5]This choice prevents the model from becoming nonlinear with the addition of a ZLB constraint.

similar to equations (21)-(23), for the corporate profits variable.[6] The full sample includes quarterly data from the second quarter of 1959 to the second quarter of 2024. In addition to the full sample, I will also repeat the estimation to investigate time variation among the sub-samples, including the pre-Volcker period (1959-1979), the post-Volcker/Great Moderation sample (1982-2007), the post-Great Moderation/post-Financial Crisis sample (2008-2019), and the COVID and its aftermath sample (2020-2024). Figure 1 displays the five series that are used as observables in the estimation.

I fix the discount rate β to 0.99, as customary, and the elasticity of labor supply $\varphi = 1$, as in Broer et al. (2020). The share $\bar{S}$ is equal to $\frac{\epsilon_p - 1}{\epsilon_p}$ in steady-state: I fix $\epsilon_p = 11$ to imply a profit share of total income around 9%, which is consistent with what observed in the data. I fix ϵ_w to the same value.

The remaining parameters are estimated. The prior selections are reported in Table 1 and are consistent with typical choices in the empirical DSGE literature. Beta distributions are assumed for the parameters that have domain between zero and one. The priors for γ_p, γ_ω, and the autoregressive coefficients ρ_j, $j = r, \mu, \omega, d$ are diffuse: they place comparable probability mass on all values excepts those at the boundaries of the interval. The Beta priors for the Calvo price and wage stickiness parameters are more informative: given that the micro evidence points toward price and wages that are reset, on average, every three or four quarters, I assume Beta distributions with mean 0.66 (implying a three-quarter duration) and standard deviation 0.15.[7] The inertia in the policy rule is similarly subject to a more informative prior, with mean 0.7, given the history of gradualism in Fed's policy. The remaining Taylor rule parameters follow Normal prior distributions with means 1.5 for inflation and 0.125 for output.

I use the Metropolis-Hastings algorithm to generate draws from the posterior distribution. I run chains consisting of 500,000 draws for each estimation, discarding the initial 25% as burn-in period. Posterior means and 90% Highest-Posterior Density intervals are reported in the next section.

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[6]With this choice, the exogenous term related to dividends is not assigned an interpretation as a structural disturbance. Adding an ad-hoc shock to dividends in the model leads to similar results, but the shock could hardly be considered structural.

[7]I experimented with prior mean equal to 0.75, with similar results. Later, I will discuss results obtained under a tighter Beta(0.5,0.1) prior.

4. Results

4.1. **Posterior Estimates.** Table 1 reports the posterior mean estimates for the model parameters along with 90% Highest Posterior Density intervals. The baseline estimation refers to the full sample, spanning the years between 1959 and 2024. Later, I will investigate the time variation across different subsamples.

Some of the key parameters that influence the effects of shocks on consumption and inequality are the degrees of price and, particularly, wage stickiness α_p and α_ω. The estimates point toward substantial nominal rigidities in both prices and wage, with Calvo parameters estimated at 0.947 and 0.921. The data indicate also large degrees of price and nominal wage indexation to lagged inflation, with mean estimates equal to 0.617 for γ_p and 0.632 for γ_ω.

The degrees of stickiness are on the high side of the ranges of estimates in the literature. Given the importance that wage stickiness in particular plays in the model, I refrained from imposing a tighter prior, and decided to let the data inform their value. An alternative would be to follow Smets and Wouters (2007) in using a Beta(0.5,0.1) prior, hence with a narrower distribution around a lower mean. I re-estimated the model under this prior and obtained a value equal to 0.85 (some of the results for this case are discussed in Section 4.4). The higher estimates of wage rigidity may be consistent with the micro evidence: Barattieri et al. (2014) find probabilities of wage change between 5% (for salaried workers) and 18% (for hourly workers) per quarter; Gottshalk (2005) obtains a resetting probability of 11%. Macro estimates, on the other hand, often imply a slighly lower rigidity. In this model, the higher estimates may be due to its simplified structure. For example, in Christiano et al. (2005), the estimated degrees of stickiness rise in the specifications without large adjustment costs or variable capital utilization rates.

The estimates for the Taylor rule parameters are in line with the literature, with reaction coefficients to inflation equal to 1.571 and to output equal to 0.08; as known, Federal Reserve's policy is extremely gradual, with an interest-smoothing term estimated at 0.802.

Turning to exogenous disturbances, the natural real rate has the highest persistence, with autoregressive coefficient 0.963; the shocks related to price-markup, wage-markup, and dividends, display very little inertia. The standard deviation is much larger for the exogenous term related to the growth rate of corporate profits, reflecting the more pronounced variability of this variable around the corresponding steady state.

4.2. **Shocks, Monetary Policy, and Inequality.** Theoretical and calibrated models cannot unequivocally clarify the effects of monetary policy on the relative consumption of workers and capitalists. The overall impact of monetary policy and the implied redistributive consequences, in fact, heavily depend on the degree of rigidity in wage setting, as shown in Broer et al (2020). With flexible wages, income and substitution effects from wage changes cancel out in the model, and hours of work don't respond. Consumption responses by workers and capitalists to policy shocks have opposite signs. When wages respond sluggishly, on the other hand, workers' labor hours must adjust to the labor demand by firms in the short run. Labor and profit income now respond with the same sign and are both procyclical. The redistributional effects of monetary policy are smaller than under flexible wages.

The estimation of the model is therefore essential due to the wide range of potential outcomes and implications that can arise simply based on theory.

Figure 2 presents the impulse responses to a contractionary, one-standard-deviation, monetary policy shock, for some of the main variables in the model: the consumption of workers, the consumption of capitalists, our inequality between workers and capitalists measure, output, inflation, real wages, and interest rates.[8] As shown in the Figure, contractionary monetary policy shocks lead to declines in both workers' and capitalists' consumption levels (given the estimated degree of wage stickiness, the two responses have the same sign). Consumption drops relatively more for workers; therefore, inequality increases in response to rising rates. Inflation and real wages also decline in response. The positive relationship between contractionary monetary policy and inequality mirrors the evidence that has been identified from individual-level consumer data (e.g., Coibion et al., 2017). Monetary policy retains large effects on output. As discussed in Broer et al. (2020), the real effects of monetary policy are obtained here in a model in which profits respond procyclically, as they do in the data, rather than countercyclically, as in the representative-agent New Keynesian model.

Figure 3 shows the responses of the same variables to inflationary shocks (an increase in the exogenous component of the price markup, which can account for an increase in goods market concentration). Positive inflationary shocks have substantially larger effects on inequality in the model: workers suffer from lower consumption due to declining real wages, with their nominal counterparts adjusting extremely sluggishly in response to rising

[8]The impulse responses are computed at each draw, and the figure shows the mean across MCMC draws, along with posterior probability bands.

inflation, as a consequence of nominal rigidities and only limited indexation; capitalists, on the other hand, fare better since dividends offer stronger protection toward inflation. When inflation increases, aggregate demand is stimulated, while nominal wages remains relatively flat. Therefore, firms' costs decline, profits improve, leading to higher dividend payments to capitalist households.

Opposite effects are found when the original impulse reflects wage markup shocks (Figure 4). Positive wage markup shocks capture exogenous increases in the bargaining power of workers relative to the bargaining power of firms, which lead to higher wages relative to marginal rates of substitution between consumption and labor. Positive wage markup shocks lead to rising workers' consumption (at least initially, since it undershoots for few quarters before reverting back to steady state later) and strong declines in capitalists' consumption (as capitalists own the firms in the model, higher wages increase costs and decrease profits for them). As a result, relative inequality drops, with workers comparatively better off and capitalists comparatively worse off than before the shock. Output declines, inflation rises (although at a ratio of one to ten compared with wages), and interest rates move higher due to the corresponding reaction of monetary policy.

Finally, Figure 5 focuses on the responses to a positive demand shock (a negative shock to the real natural rate r_t^n). Consumption, output, inflation, wages, and interest rates all increase. Demand shocks lead to stronger and more persistent effects for workers; as a result, they lead to persistent reductions in inequality.

To summarize, shocks that generate inflation cause a substantial increase in inequality. Contractionary monetary policy, possibly implemented in reaction to bursts in inflation, exacerbate the increase in inequality (although, quantitatively, the impact of monetary policy shocks is smaller than that of inflationary shocks). A strong economy, as exemplified by positive aggregate demand shocks, and improvements in workers' relative bargaining power in the labor market, instead operate in the opposite direction and have the potential to reduce inequality by considerable amounts.

4.3. **Changes over the Sample.** Limiting the results to the full sample estimation may conceal the existence of structural changes in the economy, including regime shifts in policy or in the volatility of shocks. Therefore, I re-estimate the model to analyze structural changes in the parameters over various subsamples. Previous literature has clearly identified a break in macroeconomic regimes around the Volcker years (e.g., Clarida et al., 2000, and Lubik and Schorfheide, 2007). Here, I consider four subsamples: first, the pre-Volcker, stagflation, sample between 1959:II and 1979:IV; second, the post-Volcker, Great-Moderation, sample between 1982:I and 2007:IV; third, the post-Great Moderation sample, including the Financial Crisis and the subsequent Zero-Lower Bound period (2008:I to 2019:IV); finally, the COVID and its aftermath sample, from 2020:I to 2024:II.

All the posterior estimates are reported in Table 2.

Some parameter shifts are evident across the samples. Monetary policy becomes more aggressive toward inflation after Volcker (with posterior means reaching 2.09 until 2007, and then remaining around 1.8 afterwards). The role of output fluctuations for policy decisions, instead, declines monotonically over the sample: from 0.181 until the 1970s, to 0.151 during the Great Moderation, and to 0.088 and 0.012 in the last two subsamples. Policy has become progressively more gradual: the posterior mean for ρ has increased from 0.621 to 0.884.

The degree of price stickiness, on the other hand, remains relatively flat over the whole sample. Wages behave slightly differently, with more flexibility after the Great Recession and additional rigidity around the COVID pandemic. Indexation to past inflation is higher in the 1982-2007 and 2020-2024 samples.

Given the changes in structural coefficients, we compare the impulse responses of inequality and other variables to shocks over time.

Figures 6 and 7 capture how the effects of monetary policy and inflationary shocks on inequality vary over the sample. Inequality always increases in response to monetary policy contractions. But the effects are more muted until 1979; they increase later on in the 1980s, 1990s, and 2000s, and are at their strongest in the years after the Financial Crisis. Inflationary shocks, instead, have more pronounced effects on capital-labor inequality in periods when inflation is high (the 1959-1979 and post-COVID samples), and still positive, but slightly smaller, effects in samples characterized by low and stable inflation.

The figures also show the response of inflation: it can be noted that the effectiveness of monetary policy in controlling inflation appears to have increased over time.

Given that the model allows for multiple structural shocks, it is possible to determine their relative contributions as drivers of inequality. The price and wage markup disturbances explain the largest share. Figure 8 displays the historical decomposition, which makes clear the role of the two shocks for fluctuations in inequality (at business cycle frequencies). The top panel shows the impact of price-markup shocks, which account for time-varying concentrations in less-than-fully-competitive markets (with rising concentrations leading to higher markup margins). This shock plays a role in the late 1990s, early 2000s, and it has an even larger contribution during the COVID pandemic.

The shock that plays the largest role as determinant of inequality, however, is the wage-markup shock, which accounts for shifts in the relative bargaining power of workers in the labor market (here in exogenous fashion). The wage markup shock contributes to lower inequality in the late 1960s and 1970s and it accounts for most of the positive peaks in the second part of the sample. It also accounts in part for fluctuations around the COVID years, although in that case it explains a lower share than the price-markup shock does.

4.4. **Effects of Monetary Policy and Wage Rigidity.** In the estimation, the data indicated sizable degrees of price and wage stickiness. Therefore, the results on the effects of monetary policy lie close to those that Broer et al. (2020) show for the case of fully rigid wages.

The empirical results in this paper fully reaffirm their conclusions. Unlike in a conventional representative-agent New Keynesian model, in which only one source of rigidity (either price or wage stickiness) is sufficient to generate real effects of monetary policy, in the heterogeneous agents model, both rigidities need to be included.

Figure 9 clarifies this by showing the response of output to a contractionary monetary policy shock under different cases. First, under the estimated degree of wage stickiness in the baseline case in Table 1, monetary policy has large effects. The effects are very similar when the degree of wage rigidity is still substantial, but lower ($\alpha_w = 0.85$), as a result of the estimation under a tight prior with lower mean. But when wages are close to flexible ($\alpha_w \to 0$), even though prices remain sticky, monetary policy has no effect on output. Price stickiness by itself is sufficient to generate real effects of monetary policy in the standard New Keynesian model, but these are obtained through a countercyclical, and counterfactual, response of profits. The heterogeneous agent model, with sticky prices and sticky wages, generates a similar transmission of monetary policy, but with a procyclical response of profits that is consistent with the data.[9]

[9]Issues related to the cyclicality of profits and the role it plays in New Keynesian models are also discussed at length in Bilbiee and Känzig (2024).

The figure also shows the impact of policy on inequality: lower wage stickiness increases the magnitude of the response to an interest rate increase, but the two responses are comparable in terms of sign and shape. When wages are flexible, instead, the effects of monetary policy on the distribution of income are extreme. Therefore, as in Broer et al. (2020), with only rigid prices, monetary policy has large effects on income distribution; with the addition of rigid wages, the distributional effects, while still positive, are more contained.

4.5. **Alternative Heterogeneous Agent Frameworks.** The paper's results so far have been based on the assumption that heterogeneity in the economy can be represented as in Broer et al. (2020). It is useful, however, to evaluate the empirical results under alternative setups, such as the Tractable HANK models developed and analyzed in Bilbiie (2008, 2025), Bilbiie et al. (2022), Bilbiie and Känzig (2024), and Bilbiie et al. (2023).

The new framework introduces heterogeneity by dividing agents into savers and hand-to-mouth, rather than workers and capitalists.

For ease of comparison, I estimate the smaller scale specification of the model as in Bilbiie (2025) and Bilbiie and Känzig (2024), rather than the version with capital and investment.[10] The model I use also includes cyclical income risk, introduced by allowing agents to transition between hand-to-mouth and saver state according to Markov chain probabilities. I choose a Beta(0.2,0.05) prior for the share of hand-to-mouth households and find a posterior mean estimate equal to 0.082.[11]

Figure 10 shows the responses of inequality, here defined as consumption inequality, i.e., as the difference between savers and hand-to-mouth consumption, to a contractionary monetary policy shock. The responses appear to be all in line with those obtained for the baseline model, only with different magnitudes.

Bilbiie et al. (2022) study the cyclicality of inequality conditional on monetary policy shocks, finding that inequality is countercyclical, and consumption inequality more countercyclical than income inequality.[12] This paper finds countercyclical inequality in response to

[10]In the estimation, I use the loglinearized equations for the THANK model without capital, reported in Table B.2 in Bilbiie and Känzig (2024), with few modifications, to keep it comparable to Broer et al.'s (2020) specification. The equations used in the estimation are shown in Appendix A.

[11]The estimate is somewhat sensitive to the prior. Bilbiie et al.(2023) choose to fix the parameter at 0.2. For our purposes, the main conclusions remain similar if we fix the parameter at the same value. Table A1 shows the full set of estimates.

[12]I do not study the relation between consumption and income inequality in Broer et al.'s (2020) model, since they would be identical by construction.

monetary policy regardless of whether the model is based on Broer et al. (2020) or Bilbiie and Känzig (2024).

In addition, the figure shows that inequality declines in response to a decrease in the natural rate disturbance (a positive demand shock) and worsens in response to inflationary price markup shocks. Positive wage markup shocks reduce inequality, since they benefit hand-to-mouth agents in the same way as they did for workers.

The medium-scale version of Bilbiie's (2025) framework, incorporating capital and several frictions, has already been estimated in Bilbiie et al. (2023). The paper includes inequality variables in the estimation, based on the cross-sectional standard deviations of labor earnings and disposable income. They show impulse responses for hand-to-mouth and saver households' consumption and income, finding that they both respond countercyclically (with hand-to-mouth responding more strongly).

Overall, the main results in this paper are consistent with those in other setups, probably falling on the lower end of the response of inequality. The paper's findings emphasize once more the role played by wage rigidity, and also how differences in opportunities for intertemporal smoothing by different agents may play a role for the size of responses.

4.6. **Cyclicality of Consumption Inequality.** The previous sections have shown that inequality is countercyclical conditional to monetary policy and other demand shocks. The results are consistent with the existing evidence from several empirical studies, such as Coibion et al. (2017), who show that expansionary policy reduces consumption and income inequality using U.S. data from the Consumer Expenditure Survey. Ampudia et al. (2018) find similar results on Euro data, Mumtaz and Theophilopoulou (2017) using U.K. data, and Furceri et al. (2018), using panel data from 32 countries.

Although the paper doesn't directly use data on inequality besides series to capture the distribution of factor income, the results can also connect to a different literature, which aims to study whether consumption by low-income or high-income households responds more to changes in output. By simulating the model under the estimated parameters, I can compare the cyclicality of consumption for workers and capitalists: the former has a correlation with output equal to 0.845, the latter equal to 0.56. If we look at the correlation between the growth rates of consumption by the two types of agents in the model, and the growth rate of actual Real GDP, the coefficients become 0.82 for workers and 0.33 for capitalists.

Therefore, the results are consistent with those in the empirical literature, which finds that cyclicality is stronger at the bottom of the income distribution (e.g., Guvenen et al., 2014, Heathcote et al., 2023).

5. Conclusions, Limitations, and Future Directions

This paper has estimated a New Keynesian model with heterogeneous agents, split between workers, who supply labor and receive income in the form of wages, and capitalists, who own firms and receive profits in the form of dividends. The estimation sheds lights on the interplay between inflation, monetary policy, and the distribution of income, in the context of a structural macroeconomic model.

The empirical results show that inflationary shocks and contractionary monetary policy responses lead to increases in inequality, measured here as the gap between capitalists and workers' income or consumption. Monetary policy has led to particularly negative effects toward inequality in the years after the Financial Crisis and the COVID pandemic.

The estimation also identifies wage markup disturbances (and, to a slightly smaller extent, price markup disturbances) as major contributors of fluctuations in inequality over the sample.

Given the broad nature of the income distribution topic, it is sensible to highlight some limitations of the analysis presented thus far. The distribution of income included in the model is extremely simple: it is meant to capture the division of income between labor and capital in a society with extremely concentrated wealth. Models that allow us to deal with a more granular wealth distribution are available but have larger scale, are more computationally intensive, and are still very challenging to estimate. Even within a more standard New Keynesian framework, one can envision alternative ways to separate between workers and capitalists. In the model, workers can invest in bonds, they cannot borrow, and they don't invest in equity shares or receive dividends. It is possible to soften the borrowing constraint, and allow workers to have a broader participation in asset markets and more opportunities for intertemporal substitution. The problem of capitalists can potentially be complicated, for example, by introducing a portfolio allocation problem. The paper has compared the results to those obtained under an alternative specification, which separates agents into savers and hand-to-mouth. The analysis clearly highlights the need for more research investigating similarities and differences in the interactions between inequality and business cycle variables across different model specifications.

The main interest of the paper was to analyze the role of monetary policy and inflation. Other types of policies are clearly relevant for income distribution: fiscal policy, labor market policies, and other redistribution policies, may be considered. Given that wage markup shocks have been found to be important, and that they reflect exogenous, unmodeled, shifts in the relative bargaining power of workers (or possibly unions), a next step would be to introduce a more detailed model of the labor market, by introducing search and matching frictions.[13]

The paper has followed the convention in the literature of assuming that expectations are formed according to the rational expectations hypothesis. However, subjective, behavioral, expectations can interact with inequality and reinforce the results. For example, inequality can breed pessimism for households in lower quintiles of the income distribution, and additional optimism for those in the upper quintiles. Extra pessimism and optimism across the income distribution is, in fact, observed using survey data about future aggregate income and inflation from the University of Michigan Survey of Consumers. In the survey, low-income responders tend to be more pessimistic than high-income responders about the trajectory of the economy, as they conflate aggregate and individual experiences. Expectations in the model can, therefore, be allowed to depart from rational expectations, and they can incorporate behavioral elements and positive/negative sentiment as in Milani (2007, 2011, 2017).

Finally, the analysis has focused only on the case of the United States. The interactions among monetary policy, macro shocks, and capital-income inequality, may differ to some extent across countries.

[13] Ravn and Sterk (2018) extend the HANK framework in this direction.

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Appendix A. Alternative HANK Specification

This Appendix shows the loglinearized equations for the alternative HANK specification estimated in Section 4.5. The model is based on a slightly modified version of Bilbiie (2025) and Bilbiie and Känzig (2024):[14]

$$(\pi_t - \gamma_p \pi_{t-1}) = \beta \left(E_t \pi_{t+1} - \gamma_p \pi_t \right) + \kappa_p \omega_t + \mu_t \tag{24}$$

$$c_t^S = s E_t c_{t+1}^S + (1-s) E_t c_{t+1}^H - (i_t - E_t \pi_{t+1} - r_t^n) \tag{25}$$

$$i_t = \rho i_{t-1} + (1-\rho) \left[\chi_\pi \pi_t + \chi_y y_t \right] + \varepsilon_t \tag{26}$$

$$\left(\pi_t^\omega - \gamma_\omega \pi_{t-1} \right) = \beta \left(E_t \pi_{t+1}^\omega - \gamma_\omega \pi_t \right) - \kappa_\omega (\omega_t - (c_t^w - \varphi n_t)) + \mu_t^\omega \tag{27}$$

$$\omega_t = \omega_{t-1} + \pi_t^\omega - \pi_t \tag{28}$$

$$c_t^H = \frac{1}{\mathcal{M}} (\omega_t + n_t) + t_t^H \tag{29}$$

$$t_t^H = \frac{\tau^D}{\lambda} d_t \tag{30}$$

$$d_t = y_t - \frac{1}{\mathcal{M}} (\omega_t + n_t) \tag{31}$$

$$c_t = \lambda c_t^H + (1-\lambda) c_t^S \tag{32}$$

$$y_t = n_t \tag{33}$$

$$y_t = c_t \tag{34}$$

[14]For consistency with the estimated Broer et al. (2020)'s model, I add price and wage indexation, assume constant returns to scale in the production function, and a unitary elasticity of intertemporal substitution. The definitions of variables and parameters are as in the original paper.

Param.	**Prior Distr.**	**Posterior Distributions**
Structural		
γ_p	B(0.5,0.2)	0.617 [0.04,0.81]
γ_ω	B(0.5,0.2)	0.632 [0.45,0.81]
α_p	B(0.66,0.15)	0.947 [0.93,0.96]
α_ω	B(0.66,0.15)	0.921 [0.83,0.99]
Policy		
ρ	B(0.7,0.2)	0.802 [0.77,0.83]
χ_π	N(1.5,0.25)	1.571 [1.40,1.74]
χ_y	N(0.125,0.0625)	0.080 [0.05,0.11]
Shocks & M.E.		
ρ_r	B (0.5,0.2)	0.963 [0.95,0.98]
ρ_μ	B (0.5,0.2)	0.177 [0.01,0.72]
ρ_ω	B (0.5,0.2)	0.048 [0.01,0.08]
ρ_d	B (0.5,0.2)	0.098 [0.03,0.16]
$100 \cdot \sigma_r$	Γ^{-1}(0.30,3)	0.151 [0.10,0.20]
$100 \cdot \sigma_\mu$	Γ^{-1}(0.30,3)	0.242 [0.08,0.30]
$100 \cdot \sigma_\varepsilon$	Γ^{-1}(0.30,3)	0.237 [0.22,0.26]
$100 \cdot \sigma_\omega$	Γ^{-1}(0.30,3)	0.860 [0.78,0.94]
$100 \cdot \sigma_d$	Γ^{-1}(1.00,3)	9.88 [9.19,10.60]

TABLE 1. Posterior Estimates: Baseline Estimation (Full Sample: 1959-2024).
Note: The Table reports mean posterior estimates, along with 5% and 95% percentiles.

Param.	**Posterior Distributions**			
	(1959-1979)	**(1982-2007)**	**(2008-2019)**	**(2020-2024)**
Structural				
γ_p	0.206 [0.02,0.41]	0.755 [0.63,0.90]	0.325 [0.06,0.59]	0.579 [0.28,0.89]
γ_ω	0.427 [0.22,0.64]	0.649 [0.41,0.92]	0.489 [0.17,0.82]	0.659 [0.41,0.91]
α_p	0.915 [0.88,0.96]	0.939 [0.92,0.96]	0.936 [0.90,0.97]	0.899 [0.84,0.96]
α_ω	0.859 [0.79,0.94]	0.806 [0.71,0.91]	0.689 [0.52,0.77]	0.913 [0.85,0.99]
Policy				
ρ	0.621 [0.53,0.72]	0.826 [0.79,0.86]	0.880 [0.84,0.92]	0.884 [0.84,0.92]
χ_π	0.710 [0.52,0.90]	2.090 [1.79,2.38]	1.819 [1.48,2.14]	1.82 [1.49,2.15]
χ_y	0.181 [0.12,0.24]	0.151 [0.10,0.20]	0.088 [0.04,0.14]	0.012 [0.00,0.03]
Shocks & M.E.				
ρ_r	0.953 [0.92,0.99]	0.963 [0.94,0.99]	0.967 [0.95,0.98]	0.697 [0.45,0.95]
ρ_μ	0.575 [0.28,0.93]	0.141 [0.01,0.26]	0.405 [0.13,0.66]	0.315 [0.07,0.56]
ρ_ω	0.100 [0.02,0.17]	0.179 [0.05,0.30]	0.080 [0.01,0.14]	0.233 [0.08,0.39]
ρ_d	0.212 [0.07,0.35]	0.122 [0.03,0.21]	0.142 [0.02,0.25]	0.290 [0.07,0.49]
$100 \cdot \sigma_r$	0.149 [0.09,0.21]	0.120 [0.09,0.15]	0.107 [0.07,0.14]	0.544 [0.14,0.94]
$100 \cdot \sigma_\mu$	0.155 [0.08,0.23]	0.163 [0.13,0.20]	0.167 [0.10,0.24]	0.460 [0.26,0.65]
$100 \cdot \sigma_\varepsilon$	0.233 [0.20,0.27]	0.169 [0.14,0.19]	0.132 [0.11,0.16]	0.248 [0.17,0.33]
$100 \cdot \sigma_\omega$	0.592 [0.50,0.68]	0.663 [0.55,0.78]	1.154 [0.94,1.37]	1.280 [0.88,1.67]
$100 \cdot \sigma_d$	8.305 [7.28,9.34]	8.261 [7.32,9.18]	10.59 [8.78,12.3]	17.59 [15.4,19.9]

TABLE 2. Posterior Estimates: Structural Changes over Sub-Samples.
Note: The Table reports mean posterior estimates, along with 5% and 95% percentiles. The estimations refer to four samples: pre-Volcker (1959-79), Great Moderation (1982-2007), post-Financial Crisis (2008-19), post-COVID (2020-2024).

Param.	Prior Distr.	Posterior Distributions
Structural		
γ_p	B(0.5,0.2)	0.069 [0.01,0.12]
γ_ω	B(0.5,0.2)	0.625 [0.46,0.79]
α_p	B(0.66,0.15)	0.957 [0.94,0.97]
α_ω	B(0.66,0.15)	0.893 [0.85,0.94]
λ	B(0.2,0.05)	0.082 [0.01,0.14]
Policy		
ρ	B(0.7,0.2)	0.809 [0.78, 0.84]
χ_π	N(1.5,0.25)	1.183 [1.00,1.37]
χ_y	N(0.125,0.0625)	0.104 [0.08,0.13]
Shocks & M.E.		
ρ_r	B (0.5,0.2)	0.971 [0.96, 0.99]
ρ_μ	B (0.5,0.2)	0.757 [0.70,0.82]
ρ_ω	B (0.5,0.2)	0.053 [0.01,0.09]
ρ_d	B (0.5,0.2)	0.111 [0.04,0.18]
$100 \cdot \sigma_r$	Γ^{-1}(0.30,3)	0.144 [0.12,0.17]
$100 \cdot \sigma_\mu$	Γ^{-1}(0.30,3)	0.077 [0.06,0.09]
$100 \cdot \sigma_\varepsilon$	Γ^{-1}(0.30,3)	0.246 [0.22, 0.27]
$100 \cdot \sigma_\omega$	Γ^{-1}(0.30,3)	0.855 [0.78,0.93]
$100 \cdot \sigma_d$	Γ^{-1}(1.00,3)	5.128 [4.75,5.49]

TABLE A1. Posterior Estimates: Bilbiie's THANK Model.
Note: The Table reports mean posterior estimates, along with 5% and 95% percentiles.

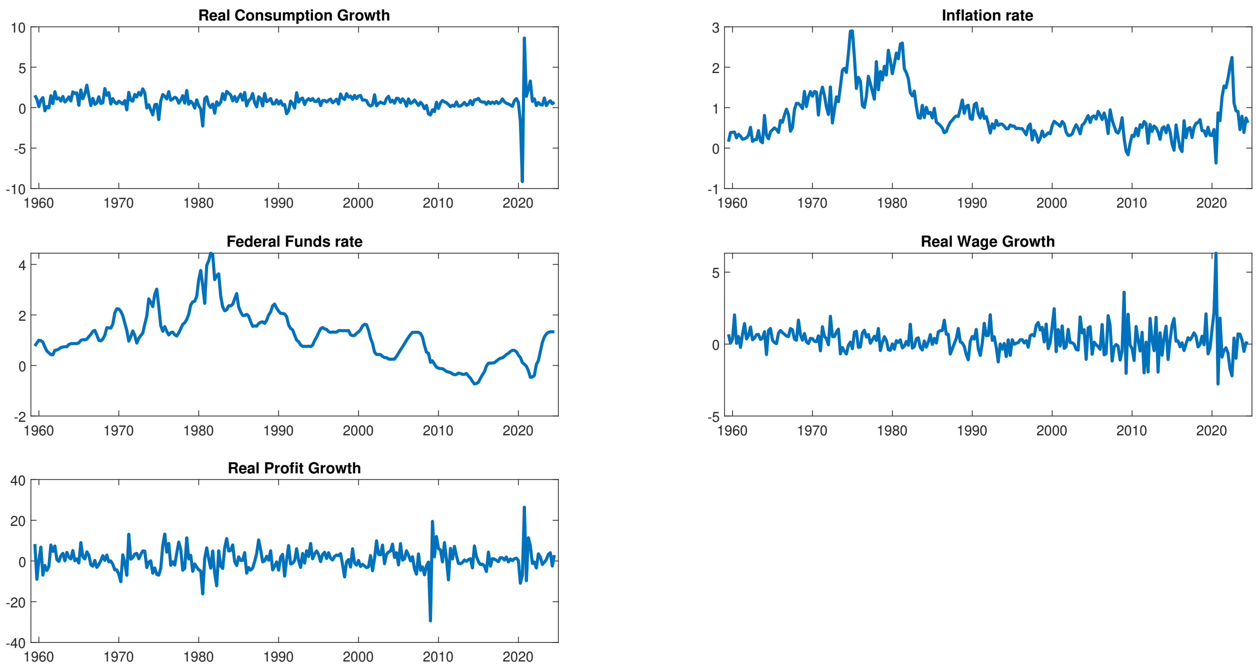

FIGURE 1. Data Series used as observable variables to be matched in the estimation.

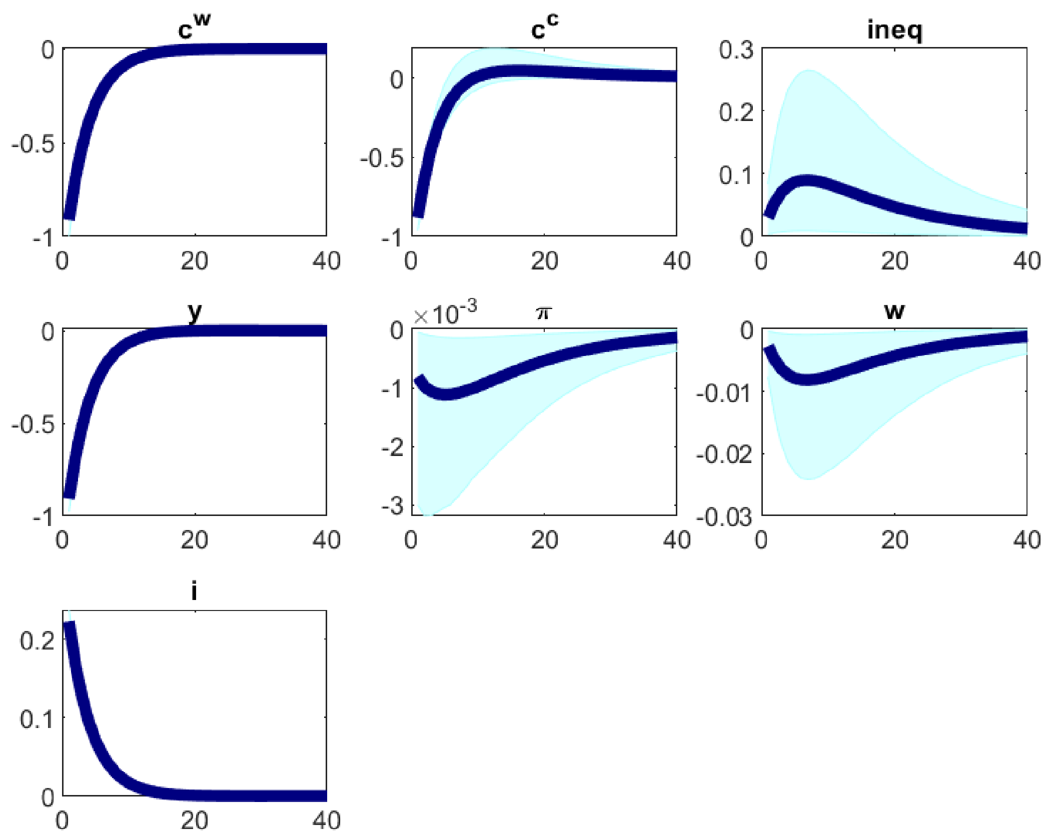

FIGURE 2. Impulse Responses to Contractionary Monetary Policy Shock.

Note: Impulse response functions refer to the full sample (1959-2024) estimation. The graphs show mean responses across MCMC draws (in dark blue) and 90% posterior bands (in celeste). From upper left, the figure shows responses of workers' consumption, capitalists' consumption, inequality, inflation, real wages, and the nominal interest rate.

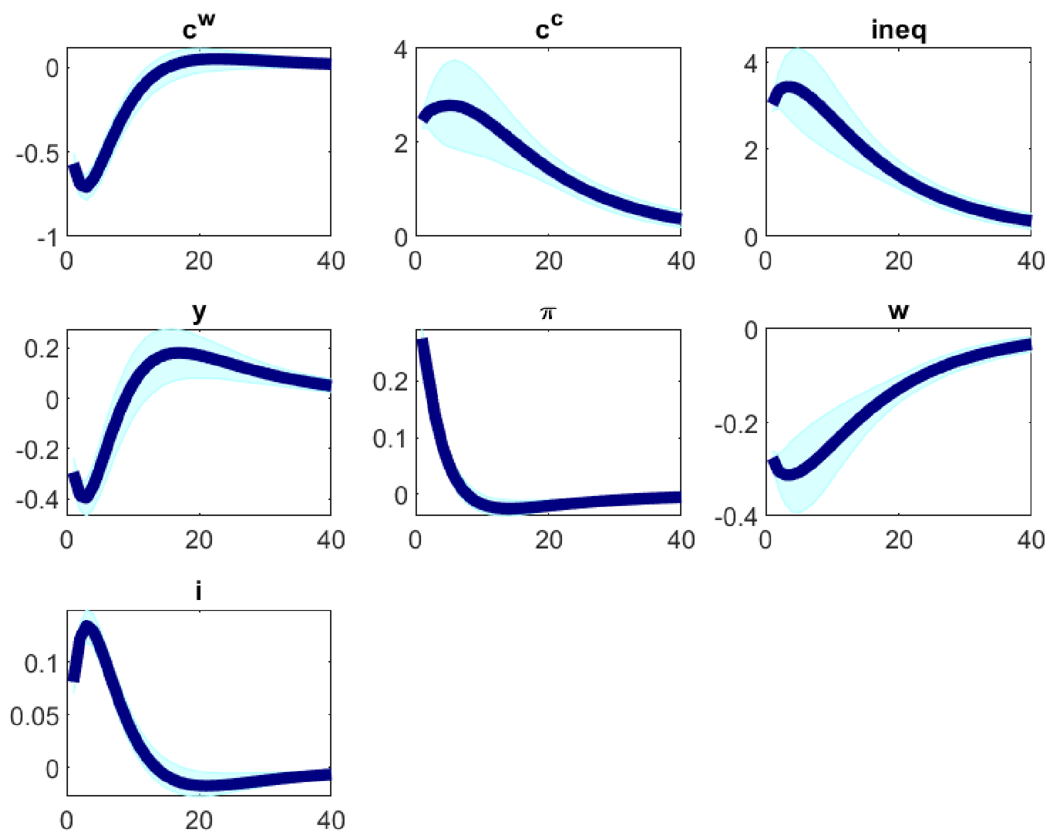

FIGURE 3. Impulse Responses to Inflationary Price-Markup Shock.

Note: Impulse response functions refer to the full sample (1959-2024) estimation. The graphs show mean responses across MCMC draws (in dark blue) and 90% posterior bands (in celeste). From upper left, the figure shows responses of workers' consumption, capitalists' consumption, inequality, inflation, real wages, and the nominal interest rate.

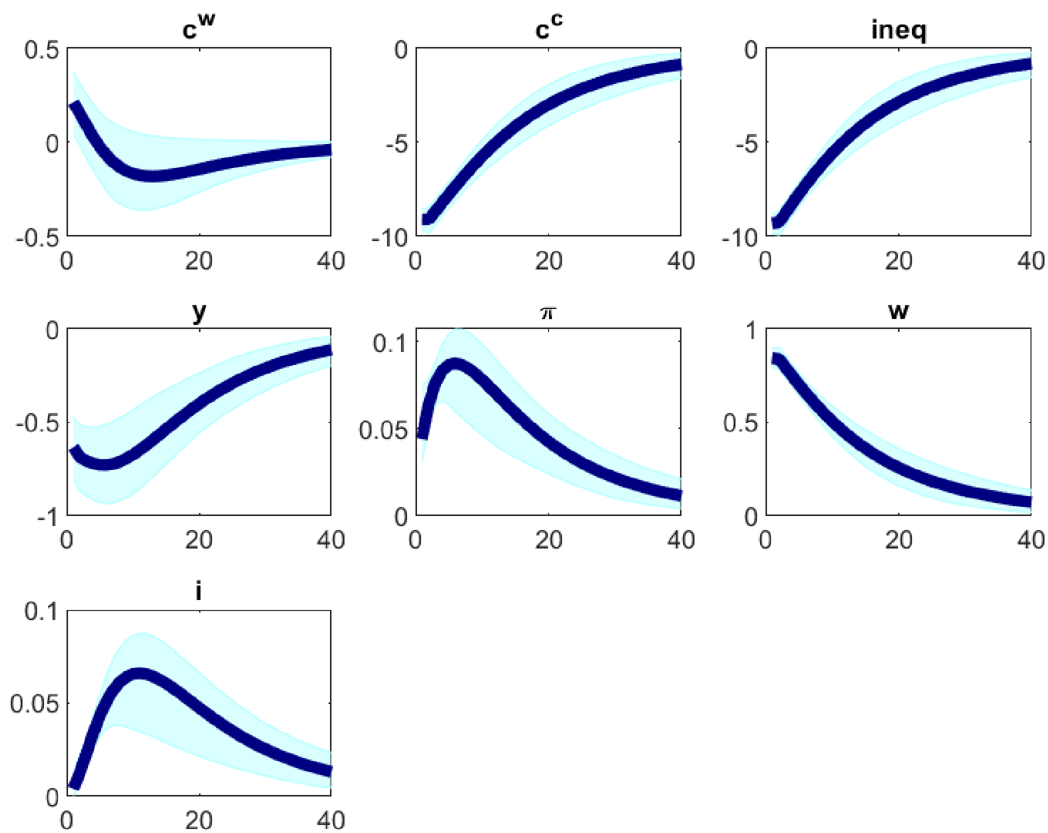

Figure 4. Impulse Responses to Wage Markup Shock.

Note: Impulse response functions refer to the full sample (1959-2024) estimation. The graphs show mean responses across MCMC draws (in dark blue) and 90% posterior bands (in celeste). From upper left, the figure shows responses of workers' consumption, capitalists' consumption, inequality, inflation, real wages, and the nominal interest rate.

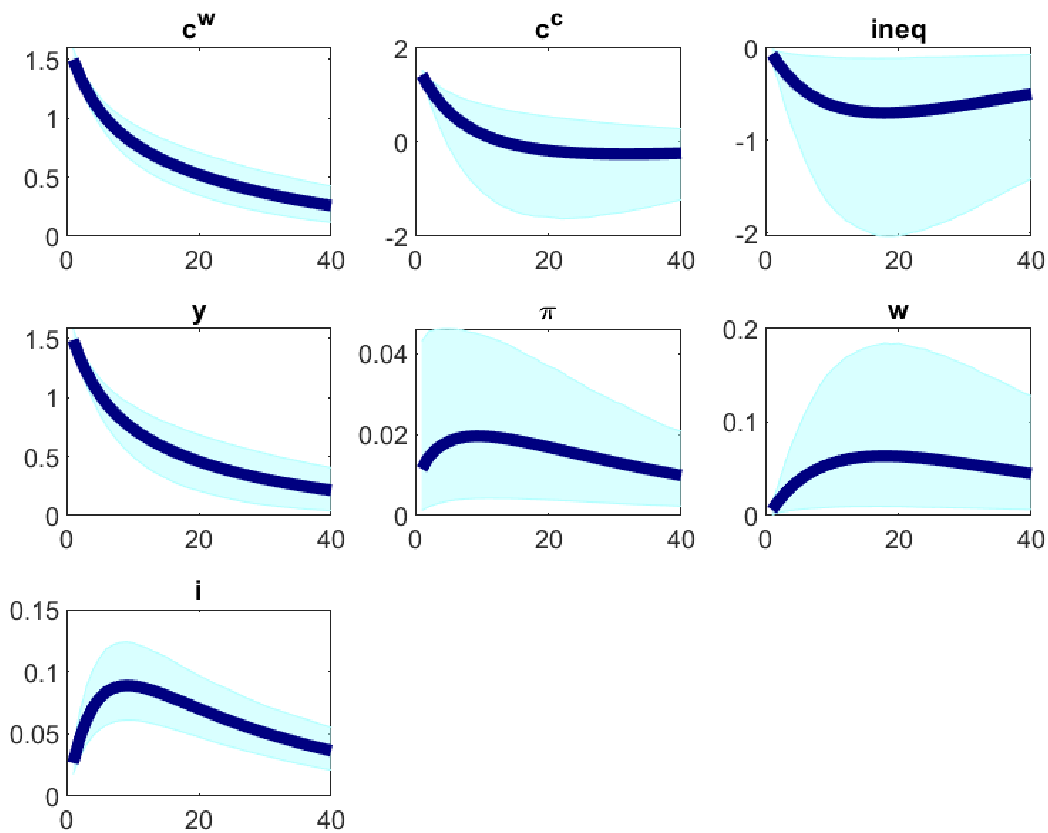

FIGURE 5. Impulse Responses to Negative Natural Rate Shock (Positive Demand Shock).

Note: Impulse response functions refer to the full sample (1959-2024) estimation. The graphs show mean responses across MCMC draws (in dark blue) and 90% posterior bands (in celeste). From upper left, the figure shows responses of workers' consumption, capitalists' consumption, inequality, inflation, real wages, and the nominal interest rate.

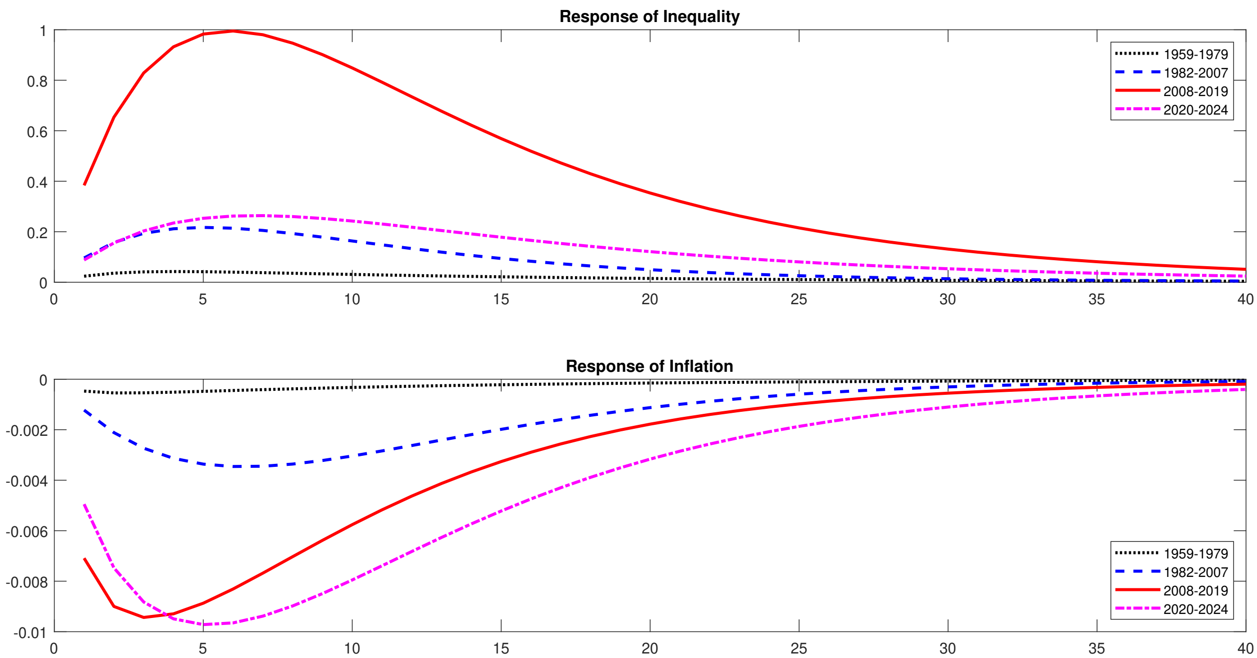

Figure 6. Impulse Responses to Contractionary Monetary Policy Shocks over Different Sub-Samples.

Note: The top panel shows impulse responses of inequality to a contractionary monetary policy shock over the four sub-samples. The bottom panel shows the response of inflation. The lines represents means across MCMC draws.

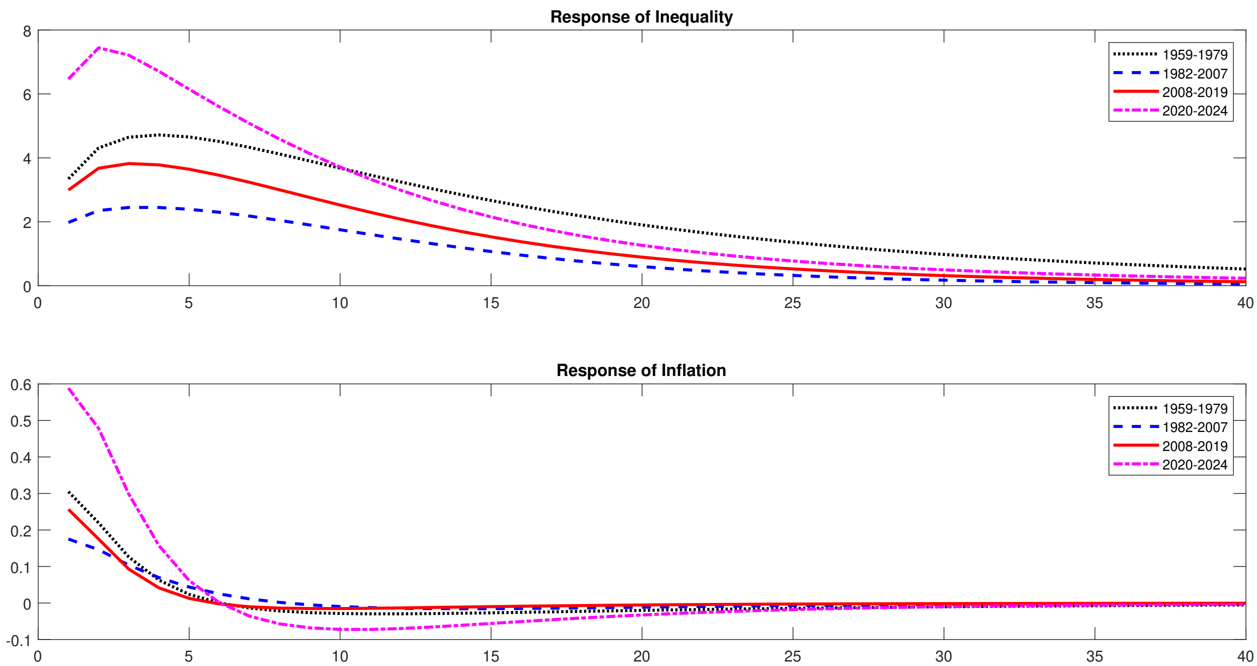

Figure 7. Impulse Responses to Inflationary Price-Markup Shocks over Different Sub-Samples.

Note: The top panel shows impulse responses of inequality to a positive price-markup shock over the four sub-samples. The bottom panel shows the response of inflation. The lines represents means across MCMC draws.

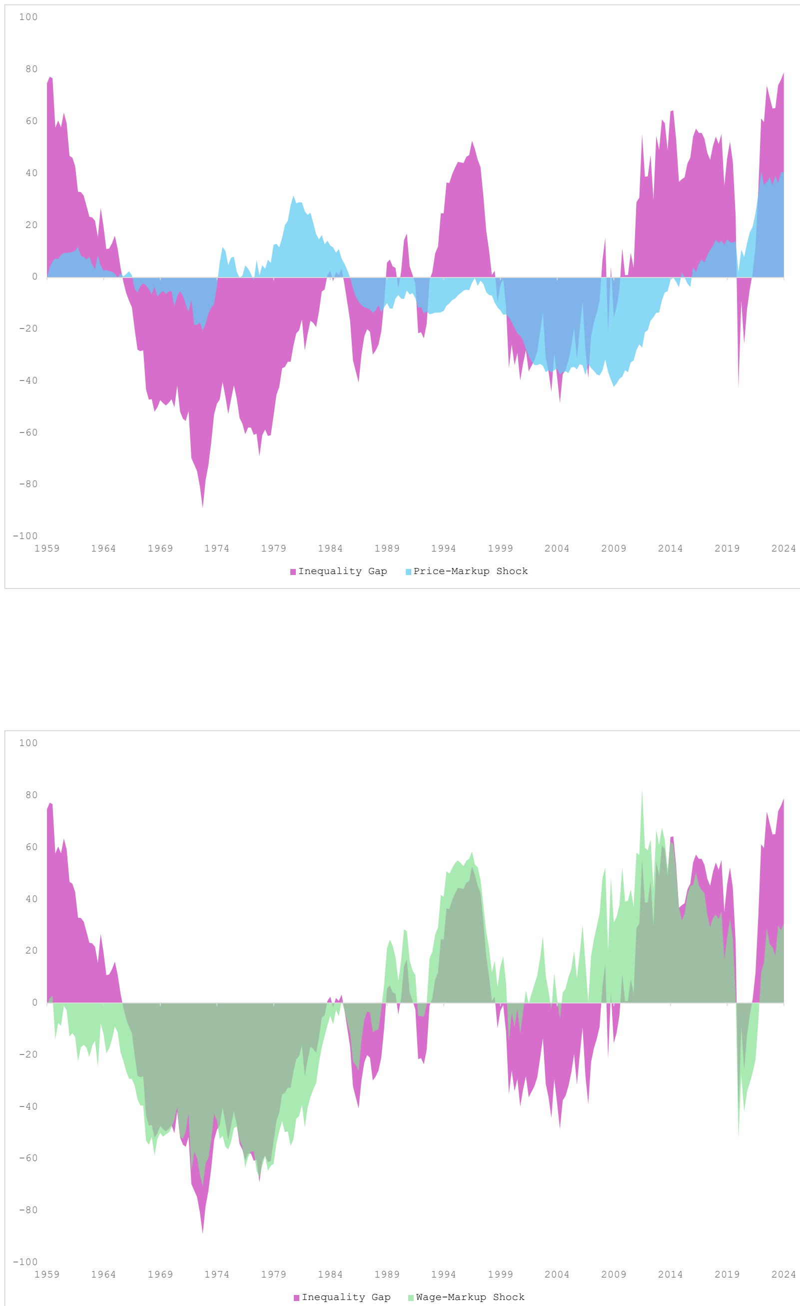

FIGURE 8. Historical Shock Decomposition.

Note: The figure shows the evolution of the inequality gap (in pink) along with the contribution of the price-markup shock (top panel, in turquoise) and the wage-markup shock (bottom panel, in green).

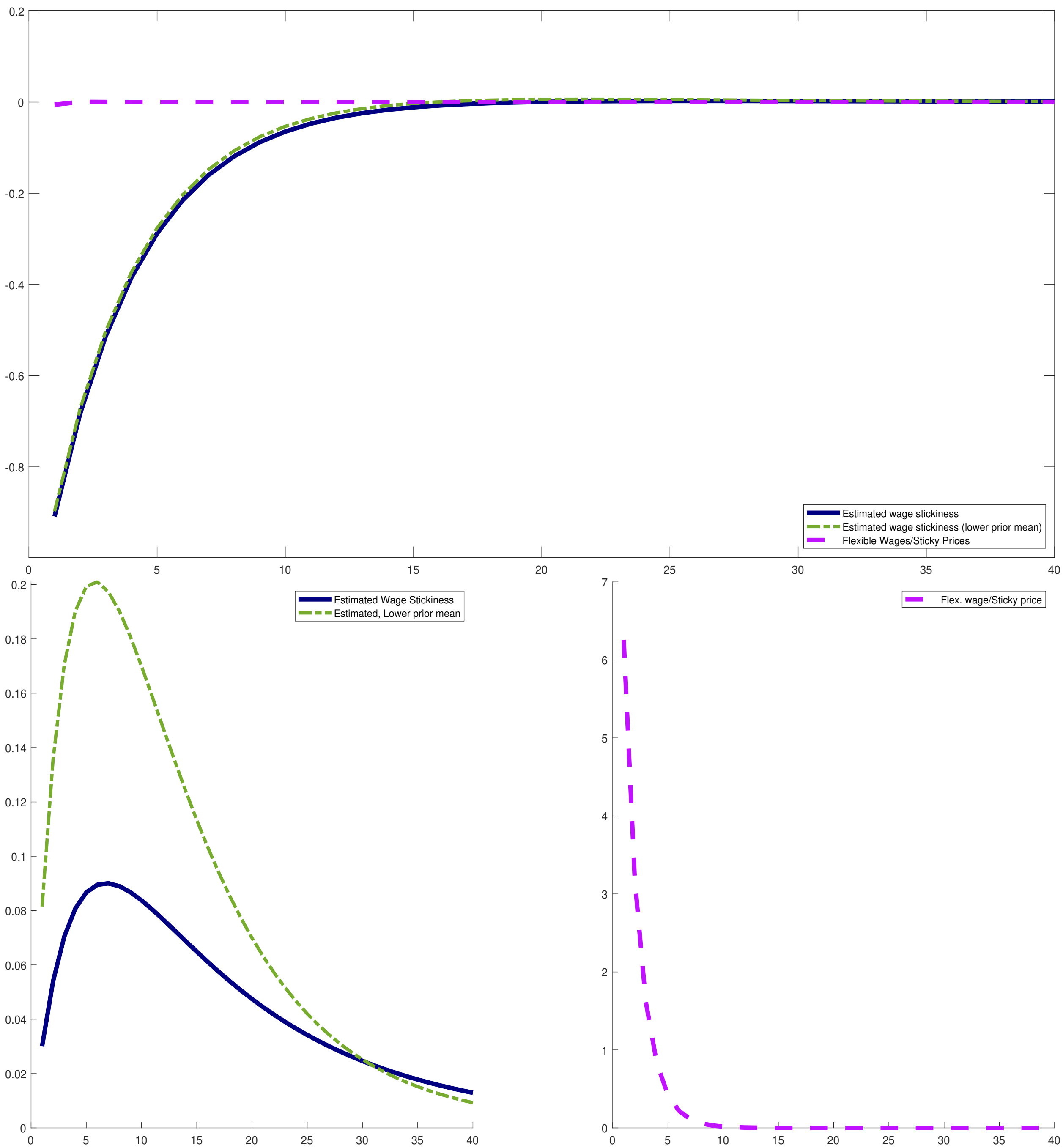

FIGURE 9. Monetary Policy Effects and Wage Rigidity

Note: The top figure shows the impulse responses of output to a contractionary monetary policy shock under different degrees of wage rigidity (estimated in baseline version, estimated under a lower prior mean, and flexible wages). The bottom figures show the impulse responses of inequality under wage stickiness (left) and flexible wages (right).

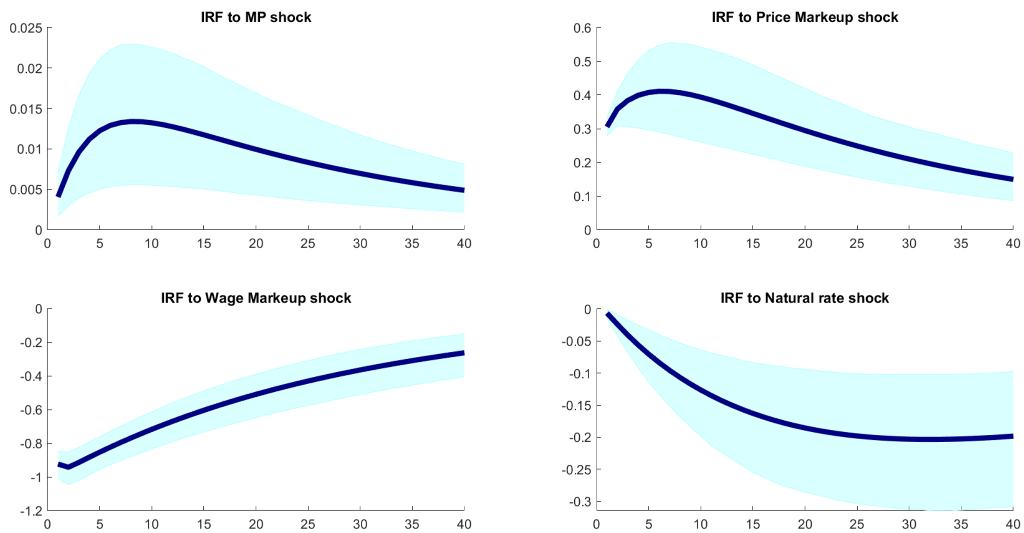

FIGURE 10. Impulse Responses of Inequality to shocks in Bilbiie's model.

Note: The figures show the impulse responses of inequality to monetary policy, price markeup, wage markup, and natural rate shocks.