Resolving the Inflation-Inclusion Trade-Off

Valerio Pieroni*

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Abstract

This paper examines how macroeconomic policies can internalize distributional concerns and support a more inclusive recovery after a demand-driven recession using a quantitative heterogeneous agent model with nominal rigidities and labor market frictions. A monetary expansion that runs the economy hot during the recovery can improve long-term labor market outcomes for low-skill workers at the cost of greater inflation. I find that fiscal policy can decouple inclusion from aggregate demand. Labor-income tax credits for low-income households can offset earnings losses due to unemployment while generating no inflation cost.

Keywords: Heterogeneous Agents, Fiscal Policy, Monetary Policy, Redistribution, Inequality.

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*University of Essex. Email: valerio.pieroni.econ@gmail.com.

1 Introduction

In recent years, micro-level evidence has documented that business cycles have unequal impact across the income distribution (Guvenen, Schulhofer-Wohl, Song, and Yogo (2017)) and that workers at the lower end of the distribution experience prolonged shortfalls in employment and earnings that persist well beyond the recovery of aggregate output and headline unemployment to their trend levels (Aaronson, Daly, Wascher, and Wilcox (2019), Yagan (2019)). This growing body of empirical evidence, together with advances in heterogeneous agents models, has shifted the policy focus away from aggregate stabilization toward promoting an inclusive recovery that mitigates unequal burdens across the income distribution, with particular emphasis on the most vulnerable households. The U.S. Federal Reserve conducted a strategic review in 2020 that resulted in a substantial revision of its monetary policy framework, emphasizing a more inclusive interpretation of the maximum employment mandate as a broad-based objective (Powell (2020)). Inclusive macroeconomic policy faces a fundamental trade-off: while sustained stimulus measures can promote a more equitable recovery, they also heighten the risk of inflationary pressures (Alves and Violante (2025a), Alves and Violante (2025b)). However, this trade-off is not immutable, rather, its magnitude depends critically on the policy instrument and the overall design of policy interventions. This paper examines the aggregate and distributional effects of interest rate cuts and labor income tax credits.

To this end, I leverage a quantitative Heterogeneous Agent New Keynesian (HANK) model with labor market frictions allowing for flows of workers between employment and unemployment, long-lasting scarring effects of recessions, and higher exposure to unemployment risk for low-skilled workers. The model features nominal rigidities in both prices and wages and allows for labor supply adjustments along both the intensive and extensive margins.

The main finding of the paper is that social insurance can be effectively decoupled from aggregate demand stimulus. This result suggests that policy interventions can be designed to support the income and consumption of the most vulnerable households while imposing little to no additional inflationary pressure. Specifically, a "lower-for-longer" monetary policy strategy that maintains interest rates at low levels for an extended period generates additional output expansion during the later stages of the recovery, thereby improving long-run labor market outcomes for low-skilled workers. Because this strategy provides insurance exclusively through aggregate demand stimulus, however, it entails a substantial increase in inflation. By contrast, labor income tax credits provide a more flexible policy instrument that can serve both insurance and aggregate demand objectives. In particular, when appropriately targeted and modest in size, temporary tax credits can directly compensate workers for earnings losses following reemployment after job displacement, allowing them to rebuild the skills and experience necessary to recover their pre-recession earnings. Such targeted interventions entail no inflationary cost.

In the model, there are employed workers and unemployed workers. Among unemployed workers I distinguish between unemployed workers with UI and unemployed workers without UI. Job-separation and job-finding rates move workers between employment and unemployment. These labor market frictions depend on the workers' labor market skills. In the model as in the data, low-skilled workers are more exposed to unemployment risk and face a lower job-finding rate and higher job-separation rate. Importantly, these rates fluctuate with the level of economic activity resulting in an increase in unemployment risk during recessions. Employed workers can choose their labor supply, introducing an intensive margin of labor supply. In addition, I introduce skill depreciation during unemployment spells. This implies that unemployed workers see their skill deteriorate and, as a result, their job-finding rate decreases while their job-separation rate increases. This generates long-lasting scarring effects of recessions on household earnings. The model is also consistent with empirical evidence on the Marginal Propensity to Consume (MPC) and on the Marginal Propensity to Earn (MPE).

I use this model as a laboratory to analyze the aggregate and distributional effects of different macroeconomic stabilization policies. Specifically, I consider a demand-driven recession induced by an increase in the rate of return on bonds akin to a "risk-premium" shock common in the literature on estimated New Keynesian models (Smets and Wouters (2007)). I show that the model generates an unequal impact of the recession, with low-skill households bearing the highest costs. Importantly, income and employment losses among low-skill households remain substantial for a prolonged period. Even one year after the shock, when aggregate output has recovered, the earnings loss of the bottom decile remains almost as large as the initial decline in the average disposable income. I evaluate the effectivness of stimulus measures, i.e. interest rate cuts and labor income tax credits, at promoting both macroeconomic stability and inclusive outcomes such that no income group is left behind during the recovery. I consider two policy options. First, a "lower-for-longer" monetary strategy keeps the policy rate at a low level for an extended period. The objective of this strategy is to induce an economic expansion in the later stages of the recovery, ensuring that not only aggregate outcomes but also the incomes of low-skilled workers fully recover. Second, a labor income tax credit for low-income working households aims to compensate for earnings losses following job displacement. Each policy has a distinct objective: interest rate cuts are aimed at stabilizing output and inflation, while labor tax credit measures are primarily directed toward insuring vulnerable households. In the HANK framework, however, this distinction is less clear-cut, as monetary policy has significant distributional effects and labor tax credits also can stimulate aggregate demand, generating macroeconomic effects. Consequently, the model provides a natural framework for jointly studying the aggregate and distributional outcomes of each policy. I find that, for interest rate cuts, there is limited scope for separating aggregate demand stimulus from redistribution. By contrast, labor income tax credits can be designed to provide targeted insurance without demand stimulus.

I first consider the lower-for-longer monetary policy. This policy primarily operates through aggregate channels by stimulating economic activity and improving labor market conditions over time. By supporting job creation and reducing job separation rates, a prolonged monetary expansion leads to more favorable long-term employment outcomes for low-skill workers, who are disproportionately exposed to unemployment risk. However, at the onset of the recession, lower-for-longer monetary policy has limited effects on the unequal impact of the shock. While aggregate output stabilizes, income and consumption losses among low-skill households remain large at impact, reflecting the slow transmission of monetary policy to labor market outcomes and the absence of direct income support.

An alternative to monetary stimulus is the use of targeted fiscal policy to provide social insurance during recessions. I consider a temporary labor income tax credit targeted at low-income working households, designed to compensate workers for the earnings losses associated with unemployment. The central result is that appropriately designed tax credits can largely decouple social insurance from aggregate demand stimulus. When the policy is sufficiently targeted in terms of eligibility and generosity, it provides substantial support to vulnerable households while generating virtually no aggregate demand response and, consequently, little inflationary pressure. In the baseline experiment, the tax credit is phased out relatively rapidly and is available only to households in the bottom 50% of the income distribution. The transfer is modest in size, reaching a maximum size of approximately \$90. This combination of narrow targeting and limited generosity substantially reduces the macroeconomic footprint of the policy. Relative to the no-policy benchmark, output, aggregate consumption, and unemployment are essentially unchanged. Because the policy does not generate a meaningful expansion in aggregate demand, it also produces virtually no additional inflation. Increasing the transfer to \$200 begins to generate a measurable aggregate demand stimulus and upward pressure on inflation. The absence of aggregate effects, however, masks substantial distributional consequences. The tax credit significantly raises labor earnings and sustains consumption among low-skilled households, thereby mitigating the unequal incidence of the recession across different skill groups. These effects persist beyond the initial impact of the recession, reflecting the role of the policy in cushioning the longer-term earnings losses associated with unemployment spells. In particular, temporary income support following reemployment allows displaced workers time to rebuild skills and accumulate work experience, reducing the persistent earnings losses that can result from recession-induced job displacement. Overall, the results highlight a fundamental advantage of targeted fiscal policy relative to conventional macroeconomic stimulus. Labor income tax credits can be designed to address the distributional and persistent consequences of recessions without generating substantial aggregate demand pressure. They therefore provide an effective mechanism for mitigating both the short- and long-term earnings losses associated with unemployment, while imposing no inflationary cost.

Since labor income tax credits can also be used to stimulate aggregate demand and reduce unemployment, I compare the effects of the Lower-for-Longer (LfL) monetary strategy with those of larger-scale Labor Tax Credits (LTC). By varying the persistence of the interest rate cut and the size of the tax credit, I trace the trade-off between inflation and unemployment, focusing both on workers at the bottom of the skill distribution and on aggregate unemployment. The results show that LfL monetary policy and LTCs can generate broadly similar aggregate demand effects, but their inflationary costs differ substantially when policymakers seek large reductions in unemployment. In particular, achieving substantial unemployment reductions through a prolonged period of low interest rates entails sizeable inflationary pressures. By contrast, LTCs can deliver comparable improvements in unemployment with substantially lower inflation. This difference reflects the greater flexibility of fiscal policy in targeting the distribution of labor income losses. Importantly, LTCs can serve two distinct functions depending on their scale. When modest in size and narrowly targeted, for example, transfers of around \$100 primarily operate as social insurance, compensating workers for earnings losses following job displacement while generating little aggregate demand stimulus. As the size of the credit increases, however, the policy begins to affect aggregate expenditure and firms' labor demand. At sufficiently large levels, such as \$500 or more, LTCs can therefore operate as a conventional demand stimulus, reducing unemployment by supporting aggregate economic activity. This dual role allows fiscal policy to be calibrated to the nature of the underlying policy objective. The distinction between earnings and employment losses is central to this result. Targeted transfers are particularly well suited to insuring households against persistent earnings losses following unemployment, whereas aggregate demand stimulus is necessary when the primary objective is to restore employment opportunities during a recession. LTCs can address both margins within a common policy instrument: small, targeted credits provide direct insurance, while larger credits can additionally support aggregate demand and employment.

Overall, the redistribution channel of several macroeconomic policies is put to scrutiny through the lens of a quantitative HANK model. The analysis highlights that policy design is crucial for achieving an inclusive recovery at low inflationary cost. Lower-for-longer monetary policy can achieve a broad-based recovery at the cost of higher inflation, while labor tax credits of modest size for low-income households can provide insurance without generating additional aggregate demand stimulus and inflation. Recognizing this result allows policymakers to better balance inflation stabilization and distributional objectives by managing different policy instruments and the scale of policy interventions. The trade-off between inflation and inclusion is not fixed across policy settings. Its magnitude depends critically on the policy instrument and the design of fiscal measures. Front-loaded fiscal support can reduce the need for prolonged low interest rates, allowing an inclusive recovery to be achieved with low inflationary pressures.

Literature. This paper is closely related to a recent literature using quantitative HANK models with labor market frictions for assessing the effects of inclusive macroeconomic policies. Along these lines, Alves and Violante (2025a) use a quantitative HANK model to construct counterfactual policy scenarios and study the effects of monetary and fiscal policy in the United States in the aftermath of the pandemic. In a similar spirit, Alves and Violante (2025b) examine the macroeconomic impact of the new monetary policy framework of the Federal Reserve using a quantitative HANK model. Nakajima (2023) analyzes the effects of monetary policy on racial inequality and labor market outcomes across different demographic groups. Nakajima (2024) using a quantitative HANK model shows that monetary policy can prevent persistent earnings losses upon job displacement by sustaining the level of economic activity during recessions. Close to this paper, Ferriere and Navarro (2024) show that top income taxation increases the effectivness of government spending by redistributing the fiscal burden across households, while Ferriere and Navarro (2025) use a quantitative HANK model to study the effectivness of different fiscal stabilization packages emphasizing the stimulative effects of income tax credits for low-income households. This paper contributes to this recent literature by jointly analyzing the aggregate and distributional effects of several macroeconomic policies and by demonstrating that the inflation–inclusion trade-off depends critically on policy design.

More broadly this paper contributes to the HANK literature studying the effects of fiscal policy and monetary policy (Kaplan, Moll, and Violante (2018), Bayer, Born, and Luetticke (2023), Auclert, Bardóczy, and Rognlie (2023), Auclert, Rognlie, and Straub (2024)). In this literature, Seidl and Seyrich (2023) establish an equivalence at the macro level between monetary policy and fiscal policy using tax and debt policies. In a similar spirit, Wolf (2025) shows that transfer policies can achieve the same aggregate outcomes as interest rate cuts. In this strand of the literature, McKay and Reis (2016) explore the role of fiscal policies and of the time-invariant tax and transfer system as automatic stabilizers.[1] McKay and Reis (2021) study the optimal design of social insurance programmes and other automatic stabilizers and find that the presence of business cycles increases the optimal unemployment insurance replacement rate, while having a negligible effect on the optimal degree of income tax progressivity. Parallel to this, Hagedorn, Manovskii, and Mitman (2019), Bouabdallah, Jacquinot, and Šterc (2025) focus on the effectivness of government spending multipliers using quantitative HANK models without labor market frictions.

[1] Also Oh and Reis (2012) analyze the effectivness of fiscal policies during the Great Recession. Kekre (2023) extends the HANK model with search frictions and argues that UI extensions reduced the unemployment rate during the Great Recession. Recent quantitative work also leverage the HANK framework to analyze how behavioral factors such as imperfect expectations and present bias shape the macroeconomic stabilization properties of UI policies (Bardóczy and Guerreiro (2024), Fernandes and Rigato (2024)). See also Bayer, Born, Luetticke, and Müller (2023) for an analysis of UI policies implemented during the pandemic period. Recent quantitative work evaluating the effectiveness of UI policies as automatic stabilizers includes Di Maggio and Kermani (2016), Mitman and Rabinovich (2015), and Mitman and Rabinovich (2021).

This paper departs from the existing literature by incorporating scarring effects of unemployment. I build on Ljungqvist and Sargent (1998), Burdett, Carrillo-Tudela, and Coles (2020) to incorporate in my model scarring effects of unemployment. In the model, skill depreciation and foregone human capital accumulation during unemployment are the key driving forces of long-term earnings losses due to job displacement after a recession. This is crucial for capturing the unequal impact of recessions and provides a rationale for inclusive macroeconomic policy interventions. I find that inclusive macroeconomic policies are more effective when they significantly reduce unemployment or the labor income tax burden, thereby preventing or compensating the long-term earnings losses associated with unemployment spells. Moreover, this paper studies monetary policy and fiscal policy by jointly characterizing their macroeconomic and distributional effects. The results underscore the significant role of monetary policy in shaping labor market outcomes, with particularly pronounced effects among low-skilled workers. They further indicate that fiscal policy serves a dual role, functioning both as a macroeconomic stabilization instrument and as a mechanism for social insurance.

This paper is also related to the literature studying how job market flows and labor supply decisions shape macroeconomic outcomes. Graves, Huckfeldt, and Swanson (2024) document the importance of labor supply decisions for the effects of monetary policy on employment. Moscarini and Postel-Vinay (2023) show how employment reallocation effects matter for the response of inflation to macroeconomic shocks. In a similar spirit, several papers highlight the importance of labor supply decisions for macroeconomic outcomes (Krusell, Mukoyama, Rogerson, and Sahin (2017), Huo and Ríos-Rull (2020), Gerke, Giesen, Lozej, and Röttger (2024), Cantore, Ferroni, Mumtaz, and Theophilopoulou (2025)).

Finally, this paper is related to a literature on optimal fiscal policy and optimal monetary policy. Bhandari, Evans, Golosov, and Sargent (2021) discuss the stabilizing properties of fiscal policy. Le Grand, Ragot, and Bourany (2024) argue that labor taxes are a powerful instrument to stabilize demand shocks. Zoi (2023) studies the optimal degree of income tax progressivity over the business cycle in a heterogeneous agent model. McKay and Wolf (2025) study the design of optimal monetary policy rules in HANK. Dávila and Schaab (2023), Smirnov (2023), Nuño and Thomas (2022) also study optimal monetary policy in HANK. My results open the question about how the distributional effects of business cycles shape the optimal design of monetary policy and fiscal policy.

Outline. The paper is organized as follows. Section 2 presents the model. Section 3 discusses its parametrization and calibration strategy. Section 4 analyzes the macroeconomic effects together with the redistribution channel of different macroeconomic stabilization policies with a focus on the economic outcomes for low-skill workers. Section 5 concludes.

2 Model

In this section, I present a quantitative HANK model with unemployment and labor market frictions. Job-finding and job-separation rates move workers between employment and unemployment. Markets are incomplete, and households accumulate assets to insure against idiosyncratic income risk and unemployment risk. The government collects labor income taxes to finance unemployment insurance (UI), lump-sum transfers, public spending, and borrowing expenses. The rest of the model follows the New Keynesian literature with nominal price rigidities and nominal wage rigidities.

2.1 Households

Households are heterogeneous along three dimensions: labor income productivity e_t, asset holdings, a_t, and labor market state s_t. I distinguish between employed workers ($s_t = e$), unemployed workers with UI ($s_t = u_1$), and unemployed workers without UI ($s_t = u_0$). Households choose consumption c_t. Unemployed households receive job offers at Poisson arrival times, while employed households separate from their jobs at random Poisson dates. Let w_t denote the real wage, r_t the return on saving, d_t business income, τ_t labor income taxes, and $\tau_{x,t}$ a government transfer. The problem of the employed is

$$\max_{c_t} \ \mathbb{E}_0 \int_0^\infty e^{-\rho t} u^e(c_t, n_t) dt, \tag{1}$$

$$\text{s.t. } da_t = ((1 - \tau_t) w_t e_t n_t + \tau_{x,t} + d_t + r_t a_t - c_t) dt,$$

$$a_t \geq -\phi,$$

where $y_t := w_t e_t n_t$ are the labor earnings of an employed worker with skills e_t, and ϕ is the borrowing limit. Employed workers separate from their jobs at rate λ_u. Workers take labor supply n_t as given. Following the literature on sticky wages, I assume that labor supply is homogeneous across households. In equilibrium, aggregate labor supply is therefore rationed across households according to the rule $n_t = N_t / \int_X e_t d\mu_t$ where μ_t is the distribution of idiosyncratic states across households. Under separable CRRA preferences, a household is rationed whenever $v'(n_t) < (1 - \tau_t) w_t e_t u'(c_t)$, so that it would optimally choose to supply more labor at the prevailing wage. Conversely, households for which $v'(n_t) > (1 - \tau_t) w_t e_t u'(c_t)$ would prefer to supply less labor but are unable to do so. This rationing friction limits households' ability to adjust labor income and thereby constrains their capacity to smooth consumption. As a result, households cannot freely adjust employment along the intensive margin in response to shocks. This assumption is also consistent with the institutional features of modern labor markets, where hours are typically organized around relatively fixed work schedules.

Among the unemployed I distinguish between unemployment with UI and unemployment without UI. In practice, not all unemployed workers are eligible for UI and a substantial fraction does not take up UI even if eligible. Therefore, I assume that only a fraction θ_u of eligible workers take up UI. Unemployed household with UI solve

$$\max_{c_t} \ \mathbb{E}_0 \int_0^{\infty} e^{-\rho t} u^{u_1}(c_t) dt, \tag{2}$$

$$\text{s.t. } da_t = (\mathcal{B}(e_t) + \tau_{x,t} + d_t + r_t a_t - c_t) dt,$$

$$a_t \geq -\phi,$$

where the UI benefits are given by $\mathcal{B}(e_t) = \min(be_t, b_{\max})$ as in McKay and Reis (2016). b is the UI replacement rate and $b_{\max}$ the UI cap. Unemployment benefits depend on the idiosyncratic productivity in order to capture the dependece of UI payments to the workers' earnings before job displacement. The eligibility for UI expires with rate λ_{u_0}. Unemployed households accept job offers at rate λ_e.

Unemployed household without UI solve

$$\max_{c_t} \ \mathbb{E}_0 \int_0^{\infty} e^{-\rho t} u^{u_0}(c_t) dt, \tag{3}$$

$$\text{s.t. } da_t = (\tau_{x,t} + d_t + r_t a_t - c_t) dt,$$

$$a_t \geq -\phi,$$

Unemployed households without UI also accept job offers at rate λ_e and upon arrival of a job offer re-enter employment. To conclude, I summarize the role of shocks for labor market flows. Employed workers $(s_t = e)$ face a job separation rate λ_u and conditional on arrival move to unemployment without UI with probability $1-\theta_u$ and to unemployment with UI with probability θ_u. Unemployed workers with UI $(s_t = u_1)$ face a job finding rate λ_e and upon arrival of a job offer can re-enter employment. Importantly, as I discuss below in this section, these job-separation and job-finding rates are endogenous as they vary with the level of economic activity. This introduces in the model an extensive margin of labor supply. The model incorporates both intensive and extensive margins of labor-supply adjustment, enabling it to capture how individuals respond not only by altering the number of hours worked (intensive margin) but also by changes in employment (extensive margin). While I do not explicitly microfound job-finding and job-separation rates, the model it is sufficiently rich to disentangle, to a first order, the relative contributions of different labor market channels. Finally, UI expires at rate λ_{u_0} moving these households to unemployment without UI. I assume that unemployed workers without UI face the same job-finding rate λ_e as unemployed workers with UI.

Households derive utility from consumption c_t, suffer disutility from labor supply n_t. I use a CRRA functional form throughout this paper. Employed workers have preferences given by the utility function:

$$u^e(c_t, n_t) = \frac{c_t^{1-\gamma}}{1-\gamma} - \frac{n_t^{1+\nu}}{1+\nu}$$

with $\gamma \geq 0, \nu \geq 0$, where $1/\gamma$ is the elasticity of intertemporal substitution and $1/\nu$ is the Frisch elasticity of labor supply. Unemployed workers have preferences given by the utility function:

$$u^u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}.$$

Workers' skills e_t evolve according to a Ornstein-Uhlenbeck process:

$$d \ln e_t = (-\nu_e \ln e_t + 1_{[s_t=e]}\delta^+ - 1_{[s_t=u]}\delta^-)dt + \sigma_e d\hat{w}_t,$$

where $d\hat{w}_t \sim N(0, dt)$ is a standard Brownian motion. The drift of the process depends on the employment status. In particular I distinguish between the drift when households are employed δ^+, and the drift when households are unemployed δ^-. This allows to capture the scarring effects of unemployment through skills depreciation and introduce hysteresis effects in the model. The recursive formulation of the household problem in (1), (2), (3) is presented in the Online Appendix A.

Outside of the steady state the job finding rate and the job separation rate vary with fluctuations in aggregate labor demand N_t. Since I use a linear production technology this is equivalent to let job finding rates and job separation rates vary with the level of economic activity, i.e. aggregate output. This captures the fact that labor market opportunities tend to improve during expansions and deteriorate during recessions. As the focus of the paper is to make a first step toward understaning the relative role of different labor market outcomes in the transmission of macroeconomic stabilization policies, I leave the microfoundation of these effects to future research. I also allow for heterogeneous labor market frictions by skill level. Specifically, I use the following functional forms

$$\lambda_{s,t} = \lambda^s(e_t)(N_t/N)^{\eta_s},$$

with $s \in \{e, u\}$, where η_s is the elasticity with respect to labor (or output). Moreover,

$$\lambda^s(e_t) = \lambda_s + \lambda_{s,1} \exp(\lambda_{s,2} e_t).$$

As individuals' labor-market skills depreciate over time, both job finding and job separation rates tend to worsen. The erosion of human capital thus amplifies labor-market frictions, making periods of unemployment increasingly detrimental. Consequently, unemployment becomes a state associated with compounding disadvantages and diminished labor-market prospects.

2.2 Price and wage setting

In this section I present the supply block of the model. I introduce in the model sticky prices and sticky wages. I assume that firms produce intermediate goods indexed by $j \in [0,1]$ in monopolistic competition using a linear production technology $Y_{jt} = N_{jt}$.

Intermediate firms supply the continuum of intermediate goods to a competitive final good producer. The final good firm aggregates the intermediate goods by maximizing profits. This firm solve the following problem

$$\max_{Y_{jt}} \; P_t Y_t - \int_0^1 P_{jt} Y_{jt} dj, \qquad \text{s.t. } Y_t = \left(\int_0^1 Y_{jt}^{\frac{\epsilon-1}{\epsilon}} dj \right)^{\frac{\epsilon}{\epsilon-1}},$$

where P is the nominal price of the final good Y is the aggregate final good, and $\epsilon > 1$ is the elasticity of substitution across differentiated intermediate goods. This implies a standard CES demand function for intermediate good of type j given by $Y_{jt} = (P_{jt}/P_t)^{-\epsilon} Y_t$.

It only remains to specify how nominal prices are set by intermediate firms in the economy. I use nominal price rigidities to derive the price Phillips curve of my model. Intermediate firms set nominal prices subject to price adjustment costs by maximizing the discounted stream of profits. Following the literature, I assume that the price adjustment costs are virtual, i.e. they do not cause a real waste of resources and only affects optimal decisions. Define $m_{jt} := P_{jt} mc_{jt}$ as the nominal marginal costs of firm j. Intermediate firms set prices to maximize the discounted sum of profits subject to price adjustment costs

$$\max_{\dot{P}_{jt}} \int_0^\infty \left[\exp\left(- \int_0^t i_s ds \right) \left((P_{jt} - m_{jt}) Y_{jt} - \frac{\theta}{2} \left(\frac{\dot{P}_{jt}}{P_{jt}} \right)^2 P_t Y_t \right) \right] dt$$

$$\text{s.t. } Y_{jt} = \left(\frac{P_{jt}}{P_t} \right)^{-\epsilon} Y_t.$$

Let the price markup $\mu_p := \epsilon/(\epsilon - 1)$, in a symmetric equilibrium with $P_{jt} = P_t$ and $Y_{jt} = Y_t$, we obtain the price Phillips curve given by

$$\pi_t \left(r_t - \frac{\dot{Y}_t}{Y_t} \right) = \dot{\pi}_t + \frac{\epsilon}{\theta} (mc_t - \mu_p^{-1})$$

The parameter θ governs the magnitude of the costs associated with price adjustments. Marginal pricing implies $w_t = mc_t$. As marginal costs rise above their steady-state level, firms adjust prices upward in order to increase markups. The total profits in this economy are given by $D_t = Y_t - w_t N_t$ and distributed to households according to the proportional rule $d_t = \frac{e_t}{\int_X e_t d\mu_t} D_t$. This distribution of profits implies that business income and dividends are concentrated at the top of the income distribution.

In the economy nominal wages are set by unions subject to wage adjustment costs. A competitive recruiting firm aggregates a continuum of differentiated labor services indexed by $k \in [0,1]$ by maximizing profits subject to a CES aggregator

$$\max_{N_{kt}} \; W_t N_t - \int_0^1 W_{kt} N_{kt} dk, \qquad \text{s.t. } N_t = \left(\int_0^1 N_{kt}^{\frac{\epsilon_w - 1}{\epsilon_w}} dk \right)^{\frac{\epsilon_w}{\epsilon_w - 1}},$$

where W is the nominal wage, N is the aggregate labor demand or hours, and ϵ_w is the elasticity of substitution across differentiated labor inputs. This implies a CES demand for labor services of type k given by $N_{kt} = (W_{kt}/W_t)^{-\epsilon_w} N_t$.

Households supply a continuum of labor services which are imperfect substitutes, and for each labor input k, a union sets the nominal wage to maximize the welfare of the average union member, taking marginal utility of consumption u' and the labor disutility v as given. The resulting marginal rate of substitution is given by $mrs_t := v'(N_t)/u'(C_t)$. The weight on the disutility of this representative worker is normalized to one. I assume that labor supply is equally distributed across workers. As discussed above this assumption implies labor rationing or forcing individuals to work more than their desired hours, which are common features in models with sticky wages. The natural interpretation of this assumption is that individuals face employment contracts with fixed working hours, often centered around a standard full-time workweek of approximately 40 hours. Thus, conditional on employment, workers have limited scope to adjust hours in response to shocks. The union solves the following problem

$$\max_{\dot{W}_{kt}} \int_0^\infty \left[\exp\left(- \int_0^t r_s ds \right) \left(\int_0^1 \frac{W_{kt}}{P_t} N_{kt} - \frac{v(N_{kt})}{u'(C_t)} - \frac{\theta_w}{2} \left(\frac{\dot{W}_{kt}}{W_{kt}} \right)^2 N_t dk \right) \right] dt$$

$$\text{s.t. } N_{kt} = \left(\frac{W_{kt}}{W_t} \right)^{-\epsilon_w} N_t.$$

Let the wage markup $\mu_w := \epsilon_w/(\epsilon_w - 1)$, in a symmetric equilibrium with $W_{kt} = W_t$ and $N_{kt} = N_t$, I obtain a wage Phillips curve given by

$$\pi_{w,t} \left(r_t - \frac{\dot{N}_t}{N_t} \right) = \dot{\pi}_{w,t} + \frac{\epsilon_w}{\theta_w} (mrs_t - w_t \mu_w^{-1})$$

The gap $mrs_t - w_t \mu_w^{-1}$ determines movements in inflation. When the real wage is below the marginal rate of substitution adjusted for the wage markup, workers desire higher wages, putting upward pressure on wage inflation. The sensitivity of wage inflation to labor market conditions is governed by the elasticity of substitution across labor types and the degree of wage rigidity. The link between price inflation and wage inflation is given by $\dot{w}_t/w_t = \pi_{w,t} - \pi_t$. So, real wages will adjust following the gap between wage and price inflation.

2.3 Government

Monetary policy sets the nominal interest rates, while fiscal policy sets taxes, transfers, public spending, and issues short-term government bonds B_t. The central bank sets nominal interest rates according to a simple Taylor rule

$$i_t = r + \phi_\pi \pi_t + v_t,$$

where v_t is the monetary policy innovation. The government collects income taxes and pays lump-sum transfers, public spending, and UI benefits. I denote as μ_t the distribution of idiosyncratic states $(a_t, e_t, s_t) \in X$. The budget constraint of the government is given by

$$dB_t = \left(r_t B_t + G_t + \tau_{x,t} + \int_X \mathcal{B}(e_t) d\mu_t - \tau_t \int_X w_t e_t n_t d\mu_t \right) dt.$$

I assume that the government gradually adjusts the level of income taxes λ_t over time to balance the budget. At the steady state I calibrate τ_x, τ and adjust G residually to clear the budget. Outside the steady state I assume that government adjusts income taxes according to

$$\tau_t = \tau (B_t/B)^{\gamma_B}.$$

2.4 Equilibrium

The equilibrium of the economy is given by paths for household consumption decision $\{c_t\}$, aggregate variables $\{C_t, Y_t, N_t, B_t\}$, prices $\{i_t, w_t, r_t, \pi_t, \pi_{w,t}\}$, monetary policy $\{v_t\}$, and fiscal policy $\{\tau_{x,t}\}$ such that in every period: (i) households solve the utility maximization problem given equilibrium prices, (ii) firms maximize profits and minize costs given equilibrium prices, (iii) the sequence of density functions $\{f_t\}$ over idiosyncratic states is consistent with the household saving decisions and income risk, (iv) monetary policy follows a Taylor rule and the government budget constraint holds, and (v) financial markets and labor markets clear

$$\int_X a_t d\mu_t = B_t,$$

$$\int_X n_t e_t d\mu_t = N_t.$$

I use the HJB and KF equations to represent the household block of the model recursively as in Achdou, Han, Lasry, Lions, and Moll (2022). Then, I solve the model globally in sequence space using the Jacobian's of the model as in Auclert, Bardóczy, Rognlie, and Straub (2021).

3 Parametrization

In this section I present the parametrization of the model, the calibration strategy, and the properties of the stationary equilibrium of the model. I first discuss the calibration of the parameters relevant for the steady state of the model and then discuss the parameters related to the dynamics of the model. Table 1 summarizes the calibrated parameters.

3.1 Calibration

I calibrate the model at quarterly frequency to the US economy. Some parameters are set externally, while others are calibrated internally to match a set of targeted moments. The internally calibrated parameters are jointly determined. However, certain parameters are more important for some moments than others. In this section I discuss the calibration strategy.

The parameters γ, ν, ϕ are calibrated externally using standard values in the literature. I set the risk aversion parameter $\gamma = 1$, the Frisch elasticity $\nu^{-1} = 0.5$, and allow for some borrowing by setting the borrowing limit ϕ to a negative value close to zero. I set the discount rate ρ to match an annual interest rate of about 4%. The mean reversion coefficient of the skill process ν_e is calibrated so that its annual autocorrelation $e^{-4\nu_e} = 0.9$ and the standard deviation rate σ_e is 0.2. The drifts of the process δ^+, δ^- are calibrated to match an average skill among employed workers close to 1 and the 10 years earnings losses upon job displacement (Davis and Von Wachter (2011)). Specifically, I compute the earning losses in the model as the percentage difference between the average earnings of employed workers with the average productivity of the unemployed and the average earnings of workers who are always employed. The job-separation rate λ_u and the job-finding rate λ_e are set to match the monthly average EU, UE flows. For the heterogeneity in labor market frictions see the Online Appendix B where I describe the calibration procedure and the fit. The UI take-up probability θ_u is calibrated to match a recipiency rate, i.e. the fraction of unemployed workers with UI, of 35% (Chodorow-Reich and Karabarbounis (2016)).

I set the elasticity of substitution between intermediate goods ϵ to match a price markup of 11%, the price adjustment cost parameter θ is set to match a slope of the price Phillips curve of 0.1. I use the same values for the parameters ϵ_w, θ_w of the wage Phillips curve. I set the net supply of government bonds in the steady state B to match an average wealth to output ratio around 1.4, and government transfers τ^x to 3% of steady-state aggregate output. I set the UI replacement rate b at 0.5 and the UI cap $b_{\max}$ to 60% of household earnings. The UI expiration rate λ_{u_0} is equal to 0.5 to match an average UI benefits duration of 6 months. The Taylor coefficient ϕ_π is set to 1.25, a standard value in the literature. I set the income tax rate $\tau = 0.25$, a standard value in the literature.

In order to generate business cycle fluctuations in the model, I introduce a demand shock akin to a "risk premium" shock common in the business cycle literature. The "demand shock" $\xi_{d,t}$ is a wedge in the Euler equation and consists in a perturbation of the bond real interest rate. An increase in the return reduces household demand for consumption and firms' labor demand. In turn, this reduces wages and inflation. To calibrate the model I follow the approach of Ferriere and Navarro (2024). Specifically, I feed into the model an aggregate demand shock that reduces output on impact by 1% and compute the targeted statistics using the impulse response functions of the model.

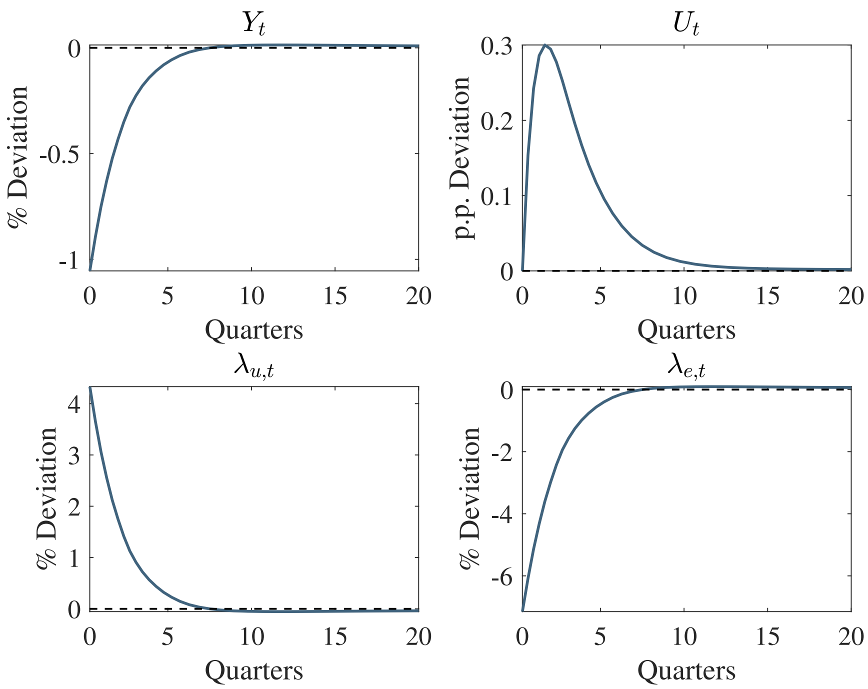


Figure 1: Impulse responses to a negative demand shock.

Note: The figure plots in order the response of aggregate output, unemployment, job separation rate and job finding rate during a demand-driven recession in the baseline model.

I calibrate the elasticities of the job separation rate and the job finding rate, η_u and η_e, to match an Okun's coefficient around 0.4 (Ball, Leigh, and Loungani (2017)) and the elasticity of job finding rates to unemployment of -0.6 (Mueller (2017)). Figure 1 reports the dynamics of aggregate output, unemployment, job separation rate, and job finding rate after an output fall of 1%. The Okun's coefficient in the model is around 0.3 at the lower bound of the empirical estimates. Unemployment increases by 0.3 percentage points when output falls by 1%. The elasticity of the job finding rate is -0.6. This elasticity is computed at the peak of the unemployment response. The increase in unemployment is due to a substantial fall in job-finding rates (bottom-right panel of Figure 1), together with a more modest increase in separation rates (bottom-left panel of Figure 1). Finally, I calibrate the parameter γ_B that governs the speed at which the government adjusts income taxes to repay public debt in the fiscal rule. I choose a value for this parameter such that govern debt is fully repaid after approximately 20 years from the shock. Table 1 collects all the parameters of the model.

Table 1: Model parameters

Parameter	Description	Value	Source
Households			
γ	CRRA/Inverse IES	1	External
ν	Inverse Frisch elasticity	2	External
ϕ	Borrowing limit	0.5	External
ν_e	Mean reversion coeff.	0.0263	External
σ_e	S. d. of innovations	0.2	External
B	Net asset supply	5	Internally calibrated
ρ	Discount rate (p.a.)	0.09	Internally calibrated
λ_e	Job-finding rate	1.1	Internally calibrated
λ_u	Job-separation rate	0.023	Internally calibrated
λ_{u_0}	UI expiration rate	0.5	External
η_e, η_u	Elasticity of λ_e, λ_u	7, -4	Internally calibrated
δ^+, δ^-	Skill process drift	0.002,0.4	Internally calibrated
θ_u	UI take-up probability	0.5	Internally calibrated
Firms and policy			
θ, θ_w	Adjustment cost	100, 100	External
ϵ, ϵ_w	Labor inputs elasticity	10, 10	External
ϕ_π	Taylor coeff.	1.25	External
b	UI replacement rate	0.5	External
$b_{\max}$	UI cap	0.5	Internally calibrated
τ	Income tax	0.25	External
τ_x	Transfers	0.1	Internally calibrated
γ_B	Speed of fiscal adjustment	1	Internally calibrated

To summarize, the model comprises 12 parameters that are internally calibrated to replicate 12 targeted empirical moments. These parameters are calibrated jointly. However, certain parameters, particularly those capturing the elasticities of labor market frictions and the responsiveness of income taxes to government debt, play an important role in shaping the model's dynamics. The remaining 9 parameters primarily influence steady-state outcomes.

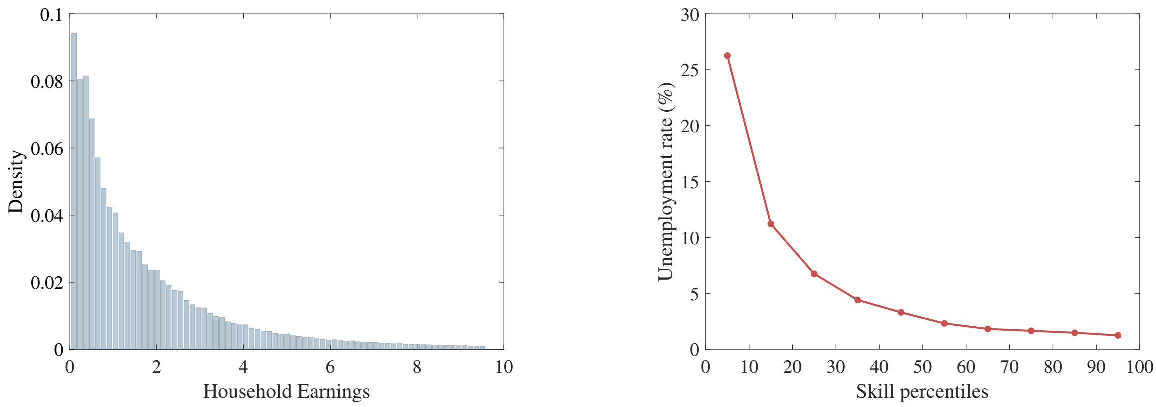
Table A.1 reports the key moments observed in the data alongside their corresponding counterparts generated by the model. The model can match the monthly EU, UE labor market flows, the long-run earning losses of job displacement, and the unemployment rate. Importantly, the model replicates the fact that UE $>>$ EU. The model can also match the level of public transfers relative to aggregate output, the aggregate wealth to output ratio, and the return on liquid wealth. The model also generates realistic levels of income and wealth inequality. The Gini coefficient of liquid wealth is 0.82 in the model, while the Gini coefficient of before-tax income is 0.48. The fraction of liquidity constrained households is around 30%.

Table 2: Steady- state moments

Description	Data	Model	Description	Data	Model
Real rate	0.04	0.04	Unemployment rate	0.05	0.05
Transfers to output ratio	0.03	0.03	Recipiency rate	0.35	0.34
Wealth to output ratio	1.4	1.4	EU flows	0.013	0.013
Earnings losses	[-0.15,-0.10]	-0.1	UE flows	0.25	0.25
MPC	[0.1,0.25]	0.1	MPE	[-0.04,0]	0

Note: UE and EU flows are averages of monthly data computed directly from the CPS from 1995 to 2019. The 10 years earnings losses upon displacement are reported as a percent of predisplacement annual earnings in recession (-0.15) and in expansion (-0.1), see Davis and Von Wachter (2011). The last line in the table reports the average quarterly MPC out of $500 windfall gain for the overall population. The second line shows the average annual MPE out of $500,000 windfall gain for the overall population.

I now turn to the discussion of the Marginal Propensity to Consume (MPC) and the Marginal Propensity to Earn (MPE) in the economy. The empirical evidence on the MPEs suggests that the annual average MPE should be between -4% and 0%. This evidence is based on Cesarini, Lindqvist, Notowidigdo, and Östling (2017), Golosov, Graber, Mogstad, and Novgorodsky (2023) who measure the response of household earnings to a one-time lottery winning. Regarding the MPCs, the literature considers 10% to 25% as the empirical benchmark for the average quarterly MPC out of a $500 transfer (Broda and Parker (2014), Parker, Souleles, Johnson, and McClelland (2013), Fagereng, Holm, and Natvik (2021), Borusyak, Jaravel, and Spiess (2024)). I compute the MPCs and MPEs out of a one-time unexpected windfall in the model. Specifically, I increase households' assets by the size of the windfall and record the response of consumption and labor earnings. I compute MPCs as the difference between the quarterly consumption when households receive the windfall and the quarterly consumption when households do not receive the windfall, relative to the size of the windfall. Similarly, I compute MPEs as the difference between the annual earnings when households receive the windfall and the annual earnings when households do not receive the windfall, relative to the size of the windfall. With these definitions the MPCs and MPEs in the model are the closest to the MPCs and MPEs reported in the empirical literature. The model can match an average MPC of 10% and produces an average MPE of 0%. The MPE is zero under the assumption of homogeneous labor supply, which implies that earnings are independent of wealth. Overall, these results imply that the responses of consumption and labor supply in the model are broadly consistent with the empirical evidence. Figure 2 shows in panel (a) the income distribution and in panel (b) the cross-sectional distribution of the unemployment rate across skill groups.



(a) (b)

Figure 2: Income distribution and unemployment rate.

Note: Panel (a) plots the income distribution. Income is normalized relative to the mean household labor income. Panel (b) plots the unemployment rate across the skill distribution.

Because of heterogeneity in labor market flows, the model generates substantial differences in the incidence of unemployment across the skill distribution. In particular, unemployment is disproportionately concentrated among low-skill workers, whose unemployment rate is significantly above the economy-wide average. This pattern reflects differences in labor market transitions across skill groups, with workers at the bottom of the skill distribution facing a higher likelihood of entering unemployment. By contrast, unemployment incidence is considerably lower among high-skill workers. For workers above the median of the skill distribution, the unemployment rate lies well below the aggregate unemployment rate, indicating that labor market risk is unevenly distributed across workers. Thus, workers with lower skills are systematically more exposed to unemployment risk, while higher-skill workers experience substantially more favorable employment prospects. Overall, the calibration delivers a model consistent with several features of the U.S. labor market, cross-sectional distributions of income and wealth, and heterogeneity in consumption labor supply elasticities.

4 Quantitative Analysis

In this section I present the main quantitative results of the paper. I begin by examining the heterogeneous effects of a recession within the model. I then turn to monetary and fiscal strategies designed to address the recession's distributional effects and to the quantification of the inflation–inclusion trade-offs. I show how fiscal policy can counteract the unequal effects of the recession while keeping inflation under control.

4.1 Unequal business cycle

The economy experiences a demand-driven recession due to an financial shock, namely an increase in the return on bonds that reduces aggregate output by approximately 1%. I calibrate the persistence of the shock so that, after one year, aggregate output nearly returns to its steady-state level. This shock is analogous to the "risk premium" shocks examined in the business cycle literature. Figure 3 plots the response of the economy to the shock. Consumption contracts as output declines leading to lower labor demand and wages.

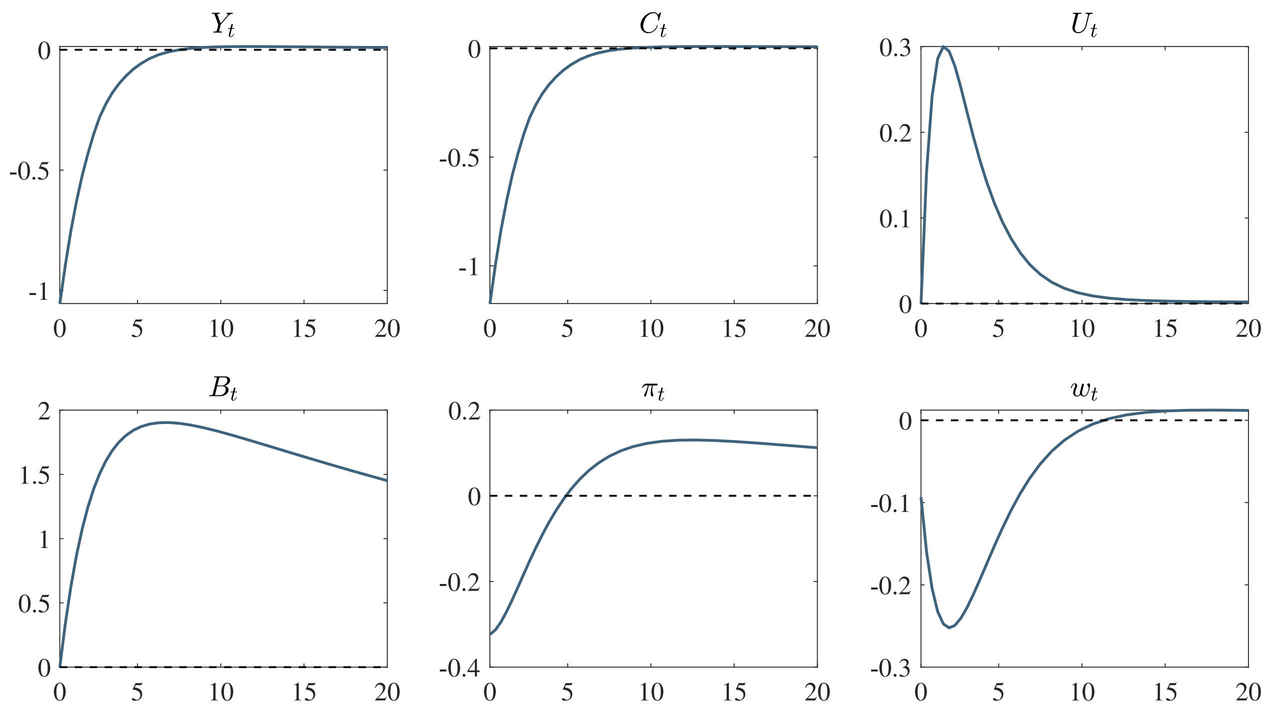
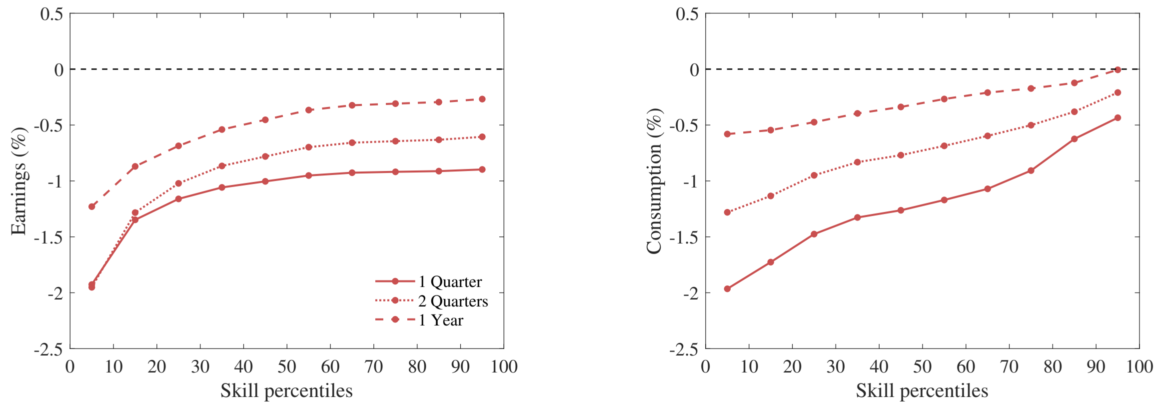


Figure 3: Impulse responses to a negative demand shock.

Note: Impulse responses of macro variables to a demand-driven recession engineered as a temporary shock to the real interest rate. Quarters on the x-axes. Percentage deviations from steady-state on the y-axes. The unemployment response is measured in percentage points deviations.

Figure 4 plots the cross-sectional responses of earnings and consumption by skill groups throughout the recession and during the recovery. Earnings are defined as labor income and UI income. The effects of the recession on both variables are clearly heterogeneous and persistent over time, with low-skilled individuals bearing the greatest burden. In the first quarter, the income loss of the bottom decile is around two times the average. Importantly, one year after the shock, when aggregate output has fully recovered, the income loss of low-skilled workers remains as large as the decline in aggregate output observed at the trough of the recession. Consumption exhibits a similar pattern, with an initial loss for the lowest-skilled group approximately twice the average, and a substantial one-year loss.



(a) (b)

Figure 4: Cross-sectional impulse responses to a negative demand shock.

Note: Impulse responses of labor income and consumption to a demand-driven recession engineered as a temporary shock to the real interest rate. Skills on the x-axes. Steady-state deviations on the y-axes.

Unemployment rises predominantly among low-skilled individuals and remaining elevated even one year after the shock, when the average unemployment rate is converging back to its steady-state level. It is worth highlighting that changes in the job-finding rate account for the majority of the variation in unemployment, whereas changes in the job-separation rate play a comparatively minor role. This result follows directly from the calibration of the elasticities of the job-finding and job-separation rates.

Overall, both in the model and in the data, focusing solely on the average can be highly misleading, as it conceals substantial heterogeneity across the distribution. Although aggregates recover within a year after the shock, the recovery of income and consumption in the cross-section is markedly uneven. Low-skilled workers experience persistent losses due to the higher exposure to non-employment risk and the skill depreciation. An inclusive macroeconomic policy design should aim to address both the unequal impact of the downturn and the long-term scarring effects of unemployment spells. In the remainder of this section, I examine how monetary and fiscal policy can address disparities in the pace and extent of the recovery.

4.2 Lower-for-Longer

In this section, I turn to the analysis of monetary policy strategies that can mitigate the distributional consequences of the recession, particularly for low-skilled workers. I focus on interventions that address these issues through traditional stabilization instruments, namely interest rate cuts, examining how a traditional macroeconomic policy can support the most vulnerable segments of the population.

I begin by examining the effects of a 25 basis points interest rate cut. Rather than assuming the standard persistence of this shock, I allow for a policy design in which the monetary authority aims to stimulate output at later stages of the recovery in order to support a strong labor market for low-skilled workers. Following Alves and Violante (2025b), I refer to this strategy as "lower-for-longer", as the interest rate is maintained at a low level for an extended period.

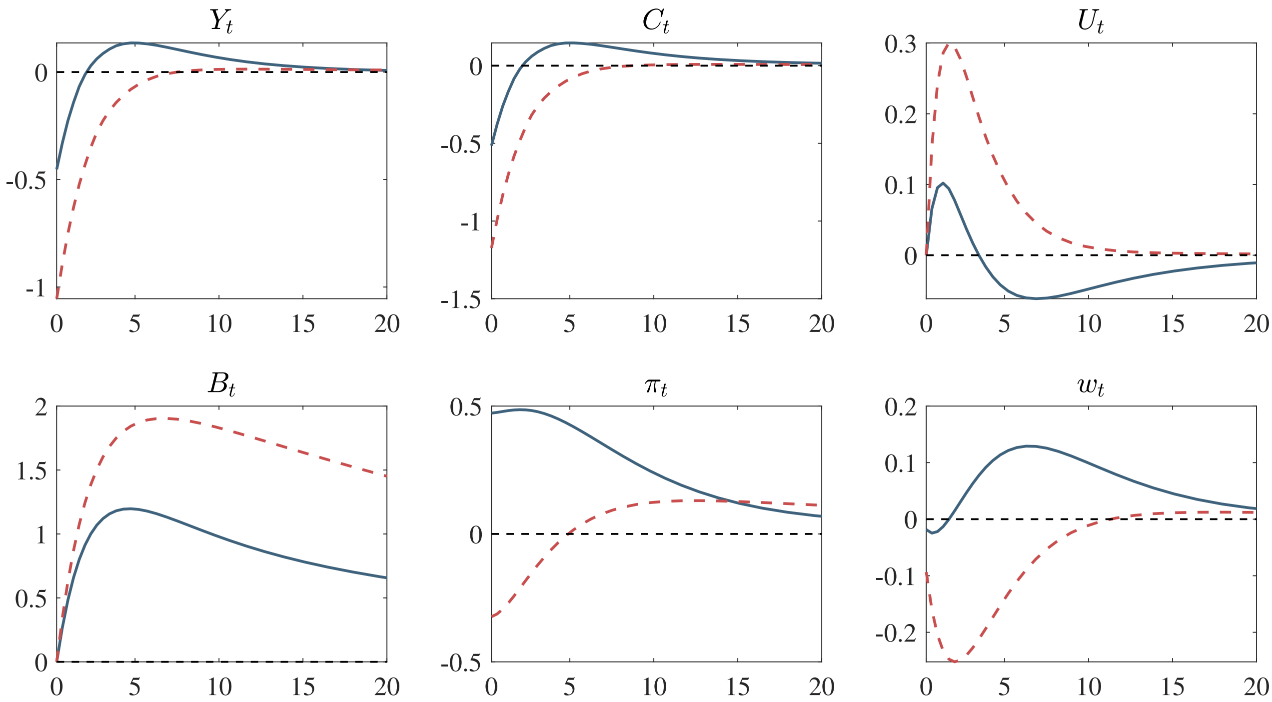
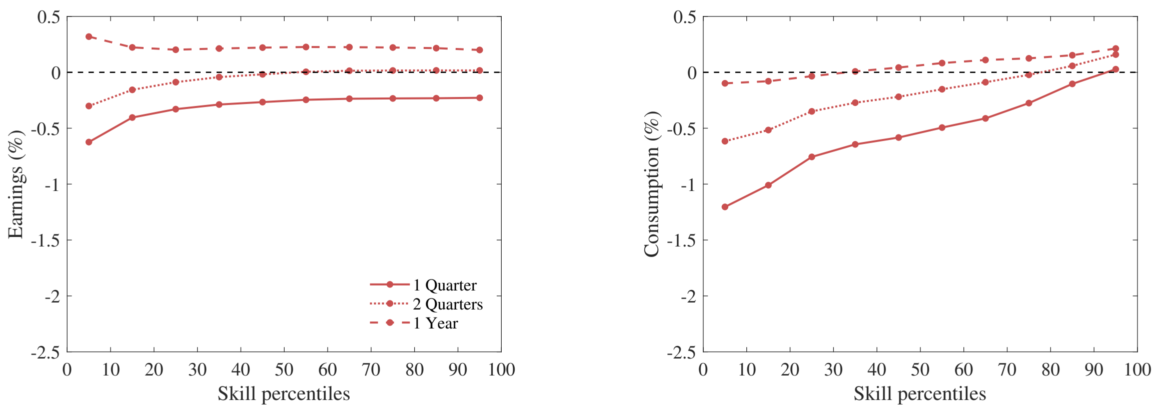


Figure 5: Impulse responses to monetary policy.

Note: Impulse responses of macro variables to a demand-driven recession and an expansionary monetary policy. Quarters on the x-axes. Steady-state deviations on the y-axes. No-policy benchmark in red.

Figure 5 illustrates the dynamics of the economy. The impulse response functions exhibit an S-shaped pattern, characterized by an initial decline followed by a subsequent expansion in output and employment. This policy also reduces the drop at impact of aggregate output and consumption. The increase in the unemployment rate is reduced by two-thirds, while the expansion in output generates an overall rise in annualized inflation of around 0.5%. Consistent with the traditional view of monetary policy as a stabilization instrument, the interest rate cut generates sizable macroeconomic effects.

Figure 6 illustrates the responses of earnings and consumption across skill groups. Relative to the responses shown in Figure 4, the lower-for-longer monetary policy strategy induces a noticeable shift of the cross-sectional responses. While the policy mitigates the unequal effects of the recession at impact, it does so only partially. In particular, income and consumption losses for households in the bottom decile of the skill distribution remain approximately larger than those experienced by the average household.



(a) (b)

Figure 6: Cross-sectional impulse responses to monetary policy.

Note: Impulse responses of labor income and consumption to a demand-driven recession and an expansionary monetary policy. Skills on the x-axes. Steady-state deviations on the y-axes.

The effects on unemployment are particularly pronounced even at short-term horizons, with the unemployment rate for the bottom decile of the skill distribution declining substantially. At longer horizons, the effects of the policy become more pronounced also for income and consumption. Approximately one year after the negative demand shock, the responses of earnings, consumption, and unemployment are nearly equalized across skill groups. This convergence reflects the stimulative effects of accommodative monetary policy, which boosts economic activity and increases labor demand, thereby reducing unemployment. By shortening unemployment spells, the policy dampens the scarring effects associated with job losses for many households, contributing to a more balanced and inclusive recovery.

In summary, a lower-for-longer strategy is particularly effective in fostering a strong labor market that improves medium and long-term labor market outcomes for low-skilled workers. This outcome is primarily driven by the economic expansion that emerges in the later stages of the recovery. By maintaining interest rates at a low level for a prolonged period, the monetary authority supports aggregate demand, which gradually stimulates labor demand across the economy. Nevertheless, the recession exhibits an unequal incidence at impact.

4.3 Labor Tax Credits

An alternative policy instrument available to policymakers is the use of targeted fiscal measures. In particular, I consider a temporary labor income tax credit for low-income working households. I find that, when appropriately targeted in terms of both eligibility and generosity, such a policy generates virtually no aggregate demand stimulus while effectively compensating households for earnings losses associated with unemployment spells. This decoupling of aggregate demand support from social insurance provision implies that the policy entails little inflationary pressure. In this respect, targeted fiscal policy represents the opposite case of the monetary stimulus analyzed in the previous section. I parameterize the tax cuts with a relatively rapid phase-out, such that only households in the bottom 50% of the income distribution receive the tax credit. The transfer amounts to approximately \$90 for the poorest households in the economy. Figure 7 shows the responses of the main macroeconomic variables to this policy.

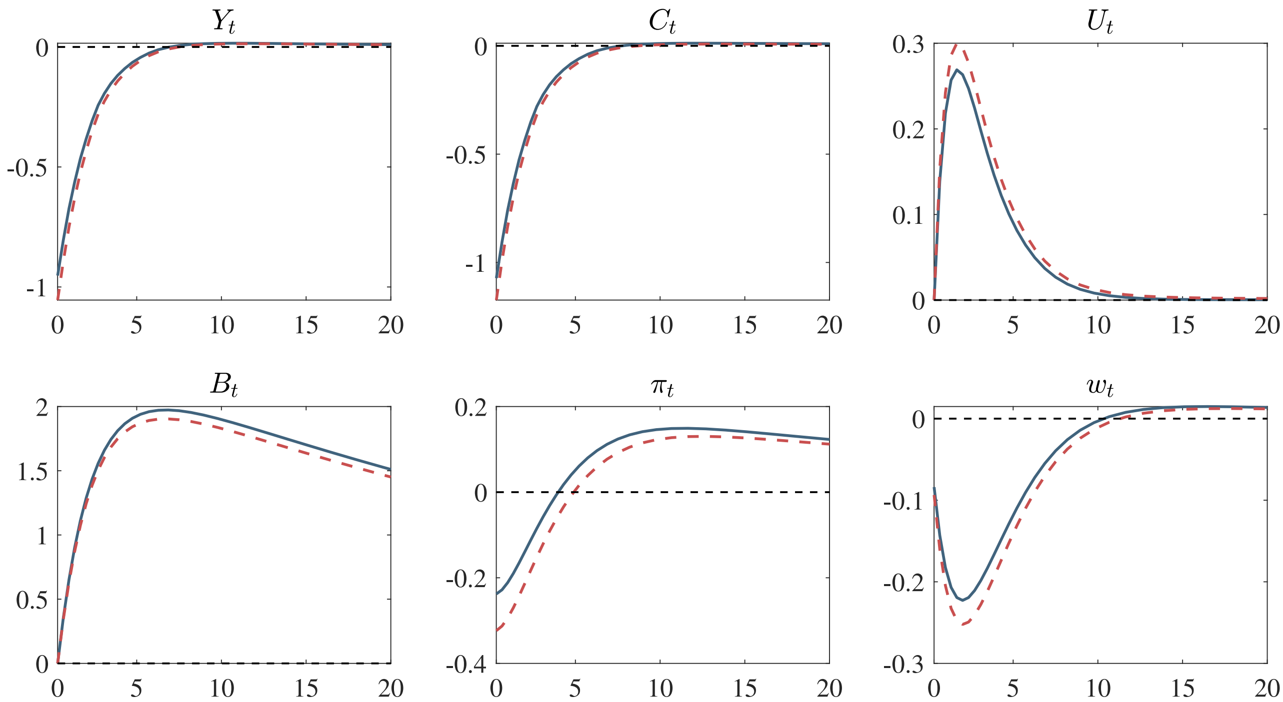
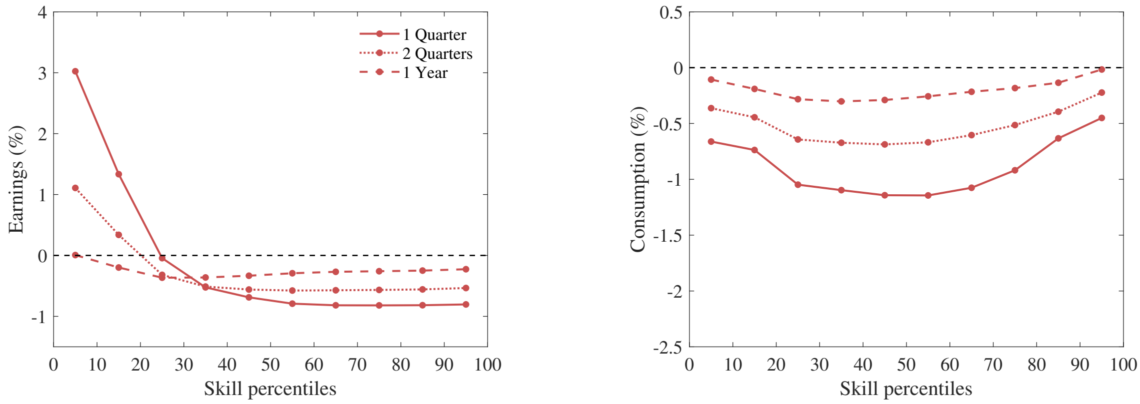


Figure 7: Impulse responses to labor tax credits.

Note: Impulse responses of macro variables to labor income tax credits during a recession. Quarters on the x-axes. Percentage deviations from steady-state on the y-axes. The unemployment response is measured in percentage points deviations. No-policy benchmark in red.

This policy has limited macro effects, reflecting its narrow targeting and modest size. Output, consumption, and unemployment remain unchanged relative to the no-policy benchmark. In absence of aggregate demand stimulus, the policy generates virtually no inflation.

Figure 8 presents the cross-sectional impulse response functions of earnings and consumption. While the aggregate macroeconomic effects of this fiscal policy are limited, the distributional consequences are pronounced. The tax credits significantly raises earnings and sustains consumption for low-skilled households, effectively offsetting the unequal impact of the recession. This compensatory effect is evident both at the time of the shock and over longer horizons, demonstrating the role of fiscal policy in stabilizing household incomes and consumption across the skill distribution.



(a) (b)

Figure 8: Cross-sectional impulse responses to labor tax credits.

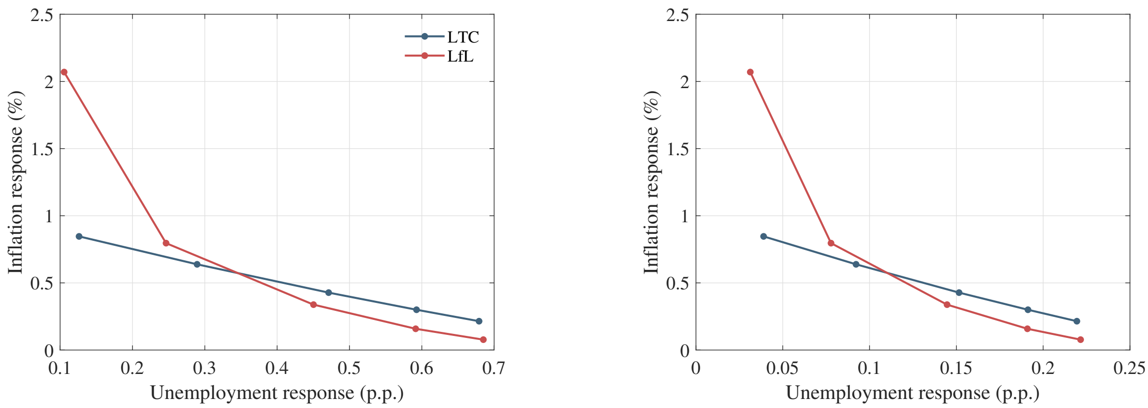
Note: Impulse responses of labor income and consumption to a demand-driven recession and labor income tax credits. Skills on the x-axes. Steady-state deviations.

Despite these positive effects on low-skilled households, the overall labor market outcomes remain large and heterogeneous. The unemployment rate still rises substantially, even under the policy intervention. In other words, while the policy succeeds in cushioning the most vulnerable households, it cannot fully neutralize the broader employment losses induced by the recession. The objective of labor tax credits is to increase household earnings following reemployment after job displacement. By temporarily supporting labor income, these policies mitigate the earnings losses associated with recession-induced employment shocks, thereby providing displaced workers with time to rebuild skills and accumulate experience.

Overall, these results show that labor income tax credits can provide an effective instrument for mitigating both the short- and long-term scarring effects of a recession. By targeting support toward low-income working households, the policy directly compensates those most exposed to earnings losses associated with unemployment spells, while avoiding the broader demand effects typically associated with fiscal stimulus. Importantly, the absence of a significant aggregate demand response also implies virtually no inflationary cost. The policy therefore achieves a form of insurance that is largely decoupled from the inflationary pressures generated by conventional macroeconomic stimulus.

4.4 Inflation and unemployment

While the previous section examined the scarring effects of unemployment spells on household earnings and consumption, this section turns to the inflationary costs associated with policies aimed at reducing unemployment. In other words, this section investigates which type of aggregate demand stimulus is most effective at reducing unemployment, conditional on the inflationary pressures it generates in the economy. I consider two types of policies: a Lower-for-Longer (LfL) monetary policy that maintains the interest rate at a low level for an extended period, and Labor Tax Credits (LTC). To construct Figure 9, I vary the persistence of the interest rate cut and the magnitude of the tax rebates, thereby tracing out the inflationary costs associated with alternative degrees of policy stimulus. Panel (a) reports the response of unemployment among workers in the bottom 10% of the skill distribution, while panel (b) reports the corresponding response of aggregate unemployment.



(a) (b)

Figure 9: Inflation and unemployment.

Note: Impulse responses of inflation and unemployment to Lower-for-Longer (LfL) monetary policy and Labor Tax Credit (LTC) during a demand-driven recession. In each plot I vary the persistence of the interest rate cut and the size of the tax cut. Panel (a) reports the unemployment response of the bottom 10% of the skill distribution, while panel (b) reports the response of aggregate unemployment.

Overall, Figure 9 shows that the LfL policy and the LTC package are substitutes in terms of aggregate demand stimulus because these policies generate broadly similar effects on inflation and unemployment. However, their implications diverge substantially when policymakers seek a large reduction in unemployment. As illustrated by the points toward the left of Figure 9, comparable reductions in unemployment can be associated with markedly different inflation responses across the two policies. In particular, the LfL policy is poorly suited to achieving large reductions in unemployment, as doing so entails substantial inflationary costs. In such cases, an LTC stimulus is preferable, as it can deliver a comparable reduction in unemployment with substantially lower inflationary pressures.

The results suggest that labor income tax credits can serve a dual role, with their relative functions determined by the scale of the intervention. When tax credits are modest in size and well targeted toward workers experiencing earnings losses following job displacement, they operate primarily as an insurance mechanism. By partially replacing lost labor income, such transfers provide consumption support precisely when households face an adverse and persistent shock to their earnings. The nature of the intervention changes, however, as the size of the tax credit increases. The quantitative results indicate that moving from relatively small credits, such as \$100, to substantially larger credits of at least \$500 can generate effects that extend beyond insurance and operate as a macroeconomic stimulus. At this scale, the additional disposable income is sufficiently large to affect household expenditure and, through general-equilibrium demand effects, firms' production and labor demand. The policy therefore acquires a second margin of adjustment: rather than merely compensating workers for earnings losses after displacement, it can mitigate the employment losses associated with a recession by supporting aggregate demand. This distinction is important because earnings and employment losses are not necessarily the same problem. The former calls for insurance against an adverse individual labor-market state, the latter reflects a common macroeconomic shock for which restoring demand can raise employment opportunities more broadly.

This feature gives fiscal policy implemented through labor income tax credits an important degree of flexibility. The same policy instrument can, in principle, be calibrated along both an intensive and an extensive margin. A relatively small, well-targeted credit can provide insurance to workers suffering concentrated earnings losses, while a larger credit can be deployed when the economy is characterized by widespread unemployment and deficient aggregate demand. Fiscal policy can thus be tuned to integrate social insurance and stabilization policy within a common instrument rather than treating them as separate policy objectives. Monetary policy faces a more binding trade-off in this respect. An expansionary monetary policy can support employment and household income by stimulating aggregate demand, thereby providing an indirect form of insurance against labor-market losses. Yet this mechanism operates through the macroeconomic environment rather than directly compensating households exposed to earnings risk. Moreover, when the economy is not characterized by substantial slack, achieving stronger employment and income outcomes through aggregate-demand expansion can entail an inflationary cost. Monetary policy therefore cannot target the distribution of labor-income losses as directly as a well-designed fiscal transfer can: its insurance effect is mediated by the aggregate response of employment, wages, and prices. The central implication is that labor tax credits occupy a distinctive position in the policy toolkit. If properly targeted, they can simultaneously provide direct insurance against earnings losses and, when sufficiently large, stabilize aggregate demand and employment, allowing fiscal policy to address both the microeconomic and macroeconomic dimensions of labor-market risk.

4.5 Exploring the design of LTC

In this section, I examine the design of labor tax credits along two dimensions: the intensive margin, which determines the size of the tax rebate, and the extensive margin, which determines the set of households eligible to receive the tax credit. I find that the intensive margin has substantially larger effects than the extensive margin and is the primary driver of the aggregate demand stimulus generated by the policy.

Figure 10 shows the impulse responses of inflation and unemployment to labor income tax credits of varying size during a demand-driven recession. I consider three policy packages that target exclusively households in the bottom 50% of the income distribution, while varying the maximum size of the transfer received by the poorest households. Across the three packages, the maximum transfer amounts are approximately \$90, \$200, and \$400, respectively. This exercise allows me to isolate the role of the intensive margin of the tax credit, that is the size of the transfer conditional on eligibility, in determining the aggregate effects of the policy.

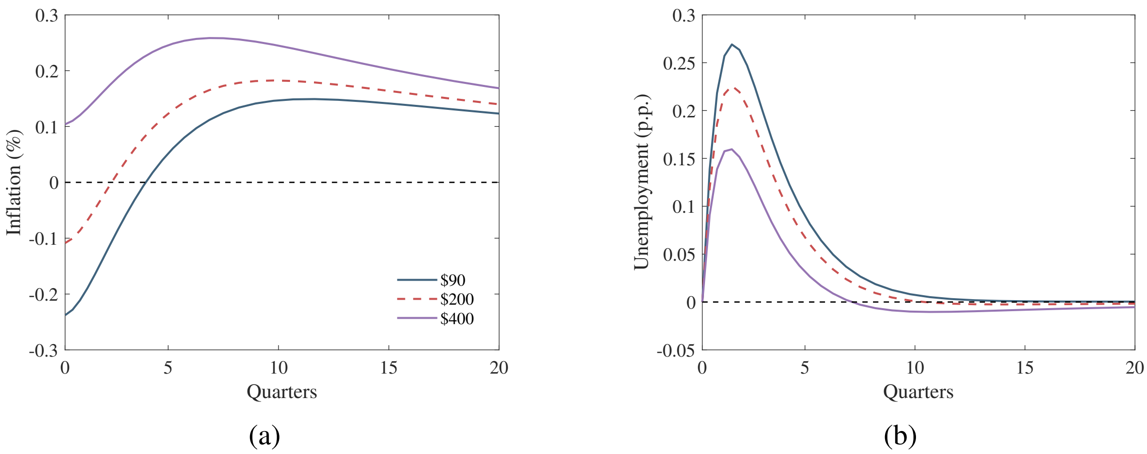


Figure 10: Intensive margin of aggregate demand stimulus.

Note: Impulse responses of inflation in panel (a) and unemployment in panel (b) to labor tax credits of varying size during a demand-driven recession.

As discussed in the previous sections, the first package, with a maximum transfer of approximately \$90, has negligible macroeconomic effects. Aggregate demand remains broadly unchanged relative to the no-policy scenario, and the response of inflation is correspondingly limited. By contrast, the second package generates a sizeable demand stimulus. In this case, the increase in the unemployment rate is substantially attenuated, falling from approximately 0.3 percentage points in the no-policy scenario to around 0.2 percentage points. The stronger demand response is also reflected in the inflation dynamics: inflation increases by approximately 0.1 percentage points relative to the no-policy benchmark. These results suggest the existence of a meaningful threshold in the intensity of the transfer: for an LTC package targeted to the bottom 50% of the income distribution, a maximum transfer of roughly \$200 appears to be necessary for the policy to generate a discernible aggregate demand stimulus. Finally, the third package, which raises the maximum transfer to approximately \$400, produces an even stronger macroeconomic response. The larger transfer generates a more pronounced increase in aggregate demand, leading to a further moderation of the unemployment response and a stronger inflationary response. Overall, the comparison across the three packages highlights the importance of the intensive margin in determining the aggregate effectiveness of targeted labor income tax credits: holding eligibility fixed, increasing the size of the transfer can substantially amplify the macroeconomic effects of the policy.

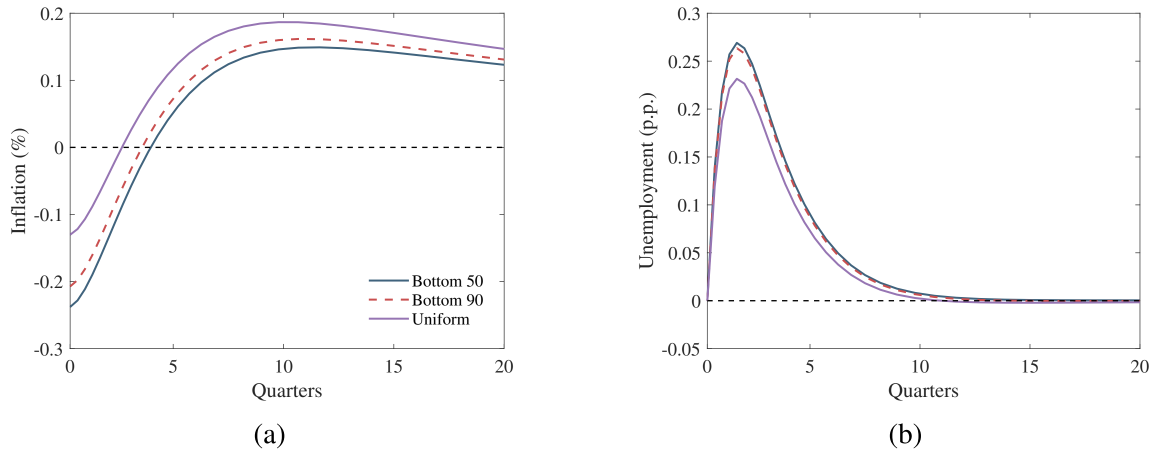
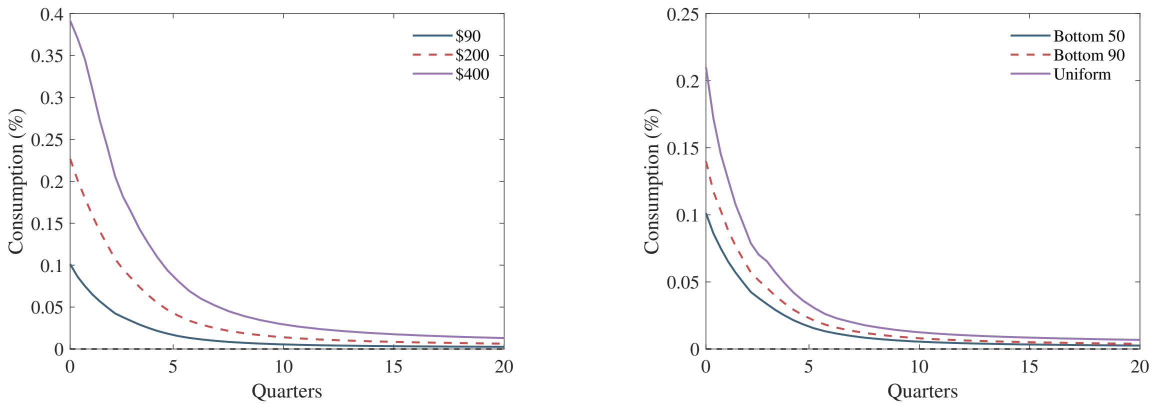


Figure 11: Extensive margin of aggregate demand stimulus.

Note: Impulse responses of inflation in panel (a) and unemployment in panel (b) to labor tax credits with varying recipient eligibility during a demand-driven recession.

Figure 11 shows the impulse responses of inflation and unemployment to labor income tax credits under alternative eligibility rules during a demand-driven recession. I consider three policy packages with approximately the same maximum transfer size of \$90, while varying the set of eligible recipients. In the first package, the credit is targeted to households in the bottom 50% of the income distribution, in the second, eligibility is extended to the bottom 90%, and in the third, the same maximum tax credit is provided uniformly to all working households. This comparison isolates the role of the extensive margin of the policy, namely the number and income range of households receiving the credit, while holding the maximum transfer size approximately fixed. The results indicate that expanding eligibility while maintaining a sharp phase-out at higher income levels has limited macroeconomic effects. In particular, the difference between targeting the bottom 50% and extending eligibility to the bottom 90% is negligible. This reflects the relatively small transfers received by households in the middle and upper portions of the income distribution, which generate only a limited additional increase in aggregate demand. By contrast, when the credit is made uniform across all working households, the policy generates a substantially stronger aggregate demand stimulus. The broader distribution of transfers leads to a more pronounced reduction in the increase in unemployment and a stronger inflation response. Taken together, these results suggest that the intensive margin is considerably more important than the extensive margin in determining the macroeconomic effectiveness of LTC. In particular, expanding the number of recipients does little to stimulate aggregate demand when the additional recipients receive relatively small transfers, whereas increasing the size of the transfer can generate substantially larger aggregate effects.



(a) (b)

Figure 12: Consumption response across LTC packages.

Note: Impulse responses of aggregate consumption to labor income tax credits during a demand-driven recession. In panel (a) I show the role of the intensive margin, while in panel (b) I study the role of th extensive margin.

Figure 12 provides an alternative way of visualizing the same mechanism. Panel (a) reports the consumption response to changes in the intensive margin of the LTC policy, while panel (b) reports the corresponding response to changes in the extensive margin. The comparison reveals a substantially stronger consumption response when the size of the transfer is varied than when the set of eligible recipients is expanded. Since consumption is the key channel through which the tax credits translate into higher aggregate demand, this comparison provides a direct measure of the relative aggregate-demand stimulus generated by the two margins of the policy. Quantitatively, a relatively small uniform transfer, with a maximum value of approximately $90, generates an aggregate consumption response comparable to that of a substantially larger transfer, targeted exclusively to the bottom 50% of the income distribution, with a maximum value of approximately $200. These results further underscore that the macroeconomic effectiveness of LTCs depends primarily on the size of the transfer received by eligible households rather than on the breadth of the recipient pool. In other words, expanding eligibility without materially increasing the resources transferred to households has limited effects on aggregate demand, whereas increasing the transfer size can generate a substantially larger consumption response even when eligibility remains narrowly targeted.

The consumption responses reported above are general equilibrium outcomes. That is, they do not simply capture the mechanical increase in household consumption associated with the labor income tax credits, but also incorporate the endogenous responses of prices in the economy. This distinction is important because the introduction of the LTCs affects household disposable income directly while simultaneously changing aggregate demand and, through general equilibrium adjustments, the economic environment in which households make their consumption decisions. The aggregate consumption response can therefore be decomposed into three main transmission channels. The first is the direct consumption response to the tax credit. Conditional on receiving an LTC, households experience an increase in disposable labor income. They subsequently adjust their consumption according to their MPC, generating a direct increase in aggregate consumption. This channel captures the immediate demand-side effect of the policy: the government transfers additional resources to households, and recipients use part of these resources to increase current consumption. The strength of this channel depends both on the size of the transfer and on the characteristics of the households receiving it, particularly their MPCs. Because most of the LTC packages considered here are targeted toward lower-income households, a relatively large fraction of the additional disposable income is spent rather than saved, making this channel quantitatively the most important. The second channel operates through changes in interest rates. Changes in the interest rate alter households' incentives to save and consume and consequently shape the initial demand response. The third channel operates through changes in wages, profits, and labor income taxes used to repay public debt and ultimately finance the LTCs. The additional demand generated by the policy affects firms' production and labor demand, leading to changes in equilibrium wages and profits. These changes alter household labor income and therefore consumption beyond the income directly provided by the tax credit. At the same time, financing the LTCs requires adjustments in labor income taxes, which affect households' disposable income and partially offset the initial transfer. Quantitatively, however, the direct effect of the LTCs accounts for the largest share of the aggregate consumption response. The general equilibrium response therefore largely reflects households' consumption decisions out of the additional resources provided by the tax credits.

This finding is consistent with the design of the policy. The LTCs are targeted toward households at the lower end of the income distribution, precisely those households with the highest MPCs. Consequently, a relatively large fraction of the transfers is converted into additional consumption, generating a sizable increase in aggregate demand. The predominance of the direct channel thus provides a microeconomic foundation for the aggregate results documented above: the effectiveness of the LTCs depends primarily on how much households receive, with targeting toward high-MPC households making the direct consumption response the dominant source of the aggregate demand stimulus. Overall, when the size of the LTC is modest, the primary effect of the policy is to provide insurance rather than to stimulate aggregate demand.

4.6 Higher MPCs

In this section, I assess the robustness of the results to the marginal propensity to consume. The baseline model can match an MPC at the lower bound of the empirical estimates. A natural question is whether a higher MPC makes it more difficult to decouple aggregate demand stimulus from social insurance. If so, labor tax credits could generate inflation even when they are modest in size and well targeted. Note, however, that this argument abstracts from the fact that labor tax credits tend to raise earnings and consumption exactly among low-skill groups. This heterogeneity creates scope for redesigning labor tax credits in the presence of higher MPCs: by using smaller transfers it is possible to still achieve income support for low-skill households while simultaneously equalizing consumption responses across skill groups. To investigate this possibility, I recalibrate average liquid wealth holdings to match an MPC of 20%.

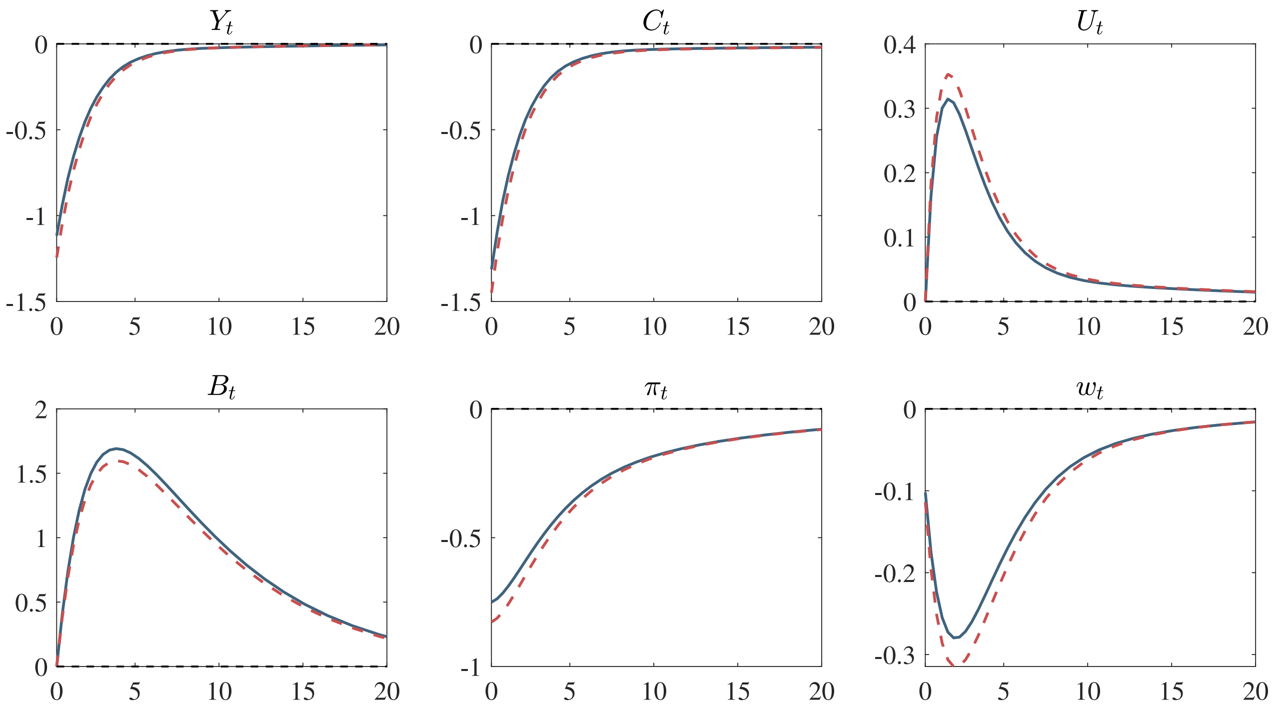


Figure 13: Impulse responses to labor tax credits with high MPCs.

Note: Impulse responses of macro variables to labor income tax credits during a recession. Quarters on the x-axes. Percentage deviations from steady-state on the y-axes. The unemployment response is measured in percentage points deviations. No-policy benchmark in red.

Figure 13 reports the impulse responses of the main macroeconomic variables under two scenarios: with labor income tax credits and in the absence of policy intervention. As before, the macroeconomic effects of the LTC policy are negligible, with inflation remaining virtually indistinguishable from its path in the no-policy scenario.

Figure 14 reports the cross-sectional responses and shows that the policy has substantial effects on the earnings and consumption of low-skill households. In particular, the LTC policy raises labor earnings on impact by reducing the tax burden faced by these households. The resulting increase in disposable income translates into a stronger consumption response, reflecting their higher MPCs. Despite the smaller size of the LTC policy, consumption responses remain effectively equalized across skill groups exactly because of the high MPCs.

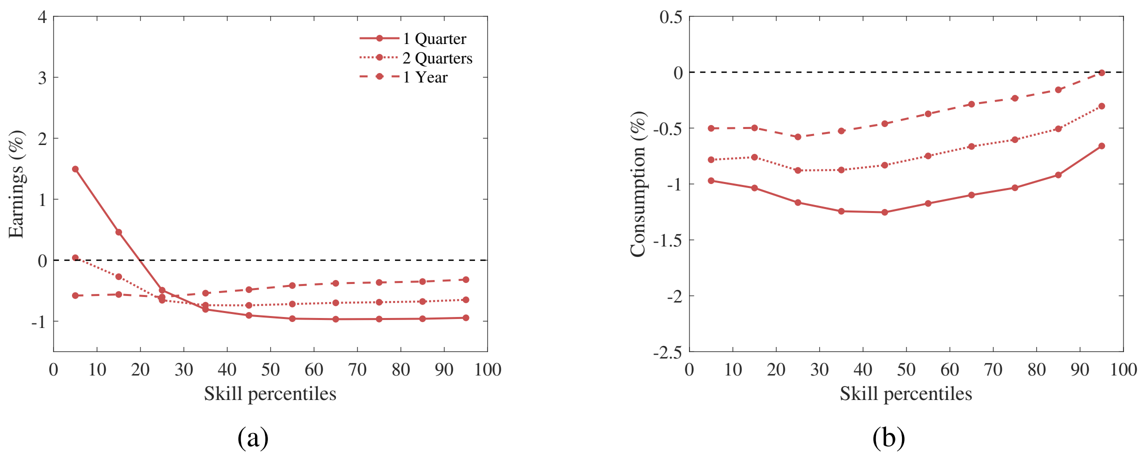


Figure 14: Cross-sectional impulse responses with high MPCs.

Note: Impulse responses of labor income and consumption to a demand-driven recession and labor income tax credits. Skills on the x-axes. Steady-state deviations.

Overall, these results show that a higher MPCs do not eliminate the possibility of decoupling aggregate demand stimulus from social insurance. Although a higher MPC strengthens the consumption response to a given transfer and could, in principle, amplify the inflationary consequences of labor tax credits, the relevant heterogeneity in MPCs is critical. In particular, low-skill households, who are the primary beneficiaries of labor tax credits, also tend to have higher MPCs. Consequently, transfers targeted toward these households generate relatively large consumption responses per unit of fiscal support, allowing the policy to provide substantial income insurance with smaller transfers and limited aggregate demand effects. Thus, rather than undermining the decoupling between insurance and aggregate stimulus, MPC heterogeneity can facilitate it by making the households most in need of insurance precisely those for whom transfers translate most strongly into consumption. The key implication is that the MPC alone is not sufficient to determine the aggregate demand consequences of labor tax credits. What matters is the joint distribution of MPCs and policy exposure across households. This allows labor tax credits to deliver relatively strong consumption insurance with smaller transfers, thereby limiting their aggregate demand effects even when the average MPC is high. Hence, heterogeneity in MPCs can strengthen, rather than weaken, the scope for decoupling social insurance from aggregate stimulus.

5 Conclusion

I employ a quantitative HANK model with labor market frictions to examine how macroeconomic policy can foster an inclusive recovery and to analyze how the trade-off between inflation and inclusion varies with policy design. The model features an empirically realistic distribution of MPCs, and matches the heterogeneous incidence of unemployment risk across the income distribution. I leverage this framework to analyze the distributional effects of a lower-for-longer monetary policy and labor income tax credits. I find that a protracted monetary expansion mostly benefit low-skill workers by improving long-term labor market outcomes through an aggregate demand channel that also raise inflation. By contrast, labor income tax credits can be designed to provide immediate income support to the most vulnerable households reducing the unequal impact of the recession without generating aggregate demand stimulus and inflation.

Overall, these results suggest that fiscal policy can be designed to support broad-based economic recovery while preserving price stability. The trade-off between inflation and inclusion is not policy invariant, but depends critically on the scale and targeting of fiscal interventions. In particular, labor income tax credits targeted toward low-income households can substantially improve the income and consumption of workers who successfully reenter employment following job displacement, while generating only limited additional inflation. This suggests that fiscal policy should focus on the scale and targeting of interventions, while the resulting limited inflationary pressures may provide monetary policy with greater scope for an earlier normalization of interest rates.

This analysis suggests that a promising direction for future research is to further quantify the optimal joint design of monetary and fiscal policies and the optimal policy rules. I leave a systematic analysis of these questions, as well as related normative issues, for future research.

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Online Appendix for
"Resolving the Inflation-Inclusion Trade-Off"

Valerio Pieroni

A HJB Equation

In this section I present the recursive formulation of the household problem. I assume a Ornstein-Uhlenbeck process for $\ln e_t$, then the Ito's formula implies that the income risk e_t follows a geometric Brownian motion with drift $m_e = (\nu_e(\mu_e(s_t) - \ln e_t) + \sigma_e^2/2)e_t$ and standard deviation rate $s_e^2 = (\sigma_e e_t)^2$. For any function of the idiosytncratic states $x_t(a_t, e_t)$ define

$$\mathcal{A}_t x_t := \frac{\partial x_t}{\partial e} m_e + \frac{1}{2}\frac{\partial^2 x_t}{\partial e^2} s_e^2 + \frac{\partial x_t}{\partial t}.$$

Employed household solve

$$\rho v_t^e = \max_{c_t} \Bigg\{ u^e(c_t, n_t) + \frac{\partial v_t^e}{\partial a}((1-\tau_t)w_t e_t n_t + \tau_{x,t} + d_t + r_t a_t - c_t) + \mathcal{A}_t^e v_t^e \\ + \lambda_u \theta_u (v_t^{u_1} - v_t^e) + \lambda_u (1-\theta_u)(v_t^{u_0} - v_t^e) \Bigg\}.$$

Unemployed household who receives UI benefits solve

$$\rho v_t^{u_1} = \max_{c_t} \Bigg\{ u^{u_1}(c_t) + \frac{\partial v_t^{u_1}}{\partial a}(\mathcal{B}(e_t) + \tau_{x,t} + d_t + r_t a_t - c_t) + \mathcal{A}_t^{u_1} v_t^{u_1} \\ + \lambda_e (v_t^e - v_t^{u_1}) + \lambda_{u_0}(v_t^{u_0} - v_t^{u_1}) \Bigg\}.$$

Unemployed household without UI solve

$$\rho v_t^{u_0} = \max_{c_t} \Bigg\{ u^{u_0}(c_t) + \frac{\partial v_t^{u_0}}{\partial a}(\tau_{x,t} + d_t + r_t a_t - c_t) + \mathcal{A}_t^{u_0} v_t^{u_0} + \lambda_e (v_t^e - v_t^{u_0}) \Bigg\}.$$

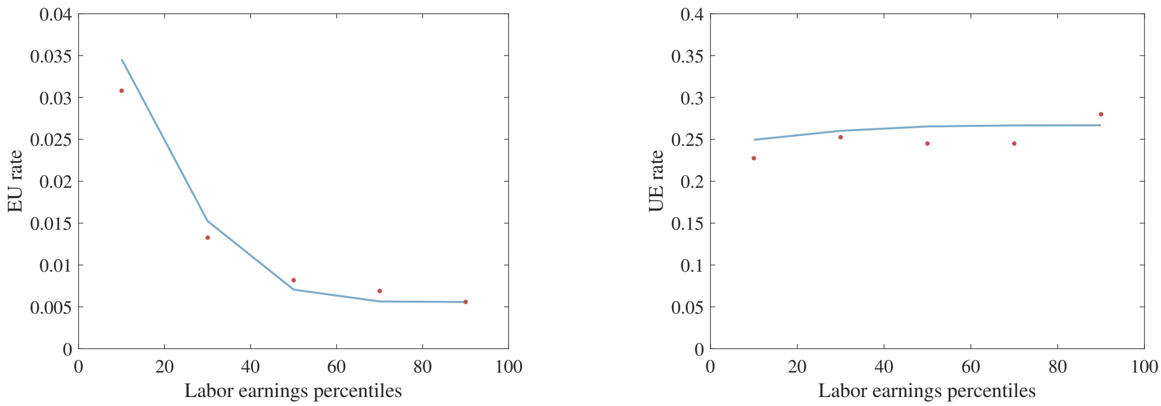
The solution to these HJB equations consists of the value functions $\{v_t^s(a_t, e_t)\}_{t\geq 0}$, as well as optimal consumption and labor supply decisions $\{c_t^s(a_t, e_t), n_t(a_t, e_t)\}_{t\geq 0}$ for $s \in \{e, u_1, u_0\}$.

B Heterogeneous labor market frictions

To capture the heterogeneity in exposure to unemployment risk by skills I parametrize the job finding rate and job separation rate as follows

$$\lambda^s(e_t) = \lambda_s + \lambda_{s,1}\exp(\lambda_{s,2}e_t).$$

The parameters λ_e, λ_u are calibrated to match the average EU, UE flows. Table A.1 reports the values for the other parameters that characterize the shape of the functions λ^e, λ^u. I calibrate these other parameters to match the heterogeneity in EU, UE rates across the income distribution. In particular, I focus on labor earnings given by $w_t e_t n_t$. In the model, there is a one-to-one mapping between labor income and labor market skill. Figure A.1 shows the fit of the model. We can observe that the UE rate is relatively flat across the income distribution while the EU rate displays a large gradient for low-skill workers. Overall, the model quantitatively captures the higher exposure of low-skill households to unemployment risk.



(a) (b)

Figure A.1: Heterogeneity in labor flows.

Note: The figure plots the steady-state EU rate and UE rate across the income distribution in the data (red dots) from Birinci and See (2023) and in the HANK model (blue line).

Table A.1: Calibrated labor market frictions

Parameter	Value	Source	Parameter	Value	Source
$\lambda_{e,1}$	-0.1	Internally calibrated	$\lambda_{u,1}$	0.3	Internally calibrated
$\lambda_{e,2}$	-6	Internally calibrated	$\lambda_{u,2}$	-6	Internally calibrated

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