

# Unfunded Fiscal Policy with Heterogeneity in Household Portfolios\*

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## Abstract

I examine the macroeconomic and distributional consequences of unfunded fiscal policy using a heterogeneous-agent New Keynesian model with incomplete markets, endogenous portfolio choice, and long-term nominal debt. Unfunded expansions—policies not backed by higher expected future primary surpluses—operate through price-level revaluation and portfolio rebalancing: inflation lowers the real value of outstanding nominal debt, shifts wealth from nominal creditors toward net debtors, and raises spending by high-MPC households. In the calibrated economy, unfunded government purchases and unfunded transfers generate essentially the same short-run transmission and deliver materially larger multipliers than funded policies. Distributionally, unfunded policy compresses consumption inequality: bottom and middle consumption shares rise while top consumption shares fall. Within funded policy, transfers provide the strongest immediate support to bottom consumption, whereas funded government purchases tilt the consumption distribution upward.

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# Introduction

What are the short-run macroeconomic and distributional consequences when fiscal expansions are financed by debt without a commitment to future consolidation? Following [Bianchi et al. \(2023\)](#), I call such policy *unfunded*—not backed by higher expected future primary surpluses. The COVID-19 response provides an example: the March 2020 relief package (about \$2.2 trillion) has been assessed as partly unfunded [Bianchi et al. \(2023\)](#). In environments with nominal rigidities and heterogeneous household portfolios, unfunded policy can work through the price level as well as through balance-sheet channels.

Most HANK analyses with portfolio heterogeneity—e.g., [Bayer et al. \(2023, 2024\)](#); [Luetticke \(2021\)](#)—are set in regimes with active monetary policy and passive fiscal policy. Much less is known about economies in which fiscal policy is active and monetary policy accommodates. This paper asks: under an active-fiscal, passive-monetary regime, how do *funded* versus *unfunded* fiscal expansions shape (i) aggregate activity and inflation and (ii) the distribution of consumption across households?

I study this question in a two-asset heterogeneous-agent New Keynesian (HANK) model with idiosyncratic income risk, nominal rigidities, and long-term nominal debt. Households choose between liquid nominal government bonds (negative positions allowed) and illiquid physical capital; in each period, capital can be adjusted only with a fixed probability. Prices and wages are sticky due to monopolistic producers and unions. Fiscal policy shifts government purchases and transfers under two regimes: *funded* (higher expected primary surpluses back current deficits) and *unfunded* (part of the adjustment occurs through price-level revaluation of outstanding nominal liabilities).

Mechanically, unfunded policy dilutes the real value of nominal government bonds on impact, moving wealth from nominal creditors to net debtors and lifting consumption where MPCs and the value of liquidity are highest; simultaneous compression of price and wage markups shifts income toward higher-productivity workers, further supporting demand. Funded policy—backed by higher expected primary surpluses—does not rely on a systematic

price-level revaluation; any inflation reflects standard demand channels, and the distributional incidence works mainly through tax-backed income rather than balance-sheet relief (funded transfers raise the bottom; funded purchases tilt upward).

In the calibrated economy, unfunded government purchases and unfunded transfers generate essentially the same short-run transmission and deliver materially larger multipliers than funded policies. Distributionally, unfunded policy temporarily compresses consumption inequality: bottom and middle consumption shares rise while the top share falls, reflecting both revaluation and markup compression. Within funded policy, instrument composition matters: funded transfers provide the strongest immediate support at the bottom, whereas funded government purchases shift the consumption distribution upward (higher top share, lower bottom and middle shares).

This paper contributes to work integrating the Fiscal Theory of the Price Level (FTPL) with heterogeneous-agent macro. [Kaplan et al. \(2023\)](#) study flexible-price settings with a single liquid asset and highlight how precautionary savings and marginal propensities to consume shape equilibrium prices and interest rates. I instead introduce nominal rigidities and a two-asset portfolio choice to analyze the joint dynamics of inflation, output, and inequality under an active-fiscal regime with monetary accommodation. Relative to the baseline HANK framework in [Bayer et al. \(2024\)](#), I (i) model direct transfers alongside government purchases as policy instruments, (ii) incorporate long-term nominal debt—attenuating, but not eliminating, revaluation, and (iii) shift the policy regime from active monetary/pассив fiscal to active fiscal/pассив monetary. These extensions, while preserving the core DSGE structure of [Christiano et al. \(2005\)](#); [Smets and Wouters \(2007\)](#), clarify how portfolio composition, nominal rigidities, and debt maturity jointly govern the short-run incidence of fiscal expansions.

The analysis also speaks to the literature on monetary–fiscal interactions and inflation’s fiscal origins. Classic contributions emphasize how solvency is sustained via growth, revaluation, and persistently low real rates [Hall and Sargent \(2011\)](#); regime-based accounts in-

terpret the 1960s–1970s as fiscally led [Bianchi and Ilut \(2017\)](#), and recent work highlights a role for unfunded policy in the post-COVID period alongside markup disturbances [Balke and Zarazaga \(2024\)](#); [Bianchi et al. \(2023\)](#). The framework here provides a structural, distributional benchmark for comparing funded and unfunded fiscal actions in the presence of nominal rigidities and portfolio heterogeneity.

The remainder of the paper proceeds as follows. Section I presents the model. Section II describes the calibration. Section III reports the calibrated results. Section IV concludes.

## 1 Model

I build on a heterogeneous-agent New Keynesian (HANK) framework that features incomplete markets, endogenous portfolio choice, and long-term nominal debt. The framework consists of three standard sectors: households, firms, and the government. The household block follows [Bayer et al. \(2024\)](#), while the government sector builds on the fiscal specification in [Balke and Zarazaga \(2024\)](#). Within the firm sector, the non-bank production block is adopted from [Bayer et al. \(2024\)](#), whereas the bank block—which intermediates long-term government debt—follows the structure in [Bayer et al. \(2023\)](#). The overall framework remains grounded in the canonical DSGE structure developed by [Smets and Wouters \(2007\)](#) and [Christiano et al. \(2005\)](#).

The modeling of the government sector follows [Balke and Zarazaga \(2024\)](#), incorporating both fiscal and monetary authorities. The fiscal authority actively manages government consumption and transfers, imposes taxes on profits and labor income, and issues both funded and partially unfunded bonds. The monetary authority, in turn, passively adjusts the nominal interest rate on government bonds in response to inflation, following a Taylor-type rule. A distinctive feature of my HANK model is the presence of partially unfunded government debt, which is not fully backed by future tax increases or spending cuts.

The household sector features two types of agents: workers and entrepreneurs, as in

[Bayer et al. \(2024\)](#). Both groups face liquidity constraints and endogenously allocate their portfolios between liquid and illiquid assets to smooth consumption and self-insure against idiosyncratic risks. Workers supply labor, are subject to stochastic income shocks, and receive an equal share of labor union profits. Entrepreneurs do not supply labor but instead share equally in firm profits, excluding those generated by labor unions.

The firm sector largely follows [Bayer et al. \(2024\)](#), with the addition of banks to accommodate long-term government debt, following [Bayer et al. \(2023\)](#). The sector includes monopolistically competitive producers of intermediate goods, which are aggregated by perfectly competitive final goods producers. Intermediate goods producers hire differentiated labor services from unions that set wages under monopolistic competition. Capital goods producers transform final goods into capital, facing adjustment costs. Banks intermediate household deposits into long-term government bonds issued by the fiscal authority. Bond prices evolve endogenously, and banking profits are transferred to entrepreneurs, who own the banks. Both price and wage setting are subject to Calvo-style nominal rigidities ([Calvo, 1983](#)).

## 1.1 Government

The government sector is modeled according to the Fiscal Theory of the Price Level (FTPL), in which inflation and government debt dynamics are jointly determined by the interaction of fiscal and monetary policies. Consistent with the active/passive classification in [Leeper \(1991\)](#), I assume a regime in which fiscal policy is active—setting the path of primary surpluses without targeting debt sustainability—while monetary policy is passive, adjusting nominal interest rates in response to inflation without counteracting the inflationary effects of fiscal shocks. A key feature of the fiscal side is the explicit separation between funded and partially unfunded expenditures, as in [Balke and Zarazaga \(2024\)](#). The fiscal authority finances government consumption, transfers, and debt rollovers through taxes on labor income and corporate profits, as well as by issuing long-term nominal debt that is only partially

backed by future fiscal adjustments. The monetary authority accommodates fiscal shocks by setting the nominal interest rate on government bonds according to a Taylor-type rule, without counteracting the fiscal stance.

### 1.1.1 Fiscal Authority

The fiscal authority finances government consumption, transfers, and the renewal of manufacturing debt through a combination of labor and profit taxes and the issuance of long-term government bonds. Total real government debt at the end of period  $t$ , denoted by  $B_{t+1}$ , consists of two components:

- $BR_{t+1}$ : the funded portion of debt, expected to be repaid through future fiscal adjustments such as tax increases or spending reductions;
- $BN_{t+1}$ : the partially unfunded portion of debt, which lacks such backing and may instead be stabilized via inflation.

The evolution of aggregate debt follows the government budget constraint:

$$B_{t+1} = G_t + Transfer_t - Tax_t + \frac{R_t^b}{\pi_t} B_t, \quad (1)$$

where  $G_t$  denotes total government consumption,  $Transfer_t$  denotes total transfers,  $Tax_t$  is aggregate tax revenue,  $R_t^b$  is the nominal interest rate on government bonds, and  $\pi_t$  is the inflation rate.

The dynamics of funded debt follow:

$$BR_{t+1} = GR_t + TR_t - \chi_1 Tax_t + \frac{R_t^b}{\pi_t} BR_t, \quad (2)$$

where  $GR_t$  and  $TR_t$  denote funded government consumption and transfers, respectively, and  $\chi_1 \in [0, 1]$  represents the share of tax revenue allocated to servicing funded debt. In the

model, I set  $\chi_1 = \frac{\bar{B}R}{\bar{B}}$ , where  $\bar{B}R$  and  $\bar{B}$  denote the steady-state levels of funded and total government debt, respectively.

Given  $BR_{t+1}$  and  $B_{t+1}$ , the partially unfunded portion is defined residually as:

$$BN_{t+1} = B_{t+1} - BR_{t+1}. \quad (3)$$

Government consumption and transfers are divided into funded and partially unfunded components:

$$G_t = GR_t + GN_t, \quad (4)$$

$$Transfer_t = TR_t + TN_t. \quad (5)$$

Here,  $GR_t$  and  $TR_t$  represent the funded portions of government consumption and transfers, whose financing is expected to be backed by future surpluses. Conversely,  $GN_t$  and  $TN_t$  denote the partially unfunded components of spending and transfers, whose fiscal backing is weaker or absent and are instead expected to be stabilized through the price level. This decomposition allows for distinct dynamic behavior and fiscal feedback across components, as captured by the rules below.

Out of steady state, the four components evolve according to:

$$\frac{GN_t}{GN} = \left( \frac{GN_{t-1}}{GN} \right)^{\rho_{GN}} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_{GN})\gamma_{YGN}} \left( \frac{BN_t}{BN} \right)^{(1-\rho_{GN})\gamma_{BGN}} \epsilon_t^{GN} \quad (6)$$

$$\frac{GR_t}{GR} = \left( \frac{GR_{t-1}}{GR} \right)^{\rho_{GR}} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_{GR})\gamma_{YGR}} \left( \frac{BR_t}{BR} \right)^{(1-\rho_{GR})\gamma_{BGR}} \epsilon_t^{GR} \quad (7)$$

$$\frac{TN_t}{TN} = \left( \frac{TN_{t-1}}{TN} \right)^{\rho_{TN}} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_{TN})\gamma_{YTN}} \left( \frac{BN_t}{BN} \right)^{(1-\rho_{TN})\gamma_{BTN}} \epsilon_t^{TN} \quad (8)$$

$$\frac{TR_t}{TR} = \left( \frac{TR_{t-1}}{TR} \right)^{\rho_{TR}} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_{TR})\gamma_{YTR}} \left( \frac{BR_t}{BR} \right)^{(1-\rho_{TR})\gamma_{BTR}} \epsilon_t^{TR} \quad (9)$$

Each of these rules captures how government consumption and transfer components respond to their own lags, to output growth, and to the relevant type of government debt—funded ( $BR_t$ ) or partially unfunded ( $BN_t$ )—with stochastic shocks  $\epsilon_t^i$ .

The parameters  $\gamma_Y$  and  $\gamma_B$  govern how each government consumption or transfer component responds to deviations in output growth and in the corresponding debt level. According to the classification in [Leeper \(1991\)](#), negative values of  $\gamma_B$  correspond to a passive fiscal policy that adjusts government consumption or transfers in response to debt levels, thereby contributing to debt stabilization. In contrast, zero or positive values of  $\gamma_B$  characterize an active fiscal policy that does not stabilize debt through government consumption or transfer adjustments. I restrict  $\gamma_{BGR} < 0$  and  $\gamma_{BTR} < 0$  to represent a passive stance for funded components, in the sense that future surpluses rise to offset current debt levels, and  $\gamma_{BGN} \geq 0$  and  $\gamma_{BTN} \geq 0$  to reflect an active stance for the partially unfunded components, in which future surpluses do not adjust to stabilize debt, consistent with the Fiscal Theory of the Price Level.

**Taxation** The tax system follows [Bayer et al. \(2024\)](#) and features nonlinear labor income taxation with an endogenous average tax rate  $\tau_t$  and a time-varying progressivity parameter  $\tau_t^P$ . The average tax rate evolves as

$$\frac{\tau_t}{\bar{\tau}} = \left( \frac{\tau_{t-1}}{\bar{\tau}} \right)^{\rho_\tau} \left( \frac{BR_t}{\bar{BR}} \right)^{(1-\rho_\tau)\gamma_B^\tau} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_\tau)\gamma_Y^\tau}, \quad (10)$$

where  $\bar{\tau}$  denotes the steady-state average tax rate and  $\rho_\tau$  captures persistence. A positive coefficient  $\gamma_B^\tau > 0$  implies that higher funded debt level raises the average tax rate.

The degree of tax progressivity is governed by the parameter  $\tau_t^P$ , which follows the AR(1) process:

$$\frac{\tau_t^P}{\bar{\tau}^P} = \left( \frac{\tau_{t-1}^P}{\bar{\tau}^P} \right)^{\rho_P} \varepsilon_t^P, \quad (11)$$

where  $\bar{\tau}^P$  is the steady-state target value of progressivity, and  $\varepsilon_t^P$  is a log-normal shock

capturing unexpected shifts in the progressivity of the tax schedule.

Let  $w_t$  denote the real wage per hour. Labor income for household  $i$  is given by  $w_t n_{it} h_{it}$ , where  $n_{it}$  is hours worked and  $h_{it}$  represents idiosyncratic labor productivity (i.e., labor income risk). Entrepreneurs do not work ( $h_{it} = 0$ ) and instead receive firm profits  $\Pi_t^E$ .

The actual average tax rate  $\tau_t$  is defined as the ratio of total tax revenue to total pre-tax labor and entrepreneurial income:

$$\tau_t = \frac{\mathbb{E}_t [w_t n_{it} h_{it} + \mathbb{I}_{h_{it}=0} \Pi_t^E] - \tau_t^L \mathbb{E}_t [(w_t h_{it} h_{it} + \mathbb{I}_{h_{it}=0} \Pi_t^E)^{\tau_t^P}]}{\mathbb{E}_t [w_t n_{it} h_{it} + \mathbb{I}_{h_{it}=0} \Pi_t^E]}, \quad (12)$$

where  $\tau_t^L$  adjusts to match the targeted average tax level.

Total government tax revenue is then computed as:

$$T_t = \tau_t \mathbb{E}_t [w_t n_{it} h_{it} + \mathbb{I}_{h_{it} \neq 0} \Pi_t^U + \mathbb{I}_{h_{it}=0} \Pi_t^E], \quad (13)$$

where  $\Pi_t^U$  and  $\Pi_t^E$  denote profits received by union workers and entrepreneurs, respectively.

### 1.1.2 Monetary Authority

The monetary authority sets the nominal interest rate according to a standard Taylor-type rule, following [Taylor \(1993\)](#):

$$\frac{R_{t+1}^b}{\bar{R}^b} = \left( \frac{R_t^b}{\bar{R}^b} \right)^{\rho_R} \left( \frac{\pi_t}{\bar{\pi}} \right)^{(1-\rho_R)\theta_\pi} \left( \frac{Y_t}{Y_{t-1}} \right)^{(1-\rho_R)\theta_Y} \epsilon_t^R. \quad (14)$$

Here,  $\bar{R}^b$  denotes the steady-state nominal interest rate. The coefficients  $\theta_\pi$  and  $\theta_Y$  govern the responsiveness of monetary policy to inflation and output growth, respectively. The parameter  $\rho_R$  captures the degree of interest rate smoothing. According to [Leeper \(1991\)](#), when  $0 \leq \theta_\pi \leq 1$ , monetary policy is considered passive, implying that the central bank responds only weakly to inflation deviations.

## 1.2 Households

The household sector follows the structure of [Bayer et al. \(2024\)](#). A continuum of ex-ante identical, infinitely lived households indexed by  $i \in [0, 1]$  choose consumption  $c_{it}$  and labor supply  $n_{it}$  to maximize lifetime utility. Each household faces idiosyncratic labor productivity  $h_{it}$ , which introduces uninsurable income risk. Households earn income from wages, capital holdings, and nominal bonds, and receive lump-sum transfers from the government. They also share in the profits of intermediate goods producers and labor unions. Labor and profit income are subject to taxation, while government transfers are tax-exempt. Markets are incomplete: households cannot fully insure against idiosyncratic risk and face borrowing constraints that influence their consumption and savings behavior.

### 1.2.1 Preferences

Households follow [Greenwood et al. \(1988\)](#) (GHH) preferences, where labor supply enters the utility function through the consumption term, eliminating the wealth effect on labor supply. Each household chooses consumption and labor in each period to maximize its expected lifetime utility:

$$\mathbb{E}_0 \max_{\{c_{it}, n_{it}\}} \sum_{t=0}^{\infty} \beta^t u(c_{it} - G(h_{it}, n_{it})), \quad (15)$$

where  $\beta$  denotes the discount factor, and  $c_{it}$ ,  $n_{it}$ , and  $h_{it}$  denote household  $i$ 's consumption, labor supply, and labor productivity in period  $t$ , respectively. The function  $G(h_{it}, n_{it})$  captures the disutility from work, reflecting how labor detracts from utility.

Utility is assumed to exhibit constant relative risk aversion (CRRA):

$$u(x_{it}) = \frac{x_{it}^{1-\xi} - 1}{1 - \xi}, \quad (16)$$

where  $x_{it} = c_{it} - G(h_{it}, n_{it})$  represents the composite demand of consumption and leisure, and  $\xi$  is the risk aversion parameter.

Following Benabou (2002) and Heathcote et al. (2017), household  $i$ 's after-tax labor income in period  $t$  is given by

$$y_{it} = (1 - \tau_t^L) (w_t h_{it} n_{it})^{1-\tau_t^P}, \quad (17)$$

where  $w_t$  is the aggregate real wage,  $\tau_t^L$  is the labor income tax rate, and  $\tau_t^P$  captures the progressivity of the tax schedule. The parameter  $\tau_t^P$  introduces nonlinear taxation: when  $\tau_t^P > 0$ , higher income is taxed at a higher rate.

The marginal disutility of labor, i.e., the increase in disutility from an additional unit of labor supplied, is

$$\frac{\partial G(h_{it}, n_{it})}{\partial n_{it}} = (1 - \tau_t^P)(1 - \tau_t^L)(w_t h_{it})^{1-\tau_t^P} n_{it}^{-\tau_t^P} = (1 - \tau_t^P) \frac{y_{it}}{n_{it}}. \quad (18)$$

Assume that the disutility function  $G$  features constant elasticity with respect to labor supply:

$$\frac{\partial G(h_{it}, n_{it})}{\partial n_{it}} = (1 + \gamma) \frac{G(h_{it}, n_{it})}{n_{it}}, \quad (19)$$

with  $\gamma > 0$ . Then, the composite consumption-leisure term simplifies to

$$x_{it} = c_{it} - G(h_{it}, n_{it}) = c_{it} - \frac{1 - \tau_t^P}{1 + \gamma} y_{it}. \quad (20)$$

That is, the disutility of labor is proportional to after-tax labor income, with the constant share  $\frac{1 - \tau_t^P}{1 + \gamma}$  applying uniformly across households. As a result, only  $y_{it}$  enters the household's utility and budget constraint, while neither  $n_{it}$  nor  $h_{it}$  appear directly.

The joint distribution of labor productivity  $h_{it}$  and the progressivity parameter  $\tau_t^P$  determines the aggregate effective labor supply  $N_t$ . For simplicity, assume tax progressivity is constant and equal to its equilibrium level:  $\tau_t^P \equiv \bar{\tau}^P$ . Suppose further that the disutility function takes the form:

$$G(h_{it}, n_{it}) = h_{it}^{1-\bar{\tau}^P} \frac{n_{it}^{1+\gamma}}{1+\gamma}. \quad (21)$$

As long as  $\bar{\tau}^P$  is constant, the first-order condition with respect to labor supply eliminates  $h_{it}$ , implying that individual productivity does not affect the optimal labor choice. Thus, all households choose the same  $n_{it} = N_t = N(w_t)$ . Given the normalization  $\int h_{it} di \equiv 1$ , total effective labor input is:

$$\int h_{it} n_{it} di = N(w_t). \quad (22)$$

Substituting into the income expression yields

$$y_{it} = (1 - \tau_t^L)(w_t h_{it} n_{it})^{1-\bar{\tau}^P} = (1 - \tau_t^L)^{\frac{1+\gamma}{\gamma+\bar{\tau}^P}} (1 - \bar{\tau}^P)^{\frac{1-\bar{\tau}^P}{\gamma+\bar{\tau}^P}} w_t^{\frac{1+\gamma}{\gamma+\bar{\tau}^P}(1-\bar{\tau}^P)} h_{it}^{1-\bar{\tau}^P}. \quad (23)$$

Therefore, income heterogeneity arises solely from heterogeneity in labor productivity  $h_{it}$ .

### 1.2.2 Baseline: Heterogeneous Households and Incomplete Markets

This section builds on the framework developed by [Bayer et al. \(2024\)](#), introducing household heterogeneity, incomplete markets, and portfolio choice under financial frictions. I distinguish between two types of agents: workers and entrepreneurs. Among workers, productivity varies, generating income heterogeneity. Transitions between income states—both across worker productivity levels and between workers and entrepreneurs—are governed by exogenous stochastic processes.

Only workers are employed and face idiosyncratic income risk. They also share equally in the profits of the union. Entrepreneurs do not work; instead, they split the profits from all non-union firms among themselves. All households can self-insure through savings in two types of assets: liquid nominal bonds and illiquid real capital. Participation in the capital market—that is, the ability to adjust capital holdings—is randomly assigned each period.

In addition, all households receive lump-sum transfers from the government.

Individual (pre-normalized) productivity  $\tilde{h}_{it}$  evolves according to the following stochastic process:

$$\tilde{h}_{it} = \begin{cases} \exp(\rho_h \log \tilde{h}_{it-1} + \epsilon_{it}^h) & \text{with probability } 1 - \zeta \text{ if } h_{it-1} \neq 0, \\ 1 & \text{with probability } \iota \text{ if } h_{it-1} = 0, \\ 0 & \text{otherwise,} \end{cases} \quad (24)$$

where  $h_{it} = \tilde{h}_{it} / \int \tilde{h}_{it} di$  denotes the productivity of household  $i$  after scaling. Households with  $h_{it} = 0$  are entrepreneurs; those with  $h_{it} \neq 0$  are workers. Worker productivity follows a log-AR(1) process with persistence parameter  $\rho_h$ , and shock term  $\epsilon_{it}^h \sim \mathcal{N}(0, \bar{\sigma}_h^2)$ . The parameter  $\zeta$  governs the probability that a worker exits employment, while  $\iota$  denotes the probability of transitioning from entrepreneur to medium-productivity worker.

Profit distribution rules play a key role in determining household income. Workers receive labor income and a lump-sum share of union profits, which helps to lessen differences in labor income. For simplicity, union profits are taxed at a fixed rate that does not depend on individual earnings.

Entrepreneurs receive profits from all firms except for unions. They can only liquidate a fraction  $\omega^{\Pi}$  of these profits by issuing claims with stochastic maturity. Each period, a fraction  $\iota^{\Pi}$  of existing claims matures and is replaced by new issuances. Assuming a unit mass of profit shares trades at price  $q_t^{\Pi}$ , entrepreneurs' total profit income in period  $t$  consists of unsold retained profits and the proceeds from new share issuance:

$$\Pi_t^E = (1 - \omega^{\Pi})\Pi_t^F + \iota^{\Pi}q_t^{\Pi}.$$

The period- $t$  budget constraint of household  $i$  is given by:

$$\begin{aligned}
c_{it} + b_{it+1} + q_t k_{it+1} &= \frac{R_{it}}{\pi_t} b_{it} + (q_t + r_t) k_{it} + y_{it} \\
&\quad + \mathbb{I}_{h_{it} \neq 0} (1 - \tau_t) \Pi_t^U + \mathbb{I}_{h_{it}=0} (1 - \tau_t^L) (\Pi_t^E)^{1-\bar{\tau}^P} + \text{Transfers}_{it}, \\
k_{it+1} &\geq 0, \quad b_{it+1} \geq \underline{B}.
\end{aligned} \tag{25}$$

Here,  $c_{it}$  is consumption;  $b_{it}$  and  $b_{it+1}$  are the household's bond holdings in periods  $t$  and  $t+1$ ;  $k_{it}$  and  $k_{it+1}$  denote capital holdings;  $q_t$  is the price of capital;  $r_t$  is the dividend on capital; and  $\pi_t$  is the gross inflation rate. The term  $R_{it}/\pi_t$  denotes the real return on bonds. Labor income is denoted by  $y_{it}$ . The indicator  $\mathbb{I}_{h_{it} \neq 0}$  selects workers who receive union profits  $\Pi_t^U$ , taxed at rate  $\tau_t$ ;  $\mathbb{I}_{h_{it}=0}$  selects entrepreneurs, who receive after-tax profits  $(\Pi_t^E)^{1-\bar{\tau}^P}$ , taxed progressively at rate  $\bar{\tau}^P$ . All households receive lump-sum transfers  $\text{Transfers}_{it}$ .

Capital must be non-negative, and bond holdings must exceed the borrowing constraint  $\underline{B} < 0$ . Households that do not participate in the capital market (i.e., for whom  $k_{it+1} = k_{it}$ ) still earn dividends and may adjust their bond holdings.

Substituting the transformed consumption variable  $c_{it} = x_{it} + \frac{1-\bar{\tau}^P}{1+\gamma} y_{it}$ , the budget constraint becomes:

$$\begin{aligned}
x_{it} + b_{it+1} + q_t k_{it+1} &= \frac{R_{it}}{\pi_t} b_{it} + (q_t + r_t) k_{it} + \frac{\bar{\tau}^P + \gamma}{1 + \gamma} y_{it} \\
&\quad + \mathbb{I}_{h_{it} \neq 0} (1 - \tau_t) \Pi_t^U + \mathbb{I}_{h_{it}=0} (1 - \tau_t^L) (\Pi_t^E)^{1-\bar{\tau}^P} + \text{Transfers}_{it}, \\
k_{it+1} &\geq 0, \quad b_{it+1} \geq \underline{B}.
\end{aligned} \tag{26}$$

The nominal interest rate  $R_{it}$  on bonds depends on whether the household is a lender or a borrower. It is determined by the central bank's policy rate  $R_t^b$ , the effectiveness of financial intermediation  $A_t$ , and the return from profit shares:

$$R_{it} = \begin{cases} A_t \frac{R_t^b B_t + \pi_t [(1-\iota^\Pi) q_t^\Pi + \omega^\Pi \Pi_t^F]}{B_t + q_{t-1}^\Pi} & \text{if } b_{it} \geq 0, \\ A_t \frac{R_t^b B_t + \pi_t [(1-\iota^\Pi) q_t^\Pi + \omega^\Pi \Pi_t^F]}{B_t + q_{t-1}^\Pi} + \bar{R} & \text{if } b_{it} < 0. \end{cases} \quad (27)$$

Households allocate savings between liquid bonds and illiquid capital. Due to capital market frictions, only a fraction  $\lambda$  of households are randomly selected to adjust capital each period. A household's choice depends on its wealth and productivity.

Let  $\Theta_t(b, k, h)$  denote the joint distribution of bond holdings, capital, and productivity across households. Define  $V_t^a(b, k, h)$  as the value function when the household can adjust both assets; and  $V_t^n(b, k, h)$  when it cannot adjust capital:

$$\begin{aligned} V_t^a(b, k, h) &= \max_{b'_a, k'} u[x(b, b'_a, k, k', h)] + \beta \mathbb{E}_t \mathbb{W}_{t+1}(b'_a, k', h'), \\ V_t^n(b, k, h) &= \max_{b'_n} u[x(b, b'_n, k, k, h)] + \beta \mathbb{E}_t \mathbb{W}_{t+1}(b'_n, k, h'), \\ \mathbb{W}_{t+1}(b', k', h') &= \lambda V_{t+1}^a(b', k', h') + (1 - \lambda) V_{t+1}^n(b', k', h'). \end{aligned} \quad (28)$$

Expectations are taken over future states  $h'$ , integrating over the productivity shock and transition probability  $\Phi(h, h')$ . The law of motion for the household distribution is:

$$\begin{aligned} \Theta_{t+1}(b', k', h') &= \lambda \int_{b' = b_{a,t}^*(b, k, h), k' = k_t^*(b, k, h)} \Phi(h, h') d\Theta_t(b, k, h) \\ &\quad + (1 - \lambda) \int_{b' = b_{n,t}^*(b, k, h), k' = k} \Phi(h, h') d\Theta_t(b, k, h), \end{aligned} \quad (29)$$

where  $b_{a,t}^*$ ,  $b_{n,t}^*$ , and  $k_t^*$  denote the optimal policy functions for bond and capital choices.

## 1.3 Firm Sector

The firm sector follows the structure in [Bayer et al. \(2024\)](#), including monopolistically competitive intermediate goods producers, perfectly competitive final goods producers, capital goods producers with adjustment costs, and labor unions. It also includes a banking sector, modeled as in [Bayer et al. \(2023\)](#), which intermediates household deposits into long-term government bonds issued by the fiscal authority.

Following [Bayer et al. \(2024\)](#), firms are managed by a representative, risk-neutral agent without access to financial markets but with the same time discount factor as households. This modeling choice avoids complications from heterogeneity in household discount factors and asset holdings. The agent is of measure zero and does not affect aggregate resource constraints. All firm sector profits, including those from banks, are redistributed to entrepreneurs. This allows firm decisions to be based on a single representative discount factor.

### 1.3.1 Final Goods Producers

Final goods producers aggregate a continuum of differentiated intermediate goods  $y_{jt}$  into a single final good  $Y_t$  using a constant elasticity of substitution (CES) aggregator:

$$Y_t = \left( \int y_{jt}^{\frac{\eta_t - 1}{\eta_t}} dj \right)^{\frac{\eta_t}{\eta_t - 1}}, \quad (30)$$

where  $\eta_t$  denotes the elasticity of substitution across varieties at time  $t$ .

Given this structure, the demand for variety  $j$  is derived from cost minimization and depends on the relative price  $\frac{p_{jt}}{P_t}$ , where the aggregate price index is defined as

$$P_t = \left( \int p_{jt}^{1-\eta_t} dj \right)^{\frac{1}{1-\eta_t}}.$$

The resulting demand function for variety  $j$  is:

$$y_{jt} = \left( \frac{p_{jt}}{P_t} \right)^{-\eta_t} Y_t. \quad (31)$$

### 1.3.2 Intermediate Goods Producers

Intermediate goods producers operate under monopolistic competition, where each firm has some pricing power but must account for competitive pressure when making production and pricing decisions.

The production function for firm  $j$  is Cobb-Douglas with constant returns to scale:

$$y_{jt} = Z_t N_{jt}^\alpha (u_{jt} K_{jt})^{1-\alpha}, \quad (32)$$

where  $\alpha$  is the labor share in production,  $Z_t$  denotes aggregate total factor productivity (TFP),  $N_{jt}$  and  $K_{jt}$  are labor and capital inputs, and  $u_{jt}$  is the capital utilization rate. TFP  $Z_t$  evolves as a log-AR(1) process.

Capital depreciation is increasing in utilization and specified as:

$$\delta(u_{jt}) = \delta_0 + \delta_1(u_{jt} - 1) + \frac{\delta_2}{2}(u_{jt} - 1)^2, \quad (33)$$

with  $\delta_1, \delta_2 > 0$ . This specification implies that utilization above the steady-state level (normalized to 1) leads to higher depreciation, with  $\delta_0$  capturing the steady-state depreciation rate.

Firm  $j$  minimizes total factor costs:

$$w_t^F N_{jt} + (r_t + q_t \delta(u_{jt})) K_{jt},$$

where  $w_t^F$  is the real wage paid by the firm,  $r_t$  is the rental rate of capital, and  $q_t$  is the price of capital.

The firm's first-order conditions imply:

$$w_t^F = \alpha mc_{jt} Z_t \left( \frac{u_{jt} K_{jt}}{N_{jt}} \right)^{1-\alpha}, \quad (34)$$

$$r_t + q_t \delta(u_{jt}) = u_{jt}(1 - \alpha) mc_{jt} Z_t \left( \frac{N_{jt}}{u_{jt} K_{jt}} \right)^\alpha, \quad (35)$$

where  $mc_{jt}$  denotes the marginal cost for firm  $j$ .

The optimal capital utilization condition is:

$$q_t [\delta_1 + \delta_2(u_{jt} - 1)] = (1 - \alpha) mc_{jt} Z_t \left( \frac{N_{jt}}{u_{jt} K_{jt}} \right)^\alpha. \quad (36)$$

Given constant returns to scale and symmetric conditions across firms, marginal costs are equalized across producers:  $mc_{jt} = mc_t$ .

Following Calvo (1983), price-setting is subject to nominal rigidities. Each period, a firm can reset its price with probability  $1 - \lambda_Y$ . The intermediate firm maximizes the expected discounted value of real profits:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \lambda_Y^t (1 - \tau_t^L) Y_t^{1-\tau_t^P} \left\{ \left( \frac{p_{jt} \bar{\pi}^t}{P_t} - mc_t \right) \left( \frac{p_{jt} \bar{\pi}^t}{P_t} \right)^{-\eta_t} \right\}^{1-\tau_t^P}, \quad (37)$$

where  $\bar{\pi}$  is the steady-state inflation rate.

The first-order condition of this pricing problem yields the New Keynesian Phillips Curve:

$$\log \left( \frac{\pi_t}{\bar{\pi}} \right) = \beta \mathbb{E}_t \log \left( \frac{\pi_{t+1}}{\bar{\pi}} \right) + \kappa_Y \left( mc_t - \frac{1}{\mu_t^Y} \right), \quad (38)$$

where  $\kappa_Y = \frac{(1-\lambda_Y)(1-\beta\lambda_Y)}{\lambda_Y}$  governs the sensitivity of inflation to real marginal cost deviations, and the target markup is given by  $\frac{1}{\mu_t^Y} = \frac{\eta_t - 1}{\eta_t}$ . The Calvo parameter  $\lambda_Y$  measures the degree of price stickiness, and  $\beta$  is the household discount factor.

### 1.3.3 Capital Goods Producers

Capital goods producers take the price of capital,  $q_t$ , as given and choose the level of investment  $I_t$  to maximize the present discounted value of profits:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t I_t \left\{ \Psi_t q_t \left[ 1 - \frac{\phi}{2} \left( \log \frac{I_t}{I_{t-1}} \right)^2 \right] - 1 \right\}, \quad (39)$$

where  $\phi$  governs the degree of convex adjustment costs in investment, and  $\Psi_t$  denotes the marginal efficiency of investment, following [Justiniano et al. \(2010\)](#). A higher  $\Psi_t$  implies more efficient conversion of investment into effective capital.

The optimality condition for investment equates the marginal cost and the expected marginal benefit of investing:

$$\Psi_t q_t \left[ 1 - \phi \log \left( \frac{I_t}{I_{t-1}} \right) \right] = 1 - \beta \mathbb{E}_t \left[ \Psi_{t+1} q_{t+1} \phi \log \left( \frac{I_{t+1}}{I_t} \right) \right]. \quad (40)$$

The law of motion for the physical capital stock is given by:

$$K_t = (1 - \delta(u_t)) K_{t-1} + \Psi_t \left[ 1 - \frac{\phi}{2} \left( \log \frac{I_t}{I_{t-1}} \right)^2 \right] I_t. \quad (41)$$

### 1.3.4 Labor Packers and Unions

At a uniform real wage  $w_t$ , households sell labor to unions, each of which supplies a differentiated type of labor service. These unions in turn sell labor to labor packers, who aggregate all labor types into a composite labor input used by intermediate goods producers. The price paid by packers for this composite labor is denoted by  $w_t^F$ . The aggregator uses a CES production function of the form:

$$N_t = \left( \int \hat{n}_{jt}^{\frac{\zeta_t-1}{\zeta_t}} dj \right)^{\frac{\zeta_t}{\zeta_t-1}}, \quad (42)$$

where  $\zeta_t > 1$  is the elasticity of substitution across labor types. A higher wage for a

specific labor type reduces its demand. The demand for labor service  $j$  is given by:

$$\hat{n}_{jt} = \left( \frac{W_{jt}}{W_t^F} \right)^{-\zeta_t} N_t, \quad (43)$$

where  $W_{jt}$  is the nominal wage set by union  $j$ , and  $W_t^F$  is the nominal wage paid by labor packers.

Unions are price-setters: they can set wages above the payments made to households, i.e.,  $W_t^F > W_t$ . However, they face wage adjustment frictions modeled à la [Calvo \(1983\)](#), where in each period only a fraction  $1 - \lambda_w$  of unions can reoptimize their wages, while a fraction  $\lambda_w$  must keep them unchanged. When given the opportunity to reset wages, a union maximizes the expected present value of profits:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \lambda_w^t \frac{W_t^F}{P_t} N_t \left\{ \left( \frac{W_{jt} \bar{\pi}_W^t}{W_t^F} - \frac{W_t}{W_t^F} \right) \left( \frac{W_{jt} \bar{\pi}_W^t}{W_t^F} \right)^{-\zeta_t} \right\}, \quad (44)$$

where  $\bar{\pi}_W$  is the steady-state nominal wage inflation rate, and  $P_t$  is the price level.

The union's optimal wage-setting condition yields a wage Phillips curve:

$$\log \left( \frac{\pi_t^W}{\bar{\pi}_W} \right) = \beta \mathbb{E}_t \log \left( \frac{\pi_{t+1}^W}{\bar{\pi}_W} \right) + \kappa_w \left( mc_t^w - \frac{1}{\mu_t^W} \right), \quad (45)$$

where wage inflation is defined as  $\pi_t^W = \frac{W_t^F}{W_{t-1}^F} = \frac{w_t^F}{w_{t-1}^F} \pi_t$ , and  $\pi_t$  denotes the general price inflation. The term  $mc_t^w = \frac{w_t}{w_t^F}$  represents the marginal cost of labor from the union's perspective. The term  $\mu_t^W$  denotes the desired wage markup, with  $\frac{1}{\mu_t^W} = \frac{\xi_t - 1}{\xi_t}$ . Finally, the slope of the wage Phillips curve is governed by:

$$\kappa_w = \frac{(1 - \lambda_w)(1 - \beta \lambda_w)}{\lambda_w}.$$

### 1.3.5 Banks

Following [Bayer et al. \(2023\)](#), banks act as financial intermediaries by issuing deposits, denoted by  $D_t$ , which households hold as liquid assets for precautionary savings and intertem-

poral consumption smoothing. These deposits are used by banks to purchase government bonds. The nominal interest rate on deposits,  $R_t^b$ , is set by the central bank as part of its monetary policy framework.

Government bonds are modeled as long-term nominal assets featuring a geometric maturity structure. Each bond pays one unit of nominal interest per period, and a constant fraction  $\delta_B$  of the bonds matures each period without repayment of principal. Bonds are traded at nominal price  $q_t^B$ . Banks are assumed to be risk-neutral and operate under perfect competition in bond markets.

The no-arbitrage condition equating the deposit return to the expected bond return is given by:

$$R_{t+1}^b q_t^B = \mathbb{E}_t [q_{t+1}^B (1 - \delta_B) + 1]. \quad (46)$$

This condition implies that the opportunity cost of holding one unit of deposits (left-hand side) must equal the expected payoff from holding one unit of bonds (right-hand side), which includes both the expected price in the next period and the periodic coupon payment of one.

The real profit of a bank in period  $t$  is given by:

$$\Pi_t^B = \frac{B_t}{\pi_t} \left[ (1 - \delta_B) \frac{q_t^B}{q_{t-1}^B} + \frac{1}{q_{t-1}^B} - R_t^b \right], \quad (47)$$

where  $B_t$  denotes the market value of government bonds held by the bank,  $\pi_t$  is the gross inflation rate, and  $R_t^b$  is the gross nominal interest rate paid on deposits.

## 1.4 Goods, Asset, and Labor Market Clearing

The labor market clears at the competitive wage defined by the wage-setting condition in equation (34).

The market for liquid assets clears according to the following condition:

$$B_{t+1} + q_t^\Pi = B^d(A_t, w_t, w_t^F, \Pi_t^E, \Pi_t^U, q_t, r_t, q_t^\Pi, q_{t-1}^\Pi, R_t^b, \pi_t, \pi_t^W, \tau_t, \Theta_t, \mathbb{W}_{t+1}) \\ := \mathbb{E}_t [\lambda b_{a,t}^* + (1 - \lambda) b_{n,t}^*], \quad (48)$$

where  $b_{a,t}^*$  and  $b_{n,t}^*$  denote the optimal bond holdings for households with and without capital adjustment, respectively. These depend on current asset prices, tax rates, and expectations of future values embedded in  $\mathbb{W}_{t+1}$ . Equilibrium in the liquid asset market requires that the total demand for bonds equals the sum of newly issued government bonds  $B_{t+1}$  and the market value of profit shares  $q_t^\Pi$ .

The value of profit shares is determined by a no-arbitrage condition that ensures deposits and profit shares offer the same expected return:

$$q_t^\Pi R_t^b = \mathbb{E}_t \pi_{t+1} [(1 - \iota^\Pi) q_{t+1}^\Pi + \omega^\Pi \Pi_{t+1}^F]. \quad (49)$$

The market for capital clears when:

$$K_{t+1} = K^d(A_t, w_t, w_t^F, \Pi_t^E, \Pi_t^U, q_t, r_t, q_t^\Pi, q_{t-1}^\Pi, R_t^b, \pi_t, \pi_t^W, \tau_t, \Theta_t, \mathbb{W}_{t+1}) \\ := \mathbb{E}_t [\lambda k_t^* + (1 - \lambda) k], \quad (50)$$

where  $K^d$  denotes the aggregate demand for capital. Here,  $k_t^*$  is the optimal capital choice for adjusting households, and  $k$  is the predetermined capital for non-adjusting ones.

Together, equilibrium in the labor, bond, and capital markets ensures that all markets clear, consistent with Walras' Law.

## 1.5 Equilibrium

A sequential equilibrium with recursive household decision-making in this model is characterized by the following elements:

- 1. Policy and Value Functions:** A set of optimal policy functions,

$$\{x_{a,t}^*, x_{n,t}^*, b_{a,t}^*, b_{n,t}^*, k_t^*\},$$

and value functions,  $\{\mathbb{W}_t\}$ , that solve the household's dynamic optimization problem. Given prices and aggregate states, these functions satisfy the associated Bellman equations.

- 2. Price and State Sequences:** Sequences of endogenous prices

$$\{w_t, w_t^F, \Pi_t^E, \Pi_t^U, q_t, r_t, q_t^\Pi, R_t^b, \pi_t, \pi_t^W, \tau_t\},$$

and exogenous state variables

$$\{A_t, Z_t, \Psi_t, \mu_{Yt}, \mu_{Wt}, D_t\},$$

along with their stochastic processes, describe the evolution of the economy over time.

- 3. Market Clearing:** Labor, goods, bond, capital, and intermediate goods markets clear in each period. Monetary policy follows a Taylor rule for setting the nominal interest rate  $R_t^b$ , and fiscal policy evolves according to a set of rules governing taxation and transfers. Asset prices and quantities adjust to ensure consistency across markets.
- 4. Rational Expectations:** Agents form model-consistent expectations. That is, expectations embedded in household decisions match the actual laws of motion of aggregate variables, ensuring internal consistency and dynamic stability of the equilibrium path.

## 2 Calibration

I pin down the steady state by fixing a small set of preference, technology, income-process, portfolio/liquidity, and fiscal parameters so that the stationary allocation matches the same quarterly targets as [Bayer et al. \(2024\)](#): earnings persistence/dispersion, worker–entrepreneur flows, the liquid–illiquid composition and borrower prevalence, factor shares, and fiscal size/progressivity.

**Preferences.** I set  $(\xi, \gamma, \beta, \gamma_{\text{scale}}) = (4, 2, 0.98255, 0.2)$  to discipline precautionary saving, the Frisch margin, the  $K/Y$  ratio, and steady hours under my tax/markup settings.

**Income and occupation.** The idiosyncratic process uses  $(\rho_h, \sigma_h) = (0.98, 0.12)$ ; worker–entrepreneur transitions are  $\iota = 1/16$  and  $\zeta = 1/4500$ . These values reproduce long-run earnings moments and a thin entrepreneurial tail needed for upper-wealth concentration.

**Technology and markups.** I fix  $\alpha = 0.318$  (labor share  $\approx 0.68$ ) and a quarterly depreciation  $\delta_0 = (0.07+0.016)/4 = 0.0215$ . Gross price and wage markups are  $\mu = \mu_w = 1.1$ .

**Liquidity, maturity, and portfolio supply.** Portfolio adjustment is  $\lambda = 0.03$ ; bond maturity is  $\delta_B = 1/5$ . Liquid supply is governed by  $\psi = 0.10$  (bonds to capital) and tradable profit claims with  $(\omega_\Pi, \iota_\Pi) = (0.15, 0.016)$ ; together these match the combined liquid paper relative to illiquid capital and help pin down the borrower share targeted in [Bayer et al. \(2024\)](#).

**Fiscal block and normalizations.** Tax parameters are  $(\tau^L, \tau^P) = (0.645, 0.1022)$ , delivering a government consumption share near 20%. I normalize  $\pi = \text{RB} = 1$  (quarterly). The borrower wedge implied by the code is  $\bar{R} = \pi(1.20)^{1/4} - 1 \approx 0.0466$ . The return normalization  $R = 1.01$  fixes the rental scale consistent with  $(\beta, \delta_0)$ .

**Model-specific steady-state constants.** A small number of parameters are scenario toggles in the code (e.g., ASHIFT, TRANSFERtoG, BRRatio, GRRatio. I list them in the table as experiment controls; they do not target external data and are not varied in estimation.

Table 1: Calibrated parameters and steady-state targets (quarterly)

| Block                                | Symbol                  | Value                                | Target / Mapping              | Data / Source                    |
|--------------------------------------|-------------------------|--------------------------------------|-------------------------------|----------------------------------|
| <i>Preferences and labor supply</i>  |                         |                                      |                               |                                  |
| Risk aversion                        | $\xi$                   | 4.000                                | Precautionary saving strength | Kaplan–Violante (2014)           |
| Inverse Frisch elasticity            | $\gamma$                | 2.000                                | Labor supply slope            | Chetty et al. (2011)             |
| Discount factor                      | $\beta$                 | 0.98255                              | $K/Y$                         | NIPA long-run averages           |
| Labor disutility scale               | $\gamma_{\text{scale}}$ | 0.200                                | Steady hours in [0.3,0.4]     | BLS/NIPA (hours)                 |
| <i>Income process and occupation</i> |                         |                                      |                               |                                  |
| Persistence (labor inc.)             | $\rho_h$                | 0.980                                | Earnings persistence          | Storesletten–Telmer–Yaron (2004) |
| Std. dev. (labor inc.)               | $\sigma_h$              | 0.120                                | Earnings dispersion           | Storesletten–Telmer–Yaron (2004) |
| $E \rightarrow W$ transition         | $\iota$                 | $1/16 = 0.0625$                      | Worker share in SS            | Guvenen–Kaplan–Song (2014)       |
| $W \rightarrow E$ transition         | $\zeta$                 | $1/4500 \approx 2.22 \times 10^{-4}$ | Top-tail wealth share         | WID/SCF                          |
| <i>Technology and markups</i>        |                         |                                      |                               |                                  |
| Capital share                        | $\alpha$                | 0.318                                | Labor share $\approx 0.68$    | NIPA factor shares               |
| Depreciation (quarterly)             | $\delta_0$              | 0.0215                               | $K/Y$                         | NIPA CFC                         |
| Price markup (gross)                 | $\mu$                   | 1.10                                 | Micro price-cost margins      | Standard benchmark               |

Continued on next page

Table 1: Calibrated parameters and steady-state targets (quarterly)  
*(continued)*

| <b>Block</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Symbol</b> | <b>Value</b> | <b>Target / Mapping</b>                | <b>Data / Source</b>            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------|----------------------------------------|---------------------------------|
| Wage markup<br>(gross)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\mu_w$       | 1.10         | Micro wage markup                      | Standard benchmark              |
| <i>Liquidity, maturity, and portfolio supply</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |              |                                        |                                 |
| Portfolio adj.<br>prob.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\lambda$     | 0.030        | Liquid/illiquid turnover               | SCF/NIPA (as in BBL)            |
| Bond maturity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $\delta_B$    | 0.200        | Avg. duration = $1/\delta_B$           | Treasury duration stylized fact |
| Bonds-to-capital                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $\psi$        | 0.100        | $(B + \bar{q}_\Pi)/K$                  | SCF/NIPA aggregate ratio        |
| Tradable profit<br>share                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | $\omega_\Pi$  | 0.150        | Liquid equity-like paper               | BBL steady-state mapping        |
| Retirement of<br>profit shares                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | $\iota_\Pi$   | 0.016        | Liquid claim turnover                  | BBL steady-state mapping        |
| <i>Fiscal block and normalizations</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |              |                                        |                                 |
| 1–Tax level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $1 - \tau^L$  | 0.645        | $G/Y \approx 0.20$ in SS               | NIPA government share           |
| Tax progressivity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $\tau^P$      | 0.1022       | Average progressivity                  | SOI                             |
| Gross inflation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $\pi$         | 1.000        | Normalization (indexation)             | Convention                      |
| Gross policy rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RB            | 1.000        | Growth-consistent level                | Convention                      |
| Borrower wedge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | $\bar{R}$     | 0.0466       | Borrower share $\sim 16\%$             | SCF (as in BBL)                 |
| Return on capital                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $R$           | 1.010        | Scale consistency w/ $\beta, \delta_0$ | Normalization                   |
| <i>Notes:</i> I target the same long-run empirical objects as <a href="#">Bayer et al. (2024)</a> : income persistence/dispersion, worker–entrepreneur flows, the combined liquid paper supply $(B + \bar{q}_\Pi)$ relative to illiquid capital $K$ , the prevalence of borrowers, factor shares, government size, and tax progressivity. “BBL steady-state mapping” refers to the accounting identity linking $(\omega_\Pi, \iota_\Pi)$ to $\bar{q}_\Pi/Y$ in their steady state. Inflation and the gross policy rate are normalizations under indexation. The borrower wedge is implied by $\bar{R} = \pi(1.20)^{1/4} - 1$ in my code. |               |              |                                        |                                 |

Table 2: Model-specific steady-state constants (not estimated)

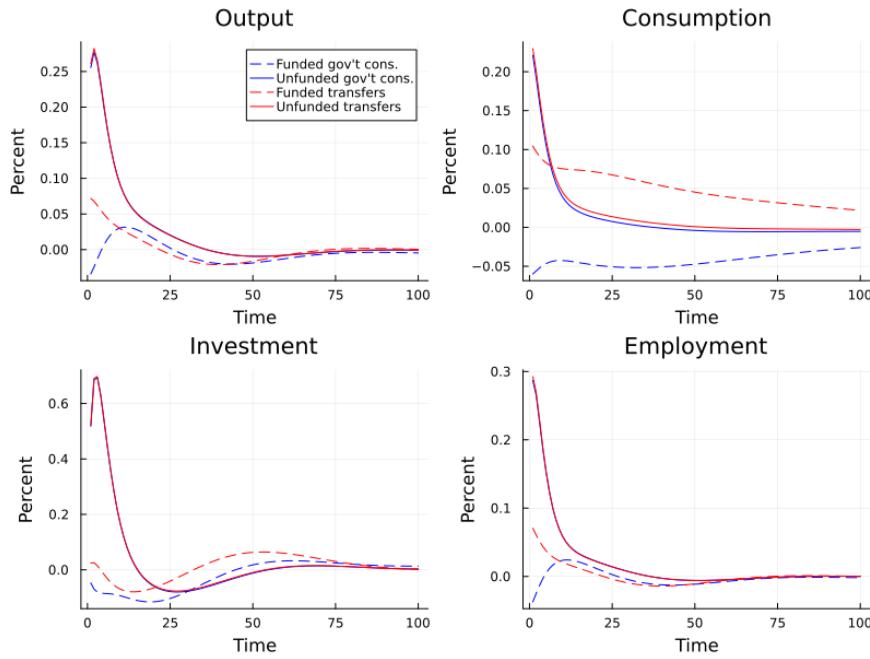
| Symbol                      | Value      | Role                   | Comment                                 |
|-----------------------------|------------|------------------------|-----------------------------------------|
| ASHIFT                      | 1.000      | Borrowing-wedge shift  | Code convenience scale                  |
| $\omega_{\Pi}^{\text{bar}}$ | 0.20       | Profit-claim scaling   | Complements $\omega_{\Pi}, \iota_{\Pi}$ |
| TRANSFERtoG                 | 1.00       | TRF/G ratio (baseline) | Scenario toggle                         |
| BRRatio, GRRatio            | 0.95, 0.95 | Ricardian shares       | Scenario toggles                        |
| $\alpha_G$                  | 0.0        | Policy switch          | Scenario toggle                         |

### 3 Calibrated Results

#### 3.1 Aggregate Effects on Activity, Prices, and Public Finances

##### 3.1.1 Quantities: Output, Consumption, Investment, Employment

Figure 1: Impulse Response Functions (IRFs) to fiscal shocks - Aggregate quantities




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Note: Impulse Response Functions (IRFs) for output, consumption, investment, and employment, showing the effects of a 0.1-percent temporary increase in fiscal expenditures. Solid lines represent unfunded shocks, while dashed lines depict funded shocks. Red lines indicate responses to transfers, and blue lines to government consumption. Here, the transfer shocks are lump-sum transfers distributed across households.

Figure 1 reports the impulse responses of output, consumption, investment, and employment to different fiscal shocks. All four aggregates rise on impact and gradually return to steady state, with unfunded shocks—both in government consumption and transfers—producing visibly stronger effects than their funded counterparts.

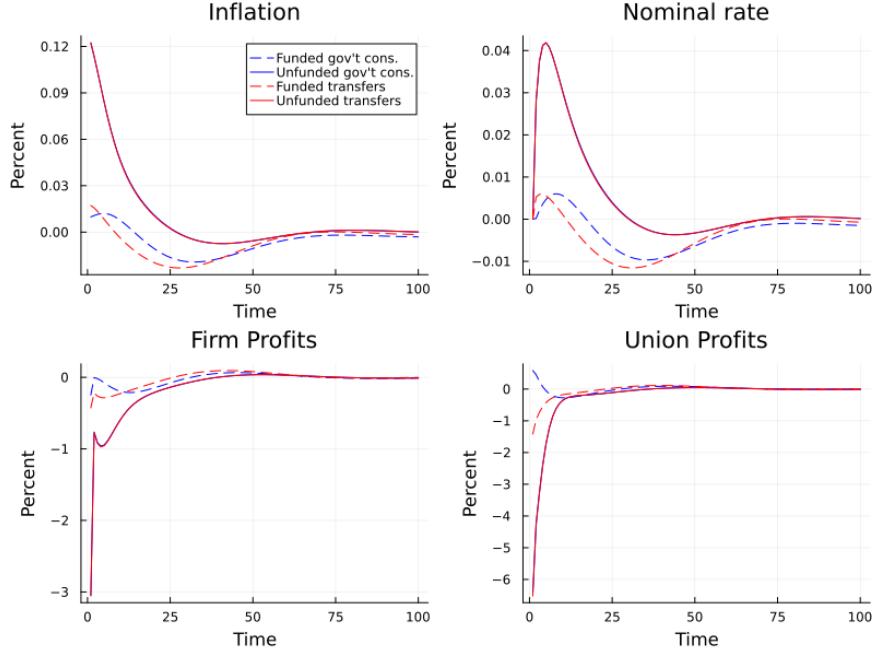
Under the fiscal theory of the price level, an unfunded expansion increases nominal liabilities without commensurate expected future primary surpluses. At pre-shock prices, the

stock of nominal debt is valued above its fiscal backing, which raises households' real net wealth and increases aggregate demand. Goods-market clearing then requires a one-time price-level revaluation that reduces the real value of nominal liabilities to align with the fiscal backing. The resulting valuation effect shifts purchasing power toward households with high marginal propensities to consume.

Notably, unfunded government consumption and unfunded transfers display almost identical impulse responses. Although the instruments differ in composition—public purchases versus household transfers—both operate through the same revaluation channel, yielding nearly indistinguishable short-run outcomes.

### 3.1.2 Prices and Incidence: Inflation, Policy Rate, Firm and Union Profits

Figure 2: Aggregate responses to fiscal shocks




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Note: Impulse Response Functions (IRFs) for inflation, nominal interest rate, firm profits, and union profits, showing the effects of a 0.1-percent temporary increase in fiscal expenditures. Solid lines represent unfunded shocks, while dashed lines depict funded shocks. Red lines indicate responses to transfers, and blue lines to government consumption. Here, the transfer shocks are lump-sum transfers distributed across households.

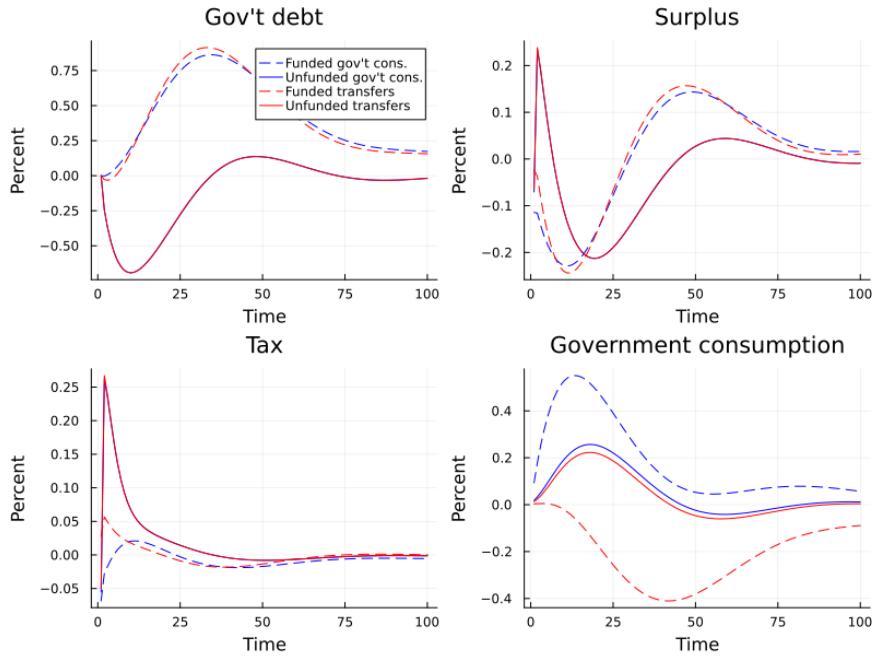
Figure 2 complements the real responses with nominal dynamics. Inflation and the policy rate rise on impact under all fiscal shocks, then dip below steady state before returning. The increase is larger under unfunded shocks because the price level jumps to restore consistency between nominal claims and fiscal backing; by contrast, under funded shocks expected fiscal consolidation tempers demand and limits the need for revaluation.

Firm and union profits fall on impact because markups compress: marginal costs and wages rise ahead of prices, reducing the price markup and the wage markup and lowering corporate profits and union rents. As markups normalize, both profit measures recover. The two unfunded instruments trace nearly identical paths, while funded shocks yield milder

movements in nominal variables and profits.

### 3.1.3 Public Finances: Real Debt, Surplus, Taxes, Government Consumption

Figure 3: Aggregate responses to fiscal shocks - Government




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Note: Impulse Response Functions (IRFs) for real government debt, surplus, tax, and government consumption, showing the effects of a 0.1-percent temporary increase in fiscal expenditures. Solid lines represent unfunded shocks, while dashed lines depict funded shocks. Red lines indicate responses to transfers, and blue lines to government consumption. Here, the transfer shocks are lump-sum transfers distributed across households.

Figure 3 reports the responses of government debt, the primary surplus, tax revenues, and government consumption. Under unfunded shocks, price-level revaluation lowers the real value of outstanding nominal liabilities on impact, so real public debt falls even as the primary balance initially deteriorates. As nominal activity expands, the tax base improves and the surplus turns temporarily positive before reverting.

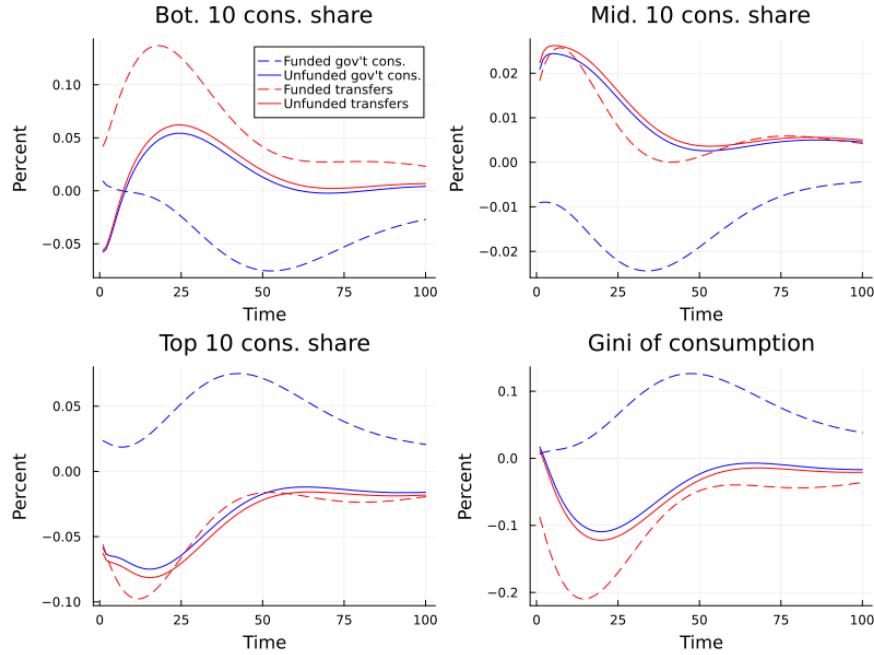
By contrast, funded shocks are backed by higher expected future primary surpluses. There is no offsetting valuation gain, so real public debt rises on impact and returns to

baseline through explicit fiscal consolidation—higher taxes and/or lower spending—rather than through prices.

Tax revenues respond primarily to movements in the tax base. Under an unfunded expansion, tax revenues dip slightly on impact and then turn positive as nominal income and the tax base expand, before reverting. Under a funded transfer shock, revenues rise mildly on impact in line with higher activity. Under a funded government consumption shock, tax revenues decline on impact in our calibration because the private tax base contracts when public purchases crowd out private activity. Overall, in this model the contribution of debt financing is larger and more persistent than that of tax financing.

### 3.2 Distributional Effects: Portfolios, Consumption Shares, and Inequality

Figure 4: Aggregate responses to fiscal shocks - Consumption shares



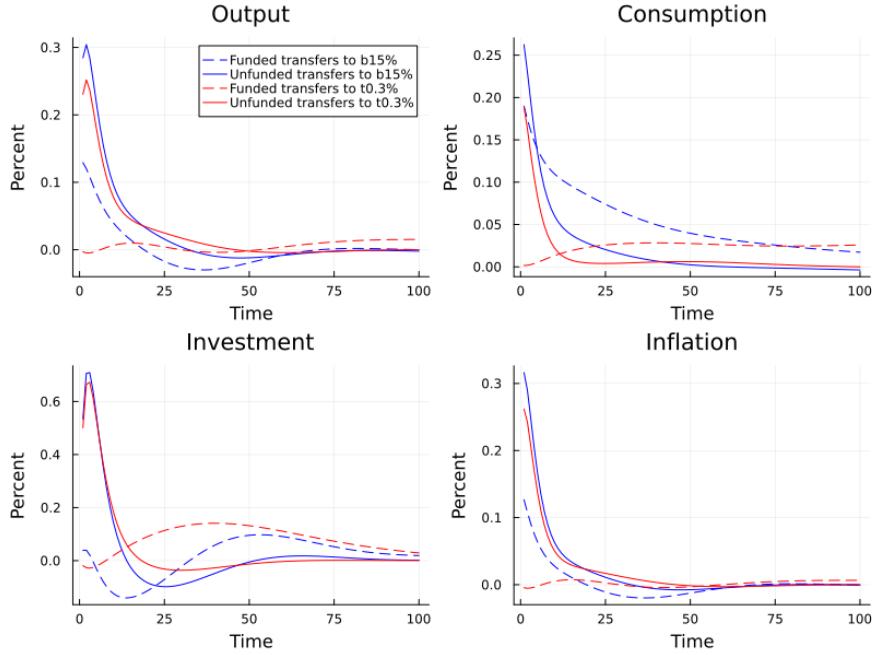
Note: Impulse Response Functions (IRFs) for consumption shares and overall consumption inequality, showing the effects of a 0.1-percent temporary increase in fiscal expenditures. Solid lines represent unfunded shocks, while dashed lines depict funded shocks. Red lines indicate responses to transfers, and blue lines to government consumption. Here, the transfer shocks are lump-sum transfers distributed across households.

Figure 4 presents distributional responses—the consumption shares of the bottom, middle, and top deciles, and the consumption Gini. Under unfunded government consumption and transfers, the bottom and middle shares rise while the top share and the Gini fall, indicating a temporary compression in inequality. By contrast, funded government consumption shifts shares toward the top and raises the Gini. Notably, funded transfers lift the bottom share more on impact than the unfunded shocks in the calibration, while still lowering the top share and the Gini.

At the bottom of the distribution, two channels are at work under an unfunded policy. On impact, union profits fall sharply as markups compress; because low-productivity households receive union profits as a lump-sum residual, their consumption share can dip briefly even if wages are rising. As price-level revaluation reduces the real burden of net nominal liabilities for high-MPC borrowers, the bottom share turns positive and then gradually returns toward steady state. The middle decile benefits earliest from improved liquidity, whereas the top decile—holding more nominal assets—loses share when revaluation erodes their real value. The cross-sectional pattern at impact thus has an inverted-U shape: the middle gains, both tails lose, and the bottom turns from negative to positive as revaluation works through. Among funded instruments, transfers deliver direct income to lower-income, high-MPC households and therefore raise the bottom share more than funded government consumption, which tilts shares upward.

### 3.3 Impact of Transfer Recipients on Economic Stimulation

Figure 5: Aggregate responses to funded versus unfunded transfers



Note: Impulse Response Functions (IRFs) for output, consumption, investment, and inflation, showing the effects of a 0.1-percent temporary increase in fiscal transfers. Solid lines represent unfunded shocks, while dashed lines depict funded shocks. Red lines indicate responses to transfers to the top 0.3 percent ( $t0.3$ ) of the population, and blue lines to transfers to the bottom 15 percent ( $b15$ ) of the population.

Figure 5 separates who receives the transfer from how it is financed. When transfers are funded, the impact depends almost entirely on recipients' MPC. Targeting the top 0.3 percent (entrepreneurs with very low MPCs) yields essentially no contemporaneous rise in aggregate consumption. By contrast, funding a transfer to the bottom 15 percent—who have high MPCs—produces an immediate and sizable increase in consumption.

Unfunded transfers add a second, price-level channel. If the transfer is targeted to the top 0.3 percent, the direct effect remains negligible, but the inflationary revaluation of nominal positions shifts wealth from the top toward the lower parts of the distribution. Because these households have higher MPCs, aggregate consumption still rises even though the transfer

went to the top. When the transfer is both unfunded and targeted to the bottom 15 percent, the two mechanisms reinforce each other: high-MPC recipients spend on impact, and the revaluation further lifts the spending capacity of lower-income households. This configuration delivers the largest consumption response.

## 4 Conclusion

This paper studies the macroeconomic and distributional effects of unfunded fiscal policy in a heterogeneous-agent New Keynesian economy with incomplete markets, endogenous portfolio choice, and long-term nominal debt. The framework places nominal rigidities alongside portfolio heterogeneity, so fiscal interventions work through both price-setting and balance-sheet channels.

Three lessons emerge from the calibrated economy.

First, funding dominates instrument for unfunded policy: unfunded government purchases and unfunded transfers generate essentially the same short-run transmission and materially larger multipliers than funded policies. The mechanism is price-level revaluation, which lowers the real value of outstanding nominal debt and raises the net worth of households with high marginal propensities to consume. On impact, price and wage markups compress, firm and union profits fall, and consumption inequality narrows temporarily.

Second, when policy is funded, composition matters. Funded transfers provide the strongest immediate support to lower-income consumption, whereas funded government purchases tilt the consumption distribution upward. Targeting and funding play distinct roles: recipient MPC pins down the sign and size of the impact response; the funding regime amplifies or attenuates it by adding (or removing) the price-level revaluation channel.

Third, fiscal balance-sheet dynamics differ sharply by regime. Unfunded shocks reduce real public debt on impact through revaluation. Funded shocks raise real debt and return toward baseline through explicit financing—higher taxes and later spending restraint—rather

than through prices.

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