Optimal Unemployment Insurance Requirements*

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Abstract

In the US, workers must satisfy two requirements to receive unemployment insurance (UI): a tenure requirement of a minimum work spell and a monetary requirement of past minimum earnings. Using discontinuity of UI rules at state borders, we find that both requirements reduce unemployment and that the monetary requirement decreases the number of employers and the share of part-time workers, while the tenure requirement has the opposite effect. We develop a heterogeneous agents model with history-dependent UI benefits to explain these results and quantify an optimal utilitarian UI design. The optimal policy has a high monetary and a short tenure requirement.

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1 Introduction

Unemployment insurance (UI) programs have attracted economists' attention both because of their moral hazard component and because of their widespread presence in many modern economies (Vodopivec and Raju, 2002). The design of such programs is usually characterized by three main elements: a replacement ratio, that is, the percentage of a past wage that the worker receives during the unemployment spell; a limit on how many months the worker can collect such benefits; and some eligibility requirement related to the worker's labor market history. In the US, workers must satisfy two eligibility requirements to receive unemployment insurance (UI): a tenure requirement of a minimum work spell and a monetary requirement of past minimum earnings. In this paper, we study empirically and quantitatively how UI requirements in the US affect the labor market and use a model to compute the optimal requirement levels.

To support our model, we first conduct an empirical analysis to understand the effect of UI requirements on unemployment, the UI recipient rate, and labor market dynamics.[1] We hand-collect data on historical UI requirements from the archives of the US Department of Labor. Exploiting discontinuities in the UI requirements at state borders and variation in the introduction of UI requirements over time, we find that both the monetary and the tenure requirements decrease unemployment. The tenure requirement increases the number of employers and the share of part-time workers, and does not affect the UI recipient rate. Conversely, the monetary requirement has a negative effect on the number of employers and the share of part-time workers, with a significant and negative effect on the UI recipient rate. These results indicate that both requirements significantly affect the pool of unemployed workers but with opposite effects when it comes to labor market dynamics.

We then build a quantitative model to explain the empirical results and quantify the optimal level of UI requirements. We develop an infinite horizon model with incomplete markets, heterogeneous agents, and a history-dependent UI program. Workers

[1] In our empirical analysis we follow a methodology similar to the one introduced by Hagedorn et al. (2016a).

choose consumption, savings, and labor supply. They receive idiosyncratic productivity shocks, including a "super-star" shock, employment and unemployment shocks, and, finally shocks related to UI to account for fraudulent take-up and program attrition.

We build into the model a history-dependent UI that closely mimics the US design. Workers can collect UI benefits after becoming unemployed if they satisfy both the tenure and the monetary requirements. The tenure requirement is a function of workers' past employment decisions, while the monetary requirement is a function of workers' past earnings. Therefore, a worker's employment history - an infinite-dimensional object - becomes part of their state space. Following Hopenhayn and Nicolini (2009), the government cannot perfectly distinguish quits from layoffs, and, with some probability, workers quitting their jobs can end up receiving UI, thus capturing one of the potential moral hazard components of the program. To solve the model numerically, we introduce a methodology that reduces the infinite-dimensional state space. By focusing on the relevant part of their employment history, we can rewrite the workers' problem in a tractable manner while still keeping it history-dependent and rich enough to accommodate empirically relevant tenure and monetary requirements.

The model replicates a broad set of untargeted moments related to the labor market and wealth distribution. It matches the mean unemployment duration, the share of workers excluded by the UI requirements, and total UI expenditures. It also captures key qualitative patterns of labor market flows across the wealth distribution, reproducing the inverse-U shape in employment-to-unemployment rates and the U-shape in unemployment-to-employment rates observed in the data (Birinci and See, 2023). Taken together, these moments indicate that the model captures the dynamic interaction between unemployment, UI eligibility, and wealth.

We show that the model can replicate the qualitative effect of changes in UI requirements on the labor market as found in our empirical analysis. An increase in the monetary requirement reduces workers' incentives to stay at low-paying jobs because these jobs are no longer covered by UI, decreasing the share of workers at such jobs. A higher tenure requirement, on the other hand, increases the incentive to stay employed. As the requirement increases, workers are more likely to remain employed—even in low-productivity jobs—to secure future eligibility for unemployment benefits. As a result, raising the tenure requirement leads to a greater share of low earnings workers staying employed.

We compute the optimal unemployment insurance (UI) design by maximizing a utilitarian social welfare function. In the optimal steady state, the planner reduces labor market distortions by raising the monetary requirement and shortening the tenure requirement. UI distorts incentives by encouraging workers to remain in low-paying jobs solely to qualify for future benefits. Raising the monetary requirement reduces incentives to accept these low-wage jobs, while shortening the tenure requirement prevents workers from prolonging such employment merely for eligibility. Increasing the monetary requirement from 4.4% to 24% of average earnings and reducing the tenure requirement from 24 to 6 weeks raises consumption-equivalent welfare by 0.9%.

Road Map. This paper is organized as follows. In the next section, we discuss the related literature. In Section 2, we show the empirical evidence obtained on the effect of UI requirements on employment outcomes. In Section 3, we construct the setting of our quantitative model, provide intuition about the underlying theory, and define all relevant model objects. In Section 4, we describe the calibration used to map the model to the data. Section 5 presents the results for the benchmark economy and the properties of the initial steady state. Section 6 lays out the thought experiment and the results of counterfactual analyses. In Section 7, we conduct a normative analysis and search for the optimal UI policy within the model environment. The last section states our conclusions.

Related Literature. This paper builds on the literature that assesses numerically the effects of unemployment insurance policies on welfare using a heterogeneous agents model as in Aiyagari (1994), Bewley (1986), Huggett (1993), and Imrohoroğlu (1989) environments. Some of the early and seminal references are Hansen and Imrohoroğlu (1992), Gomes et al. (2001), Pallage and Zimmermann (2001), Abdulkadiroğlu et al. (2002), Young

(2004), Lentz (2009), Krusell et al. (2010), and Mukoyama (2013).

We contribute to this branch of the literature by adding a history-dependent UI to an otherwise standard heterogeneous agents model with unemployment shocks. While most of the literature assumes UI eligibility to be random, we instead assume it depends on the past employment decisions of workers. This decision is empirically and quantitatively relevant. As we have shown, the UI requirements affect the type of jobs that workers are willing to take and differently affect welfare, which cannot be captured by a model in which eligibility is probabilistic.

We also contribute to the literature studying UI requirements in quantitative settings. Andersen et al. (2018) show how the employment requirement strengthens the re-entitlement effects. Auray et al. (2019) show that endogeneizing the take-up rate of UI-eligible workers slows the impact of changes in the benefit on the unemployment rate and duration of unemployment. Birinci and See (2023) analyze the UI eligibility and recipiency along the wealth distribution and find that in a heterogeneous agents job search model, the insurance benefits are larger for wealth-poor workers. In a contemporaneous paper, Chao et al. (2025) study whether paying unemployment insurance affects the value of unemployment and find that UI eligibility has a causal effect on next-period earnings. Their results are complementary to ours and in line with our empirical evidence and our model showing the relevance of UI eligibility for workers' labor market outcomes. More recently, prompted by the expansion of UI eligibility employed by the CARES Act via the Pandemic Unemployment Assistance (PUA) program, recent research, such as Chao (2025) and Michaud (2023), has quantified the impact of loosening UI requirements.

We contribute to this literature by studying a heterogeneous agents model augmented by unemployment shocks, "super-star" agents, and with a history dependent UI composed by two requirements: a monetary and a tenure requirement. We make two main contributions to this literature. First, in our model, similarly to the data, the monetary requirement depends on the average lifetime history of earnings and not only the earnings of the last period. Second, once again trying to approximate the data, our model has two distinct eligibility requirements: the tenure and the monetary requirement. Adding explicitly these two requirements allows us to study the interaction between them, which we show to matter for welfare comparisons.

We also contribute to the literature studying empirically the effect of UI. The empirical work on UI requirements and eligibility dates back to Blank and Card (1991). Marinescu (2017), for example, studies the general equilibrium effects of the extension of UI benefits on job applicants and vacancies. Our paper is most related to Hagedorn et al. (2016a,b, 2019) that uses discontinuity in state borders to understand the effect of extending UI benefits.[2]

We have two contributions to the literature studying the effect of UI on the labor market. First, we compile historical data on UI requirements at the state level going back to the 1960s. Second, we use discontinuity in UI requirements across state borders, as in Hagedorn et al. (2016a,b, 2019), to identify the effect of UI requirements. The empirical results provide insights that support our quantitative model.

2 Empirical Evidence

In this section, we study empirically how UI requirements affect the labor market in the US. In Subsection2.1 we briefly describe the institutional background of unemployment insurance in the different states. We describe our data in 2.2 and the empirical strategy used in 2.3. We then outline the results of the econometric exercises in 2.4 and discuss robustness checks in 2.5.

2.1 Institutional Background

Unemployment insurance in the US is regulated by the federal government, administered by the states, and paid weekly to workers who have lost their jobs through no fault of their own. The eligibility requirements are established by the laws of each state in reference to a base period, which is usually the first four of the last five completed calendar quarters

[2]Recent quantitative and theoretical approaches studying the relationship between UI and recessions are, for example, Mitman and Rabinovich (2015) and Pei and Xie (2021).

prior to the time the claim is filed. The majority of the states fund the program through a tax imposed on employers.[3]

States use a formula to calculate eligibility for UI. This formula usually involves, directly or indirectly, a tenure requirement and a monetary requirement, as recorded by the US Department of Labor (USDOL). The tenure requirement is the minimum amount of weeks that a worker must have contributed to be eligible. For instance, to receive UI in Wisconsin in 2022 a worker must have contributed for at least 7 weeks. The monetary requirement is the minimum earnings in the base period required for eligibility. The way that the monetary requirement is calculated varies from state to state. Some states require a minimum weekly earnings; for example, Florida and New Jersey in the 80s required workers to make more than $20 and $30 per week to be eligible, respectively. Others, like California in 2022, require a minimum contribution in the base period.

Across all states, workers with lower wages have harder access to UI benefits when there is a monetary requirement. Both eligibility requirements play a role in selecting workers to the UI. Between 2000 and 2010, about 8.6% of workers didn't satisfy the tenure requirement. The monetary requirement excluded 3.8% of workers.

2.2 Data

We use data from the IPUMS repository of the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS) between 1963 and 2016 (Flood et al., 2021). We combine the labor market statistics from this sample with data on state unemployment insurance laws from the USDOL.

Data on UI requirements are hand-collected and standardized from the USDOL historical archives. The USDOL collects data on unemployment insurance (UI) laws for all US states and publishes it in a document called "Comparison of State Unemployment Laws". This document provides detailed information on the financing schemes, eligibility criteria, employer requirements, and replacement ratios of each state's UI regulation.

[3]The US Department of Labor provides further details on the legislation and broader components of the UI regulation. The website can be found via this link.

The USDOL also provides the formula for determining UI eligibility and the minimum earnings required to qualify for UI. We have hand-collected and standardized the data on UI requirements for all states since 1950. For summary statistics and discussion on the data collection, see Appendix A.

2.3 Empirical Strategy

To identify the causal effects of UI requirements, we exploit discontinuities at state borders.[4] MSAs that span state lines experience the same economic shocks but face different UI policies. Our strategy compares both sides of the same MSA before and after a change in UI requirements to isolate their effect. The main identifying assumption is that, while UI requirements are discontinuous at the border, aggregate shocks affect both sides of a MSA. In the following analysis, we limit the sample to MSAs that cross state borders.

The main empirical model is given by:

$$y_{i,m,s,b,t} = \beta_M \mathbb{I}_{s,t} \{\text{Monetary Req.}\} + \beta_T \mathbb{I}_{s,t} \{\text{Tenure Req.}\} + X'_{i,m,s,b,t}\theta + \mu_{m,s} + \gamma_{b,t} + \epsilon_{i,m,s,b,t} \tag{1}$$

where $y_{i,m,s,b,t}$ is a labor market outcome of agent i, in MSA m and state s, which is a member of the border pair identified by b at time t. $\mathbb{I}_{s,t} \{\text{Monetary Req.}\}$ is a dummy taking a value of one if state s in year t has a monetary requirement, and $\mathbb{I}_{s,t} \{\text{Tenure Req.}\}$ is a dummy taking a value of one if state s has a tenure requirement for UI in year t. $X'_{i,m,s,b,t}$ is a set of controls, in the baseline regression we use workers' age, years of education, gender, race, and marital status. Standard errors are clustered at the MSA level.

Identification relies on the fixed effects capturing shocks and differences across border pairs that correlate with UI requirements. The fixed effect $\mu_{m,s}$ is specific to MSA m and state s, and absorbs differences in worker characteristics that may vary within MSAs across state borders. This is crucial because it ensures that the coefficients of interest, β_M

[4] For a similar methodology, see Dube et al. (2010), Hanson and Rohlin (2011), Hagedorn et al. (2016a), and Hagedorn et al. (2016b).

and β_T, are identified from within-MSA variation on each side of the border.

The fixed effect $\gamma_{b,t}$ is a border-time fixed effect, common to all MSAs that share a border. Under the assumption that labor market shocks driving changes in UI requirements are continuous across state borders, such shocks should affect both sides of a border pair b and are therefore absorbed by $\gamma_{b,t}$. This ensures that the coefficients of interest, β_M and β_T, are not biased by aggregate shocks correlated with UI requirements.

The parameters of interest, β_M and β_T, are identified by comparing changes in labor market outcomes within the same MSA across state borders. For example, if a state introduces a monetary requirement—the treatment state—the effect on the unemployment rate is identified by comparing the change in the unemployment rate in the treated MSA-state to the change in the unemployment rate in the neighboring state within the same MSA. Because these two sides of the same MSA are subject to the same economic condition but different UI requirement, differences in unemployment rate comes from differences in UI requirements.

2.4 Results

Table 1 shows that UI requirements affect unemployment, unemployment benefit recipient rates, the kinds of jobs individuals take, and the number of employers.

Column 1 of Table 1 shows that the introduction of a monetary requirement reduces unemployment by 1.9 percentage points, while the introduction of a tenure requirement reduces unemployment by 5.3 percentage points. Since the introduction of requirements tends to preclude certain workers from accessing unemployment insurance, it is reasonable to expect that removing workers from UI would then give them an incentive to work and cause a decrease in unemployment.

As shown in Column 2 of Table 1 above, we find that the monetary requirement has a significant and negative effect on UI benefit applications, whereas the tenure requirement has a negative but small and non-significant coefficient. The introduction of a monetary requirement reduces access to UI benefits by 2.8 percentage points.

Table 1: Effect of UI requirements on the labor market

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0191***	-0.0287***	-0.123***	-0.0331***
	(0.00221)	(0.000966)	(0.00141)	(0.00461)
$\mathbb{I}$ {Tenure Req.}	-0.0531***	-0.00254	0.0179***	0.0915***
	(0.00801)	(0.00413)	(0.00379)	(0.00812)
N	136617	136617	126019	123643
R^2	0.051	0.026	0.097	0.058

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. Standard errors are clustered at the MSA level. See details in Appendix A.

The UI requirements also affect the type of jobs workers take and employment dynamics. As depicted in Column 3 of Table 1, the introduction of a monetary requirement leads to a reduction in the share of part-time workers, while the tenure requirement increases part-time jobs. Since the monetary requirement directly establishes a minimum UI eligibility wage, it disincentivizes workers to take low-paying jobs, such as part-time jobs. The tenure requirement has a positive effect on part-time employment because even low-paying jobs can count toward workers' eligibility. Column 4 shows that the monetary requirement reduces the number of employers that workers had, while the tenure requirement increases it. Therefore, a monetary requirement seems to create longer employment spells, while the tenure requirement contributes to more transitions in employment.

In the next section, we use a model to interpret this empirical result. We show that a monetary requirement leads workers to wait longer to accept a job and avoid low-paying jobs. As a consequence, workers do not move across employers and do not stay in part-time jobs. The tenure requirement, on the other hand, leads workers to accept low-paying jobs just so they become eligible for UI. As a consequence, it increases the share of part-time workers and transitions in employment. Before that, we briefly discuss some of the robustness checks conducted.

2.5 Robustness and Extensions.

The main takeaway of the empirical section, which we will capture and disentangle with the model, is that the monetary requirement decreases the number of workers at part-time jobs and employer-to-employer transitions while the tenure requirement has the opposite effect. We show that this conclusion is robust to controlling for aggregate shocks, other policies, individual characteristics, interstate mobility, and alternative functional forms. The Tables with the results as well as other robustness checks are in Appendix C.

Aggregate Shocks. The estimates could be biased if UI requirements are correlated with state-specific shocks that also experience discontinuities at state borders. To address this, in Section C.1, we enhance the baseline regression by including controls that capture these state-level shocks. Consistently across all specifications, we find that the monetary requirement reduces the number of part-time workers and employer-to-employer transitions, whereas the tenure requirement has the opposite effect.

In Table A.2, we add to the set of controls of equation (1) the lagged average of the outcome variable, $y_{i,m,s,b,t}$. Table A.2 shows that it is still true that the monetary requirement decreases the number of part-time workers and employer-to-employer transition while the tenure requirement increases it.

In Table A.3, inspired by Blanchard and Katz (1992), Mian and Sufi (2014), and Autor et al. (2013), we control for a Bartik shock capturing regional exposure to aggregate shocks. And Table A.4 adds as control the average of the outcome variable, $y_{i,m,s,b,t}$, in the other side of the border discontinuity, to control for potential shocks to neighboring states. Finally, Table A.10 includes as control occupation-year and sector-year fixed effects, capturing potential broader shocks to an industry or occupation. The conclusions remain the same.

Thus, controlling for lagged aggregate outcomes, exposure to broader national shocks, neighboring region shocks, and sector or occupation-specific shocks does not change our main results. These findings reinforce that our conclusions are not affected by aggregate shocks correlated with changes in UI requirements.

Other Policy Variables. A key identification concern is the possibility that other policies may be systematically adjusted alongside the UI requirements. To assess this, in Section C.2 we add various state policy variables as controls to the baseline specification, demonstrating that results remain statistically unchanged.

In Table A.5, we include controls for minimum wage, cash transfer expenditure share, and tax revenue. Table A.6 adds controls for the UI replacement ratio and benefit duration. Finally, Table A.7 excludes observations where extended UI benefits were applied due to a crisis. Although with larger standard errors due to the large number of controls, it is still true that the monetary requirement decreases the number of part-time workers and employer-to-employer transition while the tenure requirement increases it.

Individual Controls. We also conclude that our results are robust to adding or excluding individual controls. Table A.8 shows the results without any individual controls, Table A.9 controls for sector and occupation fixed effects, Table A.10 controls for sector-year and occupation-year fixed effects, all reaching the same conclusions as before.

Mobility Across States. A key limitation of our identification strategy is that individuals are assigned to states based on their residence, not their place of work. UI eligibility, however, is determined by where people work, not where they live. This concern is especially relevant in MSAs where many workers live in one state but commute to another. To test how relevant this margin is, Table A.13 excludes border pairs with a high share of cross-state commuters. If our results are mostly driven by UI requirement affecting commuting patterns, it is should not be robust on this sample of less connected state borders. The results remain consistent: the monetary requirement reduces part-time employment and employer-to-employer transitions, while the tenure requirement increases both. Standard errors are larger due to the smaller sample.

Alternative Functional Forms. Instead of using variation from the introduction of the requirements, Table A.11 shows the estimates of the effect of marginal changes in the monetary and tenure requirements. It still finds that the tenure requirement increased the probability of workers being part-time and the employer-to-employer transition. The estimates of the effect of monetary requirement are weaker, with a negative effect on the share of part-time workers. The changes on monetary requirement after its introduction have been too small for us to be able to identify its effect on the labor market.

3 The Model

This section describes the model we use to analyze the optimal degree of unemployment insurance requirements in the US economy. The environment is an infinite horizon economy in partial equilibrium with incomplete markets and individual heterogeneity, discrete labor supply, and a UI system that depends on the employment history of workers.

3.1 Preferences

The economy is populated by a continuum of households with a time-separable period utility function. Households are risk-averse and maximize their discounted expected lifetime utility from non-durable goods consumption c and labor supply $n \in \{0, 1\}$ with β as the discount factor. They have access to incomplete markets and can choose to accumulate assets $a \geq \underline{b}$ to protect themselves against idiosyncratic shocks, where $\underline{b}$ is their borrowing limit.

3.2 Technology

There is a single good produced in this economy with technology given by a Cobb-Douglas production function that exhibits constant returns to scale, $Y = F(K_t, N_t) =$

$K_t^{\alpha} N_t^{1-\alpha}$, where $\alpha \in (0, 1)$ is the output share of capital income and Y_t, K_t and N_t denote, respectively, aggregate output, physical capital, and labor. The final good can be consumed or invested in physical capital on a one-to-one basis. A competitive representative firm uses the technology to produce Y_t and rents capital at r_t and labor at w_t. Since the benchmark model economy is going to be analyzed in a partial equilibrium setting, the interest rate r_t will be exogenously fixed at the steady state, with value r^*. From the firm's first-order conditions, we recover the associated fixed wage rate, w^*. Details are standard and can be found in Appendix B.1.

3.3 Endowments and Labor Income

Agents are born with zero assets and endowed with one unit of time. Households can be either employed or unemployed. In either case, the household receives two types of shocks: an unemployment or employment shock, p_u or p_e, respectively, and a productivity shock, z. Additionally, following Castañeda et al. (2003); Kaymak and Poschke (2016); Kindermann and Krueger (2022), among others, we augment the productivity process by including a high-productivity state, often called "super-star" state, in order to match the overall level of earnings inequality and the upper tails of the wealth distribution. The level for these state's productivity and associated parameters are calibrated separately. For the regular states, the component z is persistent and follows an AR(1) process defined by $z_{t+1} = \rho z_t + \varepsilon_t$, with $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. We discretize it in a Markov chain with transition matrix $\pi_{z,z'} = \Pr(z_{j+1} = z' | z_j = z)$ and stationary distribution $\Pi(z)$. There is no aggregate uncertainty.

An employed worker with productivity z in the previous period receives at the beginning of the current period an unemployment shock with probability p_u and a productivity shock $z' \in \{z_1, ..., z_N\}$ with probability $\tilde{\Pi}(z'|z)$. While an agent is working, individual earnings depend on the competitive wage w_t and the idiosyncratic persistent component. On the other hand, an unemployed household in the previous period receives at the beginning of the current period an employment shock with probability p_e and a productivity shock $z \in \{z_1, ..., z_N\}$ with probability $\bar{\Pi}(z')$.

We interpret each different shock $z > 0$ as the given productivity in the same job and assume that if the agent receives an unemployment shock, then $z = 0$ and the agent is laid off. Hence, in accordance with the current US unemployment insurance code, agents quitting the labor force, i.e., $z > 0$ and $n = 0$, should not receive an unemployment benefit, while only agents with $z = 0$ who meet the required eligibility criteria are able to collect it. Without loss of generality, we can collapse all shocks into one vector and rewrite the effective labor income process transition as $\Pi(z'|z)$, where $z' \in \{0, z_1, ..., z_N\}$.

3.4 Unemployment Insurance and Moral Hazard

The unemployment insurance program is designed to approximate the UI regulation in the US. The government pays and monitors UI benefits, b^{UI}, which is a percentage of the average past earnings with a replacement ratio of $\theta \in [0, 1]$. Agents receive the benefit for μ_b periods, with $\mu_b \in \mathbb{N}$. Workers have to satisfy a tenure requirement of μ_t periods, $\mu_n \in \mathbb{N}$, and a monetary requirement of $z_{min} \in \mathbb{R}^+$. Thus, the UI design is defined by the tuple $\{\theta, z_{min}, \mu_n, \mu_b\}$. We make the assumption that, in the model economy, every worker satisfying all requirements of the UI program will automatically receive the program benefits.

For an individual worker, the UI benefit is a function of past labor force participation, the history of salaries, and how long the worker has already received unemployment insurance. Denote $y_t = w_t z_t n_t$ as the labor income at time t,and n_t as the labor supply at time t, and m_t is a dummy if the worker received UI at time t. We denote $b^{UI}(\tilde{\mathbf{n}}_t, \tilde{\mathbf{y}}_t, \tilde{\mathbf{m}}_t)$ as the UI benefit of an agent with labor supply history $\tilde{\mathbf{n}}_t = \{n_0, n_1, ..., n_t\}$, labor income history $\tilde{\mathbf{y}}_t = \{y_0, y_1, ..., y_t\}$, and UI history $\tilde{\mathbf{m}}_t = \{m_0, m_1, ..., m_t\}$.[5]

Workers are also subject to two additional shocks. With probability φ, workers quitting the labor force, i.e., with $n = 0$ and $z > 0$, are not detected by UI authorities, and receive the UI benefit if they satisfy the UI requirements. Therefore, as in Hopenhayn and

[5]For the history variables $\{\tilde{\mathbf{n}}_t, \tilde{\mathbf{y}}_t, \tilde{\mathbf{m}}_t\}$, we use here the notation with subscript t in order to facilitate the comprehension of the definition by making explicit the history component. However, throughout the paper, we follow the usual convention that omits the time index for individual-level variables and use it solely for aggregate variables.

Nicolini (2009), the government cannot perfectly distinguish quits from layoffs.[6] We call φ a moral hazard shock. Second, in order for the model to be consistent with the average duration observed in the data and account for some attrition in benefit recipiency, there is an exogenous loss from the benefit shock: with probability η the unemployed agent loses her UI benefit.

The government monitors the UI system and takes account of workers' labor market history in determining UI eligibility. In the case where a worker is caught defrauding UI, all of her labor market history that counts toward eligibility is erased. The monitoring agency does not keep track of job offers or workers' decisions to take jobs after they enter a UI spell.[7]

3.5 Government

The government runs the UI system and determines its budget. The government taxes capital and labor income, as well as the UI benefits, with an exogenously calibrated flat rate, τ. The revenue from taxes on the UI benefits is denoted as $Rev_{UI,t}$. The government uses the collected revenue to fund all its expenses, including the expense on the UI program, $Exp_{UI,t}$. On top of that, the government issues a social security transfer $T_{u,t}$ paid to all unemployed households. Finally, there is an endogenous level of aggregate expenditure G_t. The government's budget constraint is then given by:

$$G_t + T_{u,t} + Exp_{UI,t} = \tau(rK_t + wN_t) + Rev_{UI,t} \tag{2}$$

We added the universal transfer T_u for two reasons. First, it ensures that workers ineligible for unemployment insurance still receive positive income, keeping the worker's

[6] This is a condition similar to the one in Hopenhayn and Nicolini (2009) that guarantees that the eligibility requirement will arise as part of the optimal mechanism in their repeated moral hazard environment.

[7] The monitoring is conducted via a system of points that the worker accrues toward UI eligibility, which is defined by the way we track labor market history in the state space of the problem. For now we abstract from the notation details for the sake of better exposition of the worker's problem but revisit them in detail in Appendix B.2.

problem well behaved. Second, it provides redistribution and risk protection through a channel separate from UI. As a result, optimal changes to UI reflect only the portion of redistributive demand not already addressed by the broader welfare system.

3.6 Recursive Household Problem

Households are heterogeneous with respect to their labor income history, $\tilde{\mathbf{y}} = \{w_j \, \epsilon_j \, n_j\}_{j=0}^{t-1} \in \mathcal{Y}^{t-1}$, labor supply history, $\tilde{\mathbf{n}} = \{n_j\}_{j=0}^{t-1} \in \mathcal{N}^{t-1}$, their UI benefit history, $\tilde{\mathbf{m}} = \{m_j\}_{j=0}^{t-1} \in \mathcal{M}^{t-1}$, their idiosyncratic productivity shock, $z \in \mathcal{Z}$, and their asset holdings $a \in \mathcal{A}$. The state space of the economy is then the set $S = \mathcal{A} \times \mathcal{Z} \times \mathcal{N}^{t-1} \times \mathcal{Y}^{t-1} \times \mathcal{M}^{t-1}$. The individual state space is an element $s = (a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}) \in S$.

Let $v_n(s)$ be the value function of an agent depending on they labor supply decision, $n \in \{0, 1\}$. This value function depends on the value function of working, $v_{n=1}$, and of not working, $v_{n=0}$. We start by defining the labor supply decision, given the value function for working or not, and follow by laying out the definition of the other two functions.

Value Function and Labor Supply Decision: Given space s, the value function and the labor supply decision follows:

$$v_n(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}) = \max\{v_{n=1}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}), v_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})\} \tag{3}$$

which is, v_n is the optimal choice between joining the labor market today or not.

Value Function if Working: If an agent works, i.e., $n = 1$, she also makes the standard consumption-savings decision by choosing consumption c and assets for next period, a'.

For the continuation value, the agent is hit by a separation shock with probability p_u at the beginning of the next period, then next period's productivity and labor supply decision are set to $z' = 0$ and $n' = 0$, respectively. The next period's value function is thus the one if the worker is laid-off, $v_{n=0}$, that we define next. With probability $(1 - p_u)$ the worker does not receive a separation shock. In that case the worker draws next period's productivity z'. The next period's value function in this case is then v_n as defined in Equation (3). In both cases the worker carries over in the state-space the labor market history until the current period, $\{\tilde{\mathbf{n}}', \tilde{\mathbf{y}}', \tilde{\mathbf{m}}'\}$, augmented by the extra period of work and earnings of the current working state.

The value function is then given by:

$$
\begin{aligned}
v_{n=1}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}) = \max_{c,a'} u(c, 1) + \beta \Big[& p_u v_{n=0}(a', 0, \tilde{\mathbf{n}}', \tilde{\mathbf{y}}', \tilde{\mathbf{m}}') + \\
& (1 - p_u) \sum_{z' \in \mathcal{Z}} \tilde{\pi}(z, z')\, v_n(a', z', \tilde{\mathbf{n}}', \tilde{\mathbf{y}}', \tilde{\mathbf{m}}') \Big] \\
\text{s.t.} & \\
c + a' = (1 + (1 - \tau) r) a + (1 - \tau) w z & \\
\tilde{\mathbf{n}}' = \{\tilde{\mathbf{n}}, 1\}, \qquad \tilde{\mathbf{y}}' = \{\tilde{\mathbf{y}}, wz\}, \qquad \tilde{\mathbf{m}}' = \{\tilde{\mathbf{m}}, 0\}, & \qquad c > 0, \qquad a' \geq \underline{\mathrm{b}}
\end{aligned}
\tag{4}
$$

where c is consumption, τ is the income tax, and wz is labor income.

The following value functions all concern to different states of not working, hence $v_{n=0}$. They are, respectively, the value function after being laid-off, the value functions if the worker quits, and the value functions if the worker receives UI. The latter value functions are both comprised of an expected value between two other value functions within each of these states. They reflect the scenarios where the worker is hit (or not) by the moral hazard shock φ when quitting or by the UI random attrition shock η, if receiving UI.

Value Function if Laid Off: If a worker is laid off i.e., $z = 0$, she receives unemployment insurance $b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})$ if she is eligible. Let $\mathbb{1}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})$ be a dummy taking a value of one if the worker is eligible for UI. The value function of a laid-off worker is

$$v_{n=0}(a,0,\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}}) = \max_{c,a'} u(c,0) + \beta\Big[(1-p_e)v_{n=0}(a',0,\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}')+ p_e \sum_{z'\in\mathcal{Z}} \bar{\pi}\left(z,z'\right) v_n(a',z',\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}')\Big]$$

$$\text{s.t.} \qquad (5)$$

$$c+a' = (1+(1-\tau)r)a + T_u + (1-\tau)b^{UI}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})$$

$$\tilde{\mathbf{n}}' = \{\tilde{\mathbf{n}},0\}, \quad \tilde{\mathbf{y}}' = \{\tilde{\mathbf{y}},0\}, \quad \tilde{\mathbf{m}}' = \{\tilde{\mathbf{m}},\mathbb{1}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})\}, \quad c>0, \quad a' \geq \underline{\mathrm{b}}$$

where, differently from the employed worker, a laid-off worker receives welfare transfer T_u and UI benefit $b^{UI}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})$, which is zero if the worker is not eligible.

Value Function if Quitting: If a worker quits, i.e., $z>0$ and $n=0$, with probability φ he receives UI if eligible and with probability $1-\varphi$ he does not receive UI. The value function of a worker who quits and receives UI is

$$v^{UI}_{n=0}(a,z,\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}}|z>0) = \max_{c,a'} u(c,0) + \beta\Big[(1-p_e)v^{UI}_{n=0}(a',z,\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}'|z>0)+ p_e \sum_{z'\in\mathcal{Z}} \bar{\pi}\left(z,z'\right) v_n(a',z',\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}')\Big]$$

$$\text{s.t.} \qquad (6)$$

$$c+a' = (1+(1-\tau)r)a + T_u + (1-\tau)b^{UI}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})$$

$$\tilde{\mathbf{n}}' = \{\tilde{\mathbf{n}},0\}, \quad \tilde{\mathbf{y}}' = \{\tilde{\mathbf{y}},0\}, \quad \tilde{\mathbf{m}}' = \{\tilde{\mathbf{m}},\mathbb{1}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})\}, \quad c>0, \quad a' \geq \underline{\mathrm{b}}$$

With probability $1-\varphi$ the worker is caught by the UI authority and does not receive UI benefits. Moreover, we assume that as punishment for attempting to defraud the UI system, the worker loses her eligibility to receive UI in the following periods. In our notation, this is equivalent to having the worker's labor market history erased. The value function of a worker who quits and does not receive UI is

$$
\begin{aligned}
v^{nUI}_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|z > 0) = \max_{c,a'} u(c, 0) + \beta \Big[(1 - p_e) v^{nUI}_{n=0}(a', z, \tilde{\mathbf{n}}', \tilde{\mathbf{y}}', \tilde{\mathbf{m}}'|z > 0) + \\
p_e \sum_{z' \in \mathcal{Z}} \bar{\pi}(z, z') \, v_n(a', z', \tilde{\mathbf{n}}', \tilde{\mathbf{y}}', \tilde{\mathbf{m}}') \Big]
\end{aligned}
$$

s.t. (7)

$$c + a' = (1 + (1 - \tau) r) a + T_u$$

$$\tilde{\mathbf{n}}' = \{0\}, \qquad \tilde{\mathbf{y}}' = \{0\}, \qquad \tilde{\mathbf{m}}' = \{0\}, \qquad c > 0, \qquad a' \geq \underline{b}$$

Therefore, using (6) and (7) we can write the value function of a worker who quits:

$$
\begin{aligned}
v_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|z > 0) = \varphi v^{UI}_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|z > 0) + \\
(1 - \varphi) v^{nUI}_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|z > 0)
\end{aligned} \tag{8}
$$

Value Function if Receiving UI: If the worker has already received UI in the last period, with probability $(1 - \eta)$ the worker keeps receiving UI and with probability η, the worker loses the benefit. The value function of a worker who is already receiving UI and has kept receiving it is defined below

$$
\begin{aligned}
v^{UI}_{n=0}(a,z,\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}}|m=1) = \max_{c,a'} u(c,0) + \beta\Bigg[&(1-p_e)v^{UI}_{n=0}(a',z,\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}'|m=1)+\\
&p_e \sum_{z'\in\mathcal{Z}} \bar{\pi}\left(z,z'\right) v_n(a',z',\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}')\Bigg]\\
\text{s.t.}\qquad\qquad & \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (9)\\
c + a' = (1+(1-\tau)r)a + T_u &+ (1-\tau)b^{UI}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})\\
\tilde{\mathbf{n}}' = \{\tilde{\mathbf{n}},0\}, \quad \tilde{\mathbf{y}}' = \{\tilde{\mathbf{y}},0\}, \quad & \tilde{\mathbf{m}}' = \{\tilde{\mathbf{m}},\mathbb{1}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})\}, \quad c>0, \quad a' \geq \underline{\mathrm{b}}
\end{aligned}
$$

where we also know that the benefit, $b^{UI}(\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}})$, does not depend anymore on the totality of the worker's labor market history, but rather only on the last level of average earnings, $\tilde{\mathbf{y}}_t$, before the worker started receiving benefits and the benefit recipient's history, $\tilde{\mathbf{m}}$. The last level of earnings suffices for the monetary requirement constraint and determines the effective replacement earnings during the entire unemployment spell.

The value function of a worker who is already receiving UI and has been randomly drawn out of the UI benefit pool is given by the problem below

$$
\begin{aligned}
v^{nUI}_{n=0}(a,z,\tilde{\mathbf{n}},\tilde{\mathbf{y}},\tilde{\mathbf{m}}|m=1) = \max_{c,a'} u(c,0) + \beta\Bigg[&(1-p_e)v^{nUI}_{n=0}(a',z,\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}'|m=1)+\\
&p_e \sum_{z'\in\mathcal{Z}} \bar{\pi}\left(z,z'\right) v_n(a',z',\tilde{\mathbf{n}}',\tilde{\mathbf{y}}',\tilde{\mathbf{m}}')\Bigg]\\
\text{s.t.}\qquad\qquad & \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (10)\\
c + a' = (1+(1-\tau)r)a + T_u &\\
\tilde{\mathbf{n}}' = \{\tilde{\mathbf{n}},0\}, \quad \tilde{\mathbf{y}}' = \{\tilde{\mathbf{y}},0\}, \quad & \tilde{\mathbf{m}}' = \{\tilde{\mathbf{m}},0\}, \quad c>0, \quad a' \geq \underline{\mathrm{b}}
\end{aligned}
$$

Therefore, using (9) and (10) we can write the value function of a worker who is already receiving UI:

$$v_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|m = 1) = (1 - \eta)v^{UI}_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|m = 1)+ \\ \eta v^{nUI}_{n=0}(a, z, \tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}|m = 1) \tag{11}$$

The solution of the dynamic programs to (3) to (11) yields the decision rules for the asset holdings $a : S \to \mathbb{R}_+$, consumption $c : S \to \mathbb{R}_{++}$, and labor supply $n : S \to \{0, 1\}$.

State Space. The state space contains the agents' full labor supply, income, and UI benefit histories, $(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})$. Given our infinite time horizon, these become infinite dimensional objects in the steady state of the model. Hence, in the way we have defined the problem so far, a numerical solution is, by construction, intractable.

In Appendix B.2 we explain how to reduce the state space to make solving the problem feasible. The principle behind the arithmetic we describe relies on only keeping track of the agents' relevant labor supply history and average earnings. Furthermore, the full definition of the partial equilibrium of the economy, together with the details on the calculations of the aggregates is described in B.3.

4 Calibration

4.1 Timing, Preferences, and Technology

We define the time period of the model to be equivalent to 6 weeks. The period utility is isoelastic in consumption c and separable with respect to the labor supply n:

$$u(c, n) = \frac{c^{1-\gamma}}{1 - \gamma} - \chi n \tag{12}$$

where γ is the coefficient of relative risk aversion and χ controls the disutility of labor. We calibrate the latter to match the employment rate (ER) of 76.7 percent calculated by Chang et al. (2019) using the Panel Survey of Income Dynamics (PSID) for heads of households and spouses during 1980-2004. For the ER, we calculate the employment share by subtracting from the model population the share of workers with $n = 0$. We set $\gamma = 1$, hence assuming $\log(c)$ form throughout our numerical exercises. We endogenously calibrate β to match the average wealth-to-income ratio in the US, which is taken from our own calculations using the Survey of Consumer Finances (SCF) of 2010 and 2013.

Following Cooley (1995) we set the capital share α to 0.36, a value already standard in the literature. We exogenously set the partial equilibrium interest rate r^* to the six-week value that is equivalent to 2 percent per year. For the depreciation rate of capital δ, we follow Gomes et al. (2001) and set it to the six-week value that is equivalent to 5 percent per year.

4.2 Endowments and Labor Income

We prevent all workers from borrowing; hence, we set $\underline{b} = 0$. The probability of finding a job p_e is calibrated endogenously to simultaneously match the average duration of UI benefits and the measure exhausting the number of payments of UI benefits. We also calibrate endogenously the probability of losing a job p_u set to match average job destruction. Our target is based on our calculation of job losers as a share of the population from 1991 to 2014 using data from the US Department of Labor (USDOL).[8]

We discretize the regular productivity values into seven points, in increasing order $z_2 < ... < z_8$. The unemployment state is denoted by $z_1 = 0$ while z_9 stands for the high productivity or super-star state. For the regular states, we follow Gomes et al. (2001) and calibrate the persistence ρ and the error variance σ_ε^2 of the AR(1) process governing the labor income shock to 0.9 and 0.052, respectively. For the super-star state, we calibrate the set of associated probabilities $\{\pi_{x,9}, \pi_{9,9}\}$, and the associated productivity shock level, z_9, to match the Gini coefficient of the earnings distribution, the top 95 to 99 percent, and top 90 to 95 percent shares of the wealth distribution. For those moments, we target the

[8]In Appendix D.1 and D.2, we conduct robustness checks on the effect of the changes in the calibrated values of p_e and p_u on some of the benchmark aggregate statistics and the optimal policy.

values computed from the 2010 SCF by Kuhn and Ríos-Rull (2015).

4.3 Unemployment Insurance and Government

The values for the parameters governing the UI system in the benchmark economy are calibrated exogenously. The replacement ratio θ is set to 0.4641, which is the US average from 1989 to 2011 as provided by the USDOL. The monetary requirement z_{min} is defined exogenously to be 0.43, which is the numerical value for the 3rd largest shock in the grid we use to discretize the AR(1) process in the computation. In the model, this is equivalent to approximately 4.4 percent of the average of six week's earnings. The maximum number of weeks that workers receive the benefit μ_b is 24, which is the closest number consistent with the average of 26 weeks as reported by the USDOL. This is equivalent to 4 model periods, which would otherwise amount to 30 weeks, had we considered 5 model periods. The same number of weeks is also required for households to attain the work tenure eligibility requirement μ_t.

The remaining parameters are all calibrated endogenously. The universal transfer T_u is calibrated to match the average transfer to unemployment over average labor income in the data. We calculate the target level for this statistic from the American Community Survey (IPUMS-ACS). The moral hazard shock φ is chosen to target the share of agents receiving UI in the US. The reference value for this moment is, once again, calculated from the average of the USDOL data from 1991 to 2014. Last, the loss of benefit shock, η, together with p_e mentioned previously, targets the average duration of UI benefits and the measure of workers exhausting UI benefits.

4.4 Summary of Calibration

We summarize the information associated with the calibrated parameters in the sequence of tables below. In Table 2, one can find the exogenously calibrated parameters and their sources. Table 3 shows the endogenously calibrated parameters, the targeted moments associated with each of them, the source of such moments for their data counterparts, and the value of such statistics computed for the model economy. We also conduct a sensitivity analysis with variations in the employment probabilities, p_e and p_u. These results are shown in Table A.14 in Appendix D.1.

Table 2: Exogenously calibrated parameters

	Parameter	Value	Target / Source
Timing			
Model's period	t	$\{1, \ldots, \infty\}$	6 weeks (Hansen and Imrohoroğlu, 1992)
Preferences			
Relative risk aversion	γ	1.0	Standard
Technology			
Capital share	α	0.36	Cooley (1995)
Interest rate	r	0.002	$\approx$ 2% per year
Depreciation of K	δ	0.006	$\approx$ 5% per year (Gomes et al., 2001)
Labor Income			
Persistence and variance of AR(1)	$\{\rho, \sigma_\varepsilon^2\}$	0.900, 0.052	Gomes et al. (2001)
Government and UI			
Replacement ratio	θ	0.46	US Department of Labor
Monetary requirement	z_{min}	0.43	4.4% of avg six-weeks earnings
Maximum benefit periods	μ_b	24	US Department of Labor
Eligibility requirement	μ_t	24	US States Data

Notes: The table shows model parameters, their numerical values, targeted moments in the model economy, and their data sources.

Table 3: Endogenously calibrated parameters

	Parameter	Value	Target	Data	Model
Preferences and Government					
Discount factor	β	0.992	Wealth/Income	2.5	2.5
Labor disutility	χ	0.337	Employment Rate	0.767	0.767
Transfer to unemployed	T_u	0.089	Transfer to Unemp/Average Lab. Inc.	0.009	0.009
Labor Market Shocks					
Probability of job offer	p_e	0.797	Weeks receiving UI & shr. exhaust. UI	16 & 0.371	16.4 & 0.371
Probability of losing job	p_u	0.004	Job destruction	0.029	0.029
Prob of becoming superstar	$\pi_{x,9}$	0.003	Earn. Gini	0.65	0.65
Prob of staying superstar	$\pi_{9,9}$	0.694	Wealth 90% - 95%	13.5%	18.5%
Superstar shock	z_9	69.39	Wealth 95% - 99%	26.8%	24.7%
Moral Hazard Shocks					
Probability of UI benefit w/o being fired	φ	0.058	Share of agents receiving UI	0.011	0.011
Probability of losing UI exogenously	η	0.218	Weeks receiving UI & shr. exhaust. UI	16 & 0.371	16.4 & 0.371

Notes: The table shows model parameters, their numerical values, and targeted moments in the model economy. See text for the source of the data counterparts.

5 Model Fitness and Validation

In Table 3 we have shown that the model is able to closely match the targeted data moments. For a better validation of our model, we show in this Section a collection of non-targeted model moments we consider relevant for our environment to be well specified for the quantitative experiments. We divide the analysis in two parts: (i) unemployment and UI-related moments and (ii) wealth distribution and labor market flow's moments. We show in the following sections that the model is capable of replicating qualitatively the results from the empirical section.

5.1 Unemployment and UI

Table 4 shows that the model closely replicates several untargeted moments, including the mean unemployment duration, the share of workers excluded by the monetary requirement, and the share excluded by the tenure requirement. Notice that the unemployment duration is around 22 weeks, with an average duration that is 8 weeks longer than the average UI benefit duration. Hence, the model is able to be precise about the dynamic behavior of the pool of unemployed workers in and out of the labor market and the insurance system.

Table 4 shows that the model closely matches both UI expenditures and the share of individuals excluded by eligibility requirements. This matters because it confirms that our history-dependent UI benefit model captures the key mechanisms that determine who receives UI benefits and who is excluded.

Table 4: Non-targeted moments of the benchmark economy

Statistic	**Data**	**Model**
Mean Unemployment Duration	22.6	22.2
UI Expenditure/GDP	0.7%	0.9%
Share Excluded by Mon. Req.	3.8%	2.9%
Share Excluded by Tenure Req.	8.6%	10.6%

Notes: The table displays non-targeted moments computed in the data and in the model. The mean unemployment duration is denoted in weeks.

5.2 Wealth and Labor Market Flows

In Table 5 we document the employment-to-unemployment (EU) and the unemployment-to-employment (UE) rates across the wealth distribution, comparing it with the data in a similar fashion to in Krusell et al. (2017) and Birinci and See (2023). Following their standard, we compute those as a share of the average rate at each wealth quintile: we calculate the average EU/UE rate by wealth quintile and divide it by the average EU/UE rate economy-wide. The data used as benchmark for comparison is taken from the most recent calculations from the Survey of Income and Program Participation (SIPP) reported in Birinci and See (2023), in which assets are measured as net liquid wealth holdings.[9]

The model captures the general qualitative aspects of how the rates behave across the wealth distribution, approximating the data as well as Birinci and See (2023). The EU rate follows the expected inverse U-shape driven by high income workers with low liquid wealth. Similarly, the UE flows exhibit the more U-shaped pattern present in the data, with low and high-wealth workers having higher rates.

[9] In our model setting, the EU flow is calculated by identifying workers that were working in the previous period and have received the p_u shock taking them to the $z = 0$ productivity state in the current period. Conversely, the UE flow is measured by workers that were not working in the previous period and receiving UI but are now working in the current period with both $n = 1$ and $z > 0$.

Table 5: Earnings and wealth distributions in the model economy (quintiles only, in percent)

	Wealth Quintile				
	1st	2nd	3rd	4th	5th
			EU		
Data	0.97	1.64	1.11	0.76	0.61
Model	1.05	1.20	1.16	1.00	0.61
			UE		
Data	1.13	0.80	0.96	1.05	1.06
Model	1.29	0.51	0.67	1.12	1.42

Notes: The table shows the average EU/UE rate at each wealth quintile divided by the overall EU/UE averages. The data shown in the table are as reported in Birinci and See (2023), computed from the 1996-2016 SIPP.

6 Counterfactual Analyses

In this section, we discuss what happens to the economy when the design of the UI changes. First, we describe the thought experiment and the adaptations in the model required to conduct the counterfactuals. Second, we analyze in Subsection 6.2 the effect of all elements of the UI design on low-wage employment. In Subsection 6.3, we discuss the effects of the tenure and monetary requirements on the moral hazard component of our economy. We find that raising the monetary requirement reduces moral hazard and discourages workers from accepting low-paying jobs, since those jobs no longer count toward UI eligibility. In contrast, increasing the tenure requirement raises moral hazard and encourages workers to accept low-paying jobs, as they need longer employment spells to qualify for UI.

6.1 Thought Experiment

The idea behind the counterfactual exercises of changing the design of UI can be described as follows: we vary the value of the policy instrument, say the monetary requirement z_{min}, while keeping all other parameters of the UI constant. Naturally, the change of regime in this *ceteris paribus* fashion will affect the endogenous spending and revenues of the UI budget. In order to impose discipline on the government's administration of the program, we keep T_u and G fixed at their benchmark numerical level. We then add an endogenous payroll and UI benefit tax τ_{UI} to finance any residual UI financing needs and close the government's budget. The budget constraint of the household then becomes:

$$c + a' = (1 + (1 - \tau)r)a + (1 - \tau - \tau_{UI})wzn + (1 - n)T_u + (1 - n)(1 - \tau - \tau_{UI})b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}}) \tag{13}$$

We also need to update the budget constraint of the government under this new regime to add the revenue accrued from the payroll tax τ_{UI}. We can compute it as follows:

$$\tau_{UI} = \frac{G + T_u + \int_S (1 - \tau_{UI}) b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})\, d\Phi(s) - \tau \left(r^* K + w^* L + \int_S b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})\, d\Phi(s) \right)}{w^* L} \tag{14}$$

We use the notion of a partial equilibrium of the model economy as described in Appendix B.3 and add τ_{UI} as an endogenous equilibrium object in our equilibrium definition. We do so by modifying the condition for the government budget constraint described in Appendix B.3 and substituting it with (14). The solution algorithm to find the partial equilibrium now consists of iterating on the underlying fixed point defined by the budget-clearing rate τ_{UI}. In Appendix D, we generalize the thought experiment above, allowing for a full general equilibrium analysis, and compare the results with our main findings.

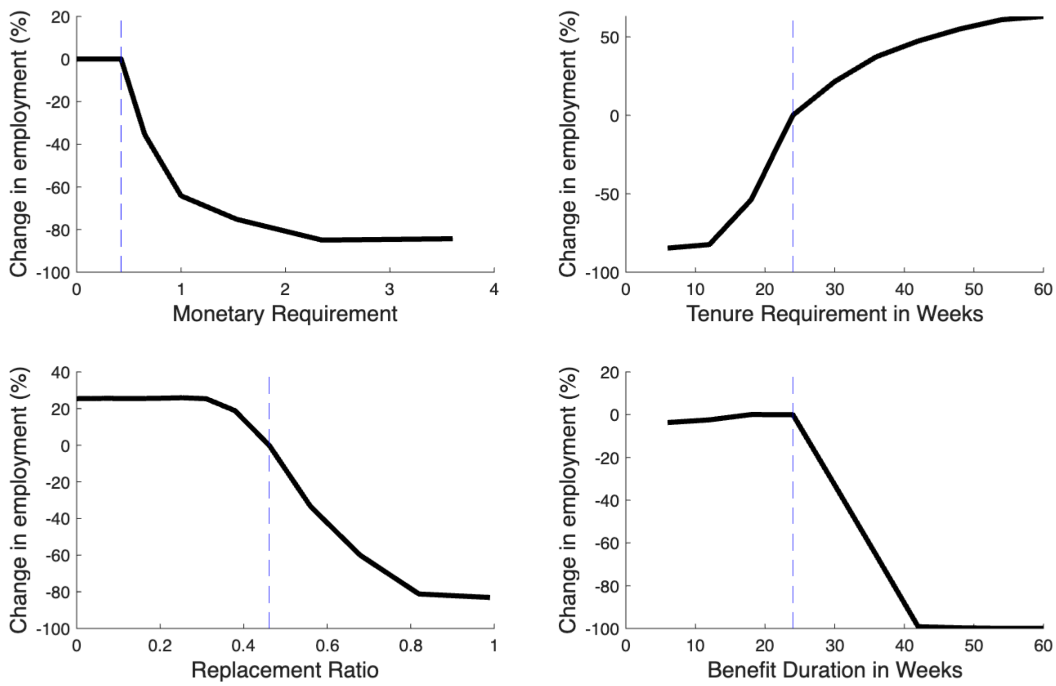
6.2 Effects of the UI Design on Employment

Figure 1 shows the effect of UI requirements on employment among low-earning workers. To construct this figure, we first calculate the employment share in the bottom 20% of the earnings distribution. We then plot the percentage change in that share relative to the baseline calibration.

The figure in the top left corner shows that an increase in the monetary requirement reduces low-wage employment, similarly to what we found in the empirical analysis in Section 2.4. When the monetary requirement increases, it decreases the value of working under a low-productivity job, since earnings from such jobs can decrease or even remove UI eligibility. As a result, stricter monetary requirements reduce the share of workers employed in low-wage jobs.

The top-right panel of Figure 1 shows that the tenure requirement has the opposite effect: it increases employment in low-paying jobs, which is the same pattern that we found on the data. A higher tenure requirement raises the value of staying attached to the labor force. Workers close to meeting the tenure requirement are more willing to remain employed, even in low-productivity jobs, in order to qualify for UI benefits in the future. As a result, increasing the tenure requirement leads to a higher share of low-productivity workers remaining employed.

Figure 1: Percent variation in employment for the bottom 20 percent of the earnings distribution



Notes: The figure shows the percent variation in the share of employment for the bottom quintile of the earnings distribution relative to the share by that quintile in the benchmark economy. The variation is shown along the entire ranges considered for each UI policy element. The top panels show the variation for the monetary and tenure requirement, respectively. The bottom panels show the variation for the replacement ratio and the benefit duration, respectively. The lines have been smoothed with a moving average for better visualization. The vertical dashed lines mark the calibrated value of each of the instruments in the benchmark economy.

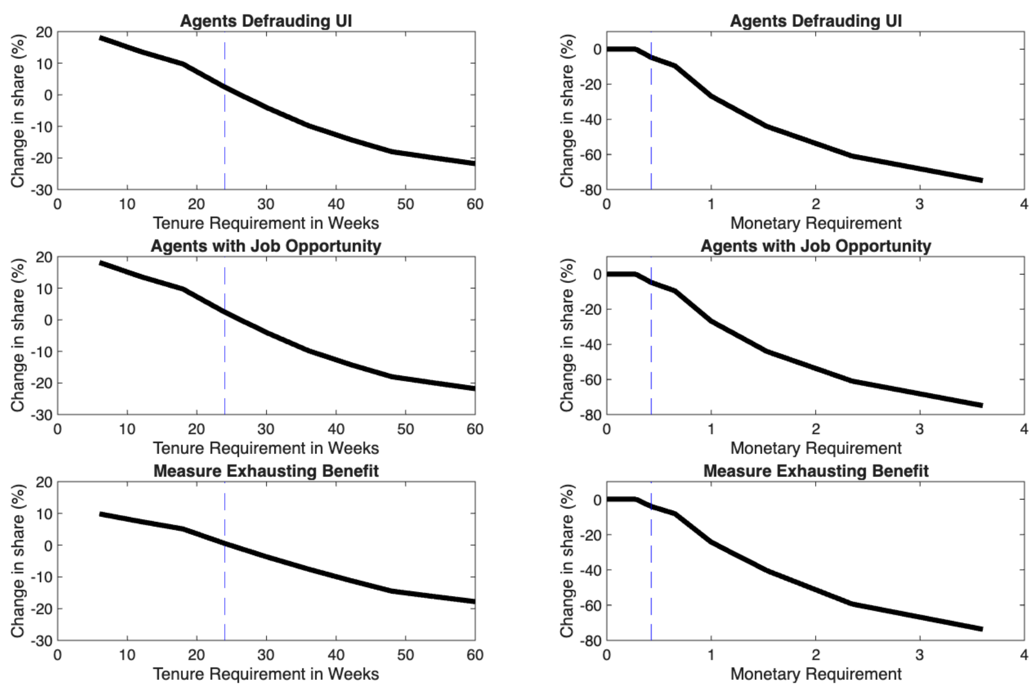
The replacement ratio and the benefit duration decrease employment at the bottom of the earnings distribution. As the level of the UI benefit or its duration increases, there is less incentive for low productivity workers to remain employed.

6.3 The Effects of UI Requirements on Moral Hazard

In Figure 2, we show, from top to bottom on the graph, respectively, the effect of changing the tenure and the monetary requirement on the share of workers who are defrauding UI benefits, the share of UI recipients with job opportunities, and the measure of workers who have exhausted the UI benefits. All of these metrics measure moral hazard in the UI system.

On the top graph, a stricter monetary requirement reduces the share of workers who defraud UI, i.e., workers who decided not to work but still receive UI. Without monetary requirement, the share defrauding the UI is not far off from the calibrated value. Conversely, in the highest possible value, the share defrauding UI decreases by 80%, an effect more significant than that of the tenure requirement.

Figure 2: Moral hazard and the tenure and monetary requirements



Notes: The figure shows in the top panels the share of workers defrauding UI, in the middle panels the share of workers with a job opportunity, and in the bottom panels the measure of workers exhausting all available periods of UI recipiency. All of those are shown along different levels for the tenure requirement in the left column and for the monetary requirement in the right column. The lines have been smoothed with a moving average for better visualization. The vertical dashed lines mark the calibrated value of each of the instruments in the benchmark economy.

The same inverse relationship happens with the share of workers receiving UI that have a positive productivity. With a loose monetary requirement, a similar level of workers to the benchmark remain in the unemployment state due to the possibility of collecting undue benefits. Once again, by choosing the strictest possible value of the requirement, one can greatly reduce such a share when compared to the benchmark level.

The tenure requirement reduces the share of agents defrauding UI, the share receiving UI while holding a job opportunity, and the measure of agents exhausting their benefits. This occurs through a single mechanism: the tenure requirement increases the value of staying attached to the labor market. Although workers value UI as insurance, a higher tenure requirement means they must remain employed longer to qualify. To meet this threshold more quickly, workers lower their reservation wages and reenter the labor force sooner. As a result, fewer agents defraud the system, fewer receive UI while turning down job offers, and fewer exhaust their benefits.

7 Optimal Policy Analysis

7.1 Definition of Welfare

We conduct an optimal policy analysis by finding the UI design that maximizes welfare in the economy described. In order to do so, we define a utilitarian social welfare function (SWF) dependent on all relevant policy parameters as follows:

$$W(\theta, \mu_t, \mu_b, z_{min}) = \int v^*(a, z, \bar{n}, m, \bar{y} \mid \theta, \mu_t, \mu_b, z_{min})\, d\mu^* \tag{15}$$

where $\{v^*, \mu^*\}$ are, respectively, the value function and distribution associated with a stationary partial equilibrium.

Essentially, we hold constant the income tax τ and the expenditure components G and T_u, as if they were fixed by the government at $t = 0$, and find the combination of static UI policy parameters that optimize the social welfare function subject to its being consistent with a stationary partial equilibrium. This set of partial equilibria to which the planner restricts her attention will be the one defined by the household's optimization together with the government's budget constraint balanced by τ_{UI} as shown in Subsection 6.1.

In light of this reasoning, the restricted social planner's problem is thus defined as:

$$\max_{\{\theta,\mu_t,\mu_b,z_{min}\}\in\Gamma} W(\theta,\mu_t,\mu_b,z_{min}) \tag{16}$$

where Γ is the restricted set of policies for which an associated stationary partial equilibrium exists. We solve this problem on a grid defined for each of the policy instruments.[10]

We report the welfare gain in terms of the consumption equivalent variation (CEV). This measure defines the increment in consumption that we would need to give households in each state of the world so that they would be indifferent between their benchmark level of consumption and their level of consumption in the alternative economies. We do so by calculating the household's *ex-ante* value, hence under the veil of ignorance. The CEV is defined for our environment as follows:

$$CEV(\theta,\mu_t,\mu_b,z_{min}) = 100 * \{\exp\left[(1-\beta)\left(W(\theta,\mu_t,\mu_b,z_{min}) - W_{bchmk}\right)\right] - 1\} \tag{17}$$

where W_{bchmk} is the SWF associated with the benchmark partial equilibrium parameterized according to Table 2.

7.2 Optimal Requirements

Table 6 presents the optimal policy across different UI instruments. Column 1 reports the benchmark calibration. Columns 2 to 5 show the optimal value of each UI design element while holding the others fixed. Column 6 reports the jointly optimal UI requirement.

[10] We consider 8 points for z_{min}, 10 points for the benefit duration and the tenure requirement, and 20 points for the replacement ratio.

The optimal replacement ratio, shown in Column 2, increases welfare by 0.3% with a reduction of the replacement ratio to 0.6%. This reduction doesn't decrease the share of individuals receiving the UI but leads to a significant decrease in the cost of the program. This cost decrease is passed to households as a lower UI tax. Similar near-zero optimal replacement rates have been found in related settings (Hansen and Imrohoroğlu, 1992; Young, 2004).[11]

Column 3 shows that the optimal benefit duration is 12 weeks, half the current length, and raises welfare by 0.1%. Shortening benefit duration reduces labor market distortions caused by UI and lowers the labor tax needed to fund it: now workers have less incentive to adjust their labor supply to become eligible to UI. However, this cost-cutting approach is less effective than reducing the replacement ratio because workers facing a series of negative productivity shocks, which have higher marginal utility, lose coverage sooner. As a result, cutting the replacement ratio gives larger welfare gains than shortening the benefit duration.

Column 4 shows that raising the monetary requirement increases welfare. The optimal level is 24% of average earnings, which lowers the share of UI recipients to just 0.3% of the population. This policy is optimal for two reasons. First, as previously discussed, the planner wants to reduce UI spending, which can be done by increasing the monetary requirement. Second, a higher monetary requirement reduces moral hazard by discouraging workers from remaining in low-paying jobs solely to qualify for UI later. As a consequence of these two forces, the optimal monetary requirement increases welfare by 0.6%, the largest gain among individual UI design features.

[11] For a recent discussion and meta-analysis of some of these findings, see Cohen and Ganong (2024).

Table 6: Optimal policies and statistics for each of the UI program instruments

	(1) Benchmark	(2) Replacement Ratio	(3) Benefit Duration	(4) Monetary Requirement	(5) Tenure Requirement	(6) Requirements
Optimal Policies						
Replacement Ratio	46%	0.6%	46%	46%	46%	46%
Benefit Duration	24	24	12	24	24	24
Monetary Requirement	4.4%	4.4%	4.4%	24%	4.4%	24%
Tenure Requirement	24	24	24	24	6	6
Statistics						
CEV	0	0.3%	0.1%	0.6%	0.2%	0.9%
τ_{UI}	0	-0.8%	-0.3%	-0.2%	0.4%	0.2%
Expenditure/GDP	0.9%	0.0%	0.6%	0.7%	1.3%	1.1%
Beneficiaries	1.1%	1.1%	0.7%	0.3%	1.3%	0.4%

Notes: The table displays the computed results for the model. The benefit duration and the tenure requirements are denoted in weeks. The monetary requirement is in percentage of six-week average earnings. The expenditure/GDP is shown net of added UI revenue.

Column 5 shows that the optimal tenure requirement is 6 weeks. This feature of the UI design delivers the smallest welfare gain because it balances two opposing forces. On one hand, the planner wants to reduce UI coverage to lower distortions and tax rates. On the other, a higher tenure requirement, which would reduce UI expenditure, would also encourage workers to remain longer in low-paying jobs to meet UI eligibility, exacerbating UI distortions. Since the second force dominates, the planner lowers the tenure requirement, reducing distortions at the cost of higher UI spending.

The last column of Table 6 reports the optimal joint tenure and monetary requirements. The optimal policy sets a high monetary requirement (24% of average earnings) and a low tenure requirement (6 weeks). These two changes reinforce each other by reducing incentives for workers to remain in low-paying jobs they would otherwise avoid without UI. This reform leads to a welfare gain of 0.9%.

7.3 Robustness of the Model

We conduct three robustness exercises on our results for the optimal policy analysis: (i) we re-analyze the partial equilibrium result for simultaneous optimality in both requirements with a small variation on the calibrated employment probabilities; (ii) we analyze the results when allowing for general equilibrium effects; and (iii) we calculate the welfare comparison including the effects of the transitional dynamics into the optimal policies.

Overall, our conclusion of the optimal analysis remains the same: the main direction of welfare-improvement is the one of making the monetary requirement stricter. The tables with the results as well as extra discussion notes for each of the robustness exercises can be found in Appendix D.

Change in Employment Probabilities. The employment transition probabilities, which otherwise would be endogenous in a standard search and matching environment, are an important component of the mechanism in our optimal policy analysis. Hence, in this robustness exercise we conduct a 10 percent reduction and increase in the parameters of the probability of a job offer and the probability of losing a job, p_e and p_u, respectively. We show how these changes affect the calculation of the optimal unemployment insurance requirements with simultaneous choice of both the tenure and the monetary requirement as shown in the last column of Table 6. Table A.15 in Appendix D.2 shows that the variation in the unemployment and employment probabilities does not significantly affect the optimal choice of requirements, keeping the overall choice of increase in the monetary requirement and reduction of the tenure requirement.

General Equilibrium Effects In order to understand the potential general equilibrium effects of our welfare analysis, we generalize the partial equilibrium defined in Subsection B.3 and the thought experiment in Subsection 6.1 to general equilibrium. Our generalization works as follows: (i) we keep the same calibration as in the partial equilibrium analysis shown in Tables 2 and 3; (ii) we start with the initial value of $\tau_{UI} = 0$ as in the benchmark economy; (iii) as in Subsection 6.1, G and T_u are fixed at the benchmark level; and (iv) prices r and w vary in each counterfactual, in which we find a fixed point in the capital-labor ratio, K/N.

We then compute an equilibrium for each of the optimal policies obtained in partial equilibrium above and compare it to the general equilibrium version of the benchmark economy. The results are in Table A.16 in Appendix D.3 which replicates Table 6 but showing statistics taking into account the general equilibrium effects. We conclude that the extension to a general equilibrium setting does not bring much action at the aggregate level and the result that the increase in the monetary requirement has the highest gradient when it comes to welfare-improvement is preserved.

Transitional Dynamics We also solve for the transitional dynamics along the path of τ_{UI}, clearing the government budget constraint period-by-period in a partial equilibrium fashion similar to our main analysis. With this exercise, we calculate the welfare accounting for the transition dynamics. The results are in Table A.17 in Appendix D.4, which replicates Table 6 with statistics for the first period after the policy reform. Table A.17 shows that the economy is still better-off with an increase of the monetary requirement.

When accounting for the transition, welfare declines under all implemented policies. The intuition is straightforward: the benefits of reducing UI accrue only in the long run, while the costs are incurred in the short run. As discussed earlier, UI distorts incentives by encouraging workers to accept lower-paying jobs, but it also provides valuable insurance against unemployment risk. In the steady state, the trade-off favors reducing UI, as the distortionary effects outweigh the insurance benefits. However, during the transition, these forces are weighted differently. The gains from improved labor allocation emerge gradually, while workers immediately face increased consumption risk due to higher exposure to unemployment shocks. As a consequence, the welfare gains of all reforms decrease. A potential message of Table A.17 is that the planner would like to arrive in the steady state economy described in Table 6, but would not choose to do so with a one-time increase of requirements.[12]

[12] Solving for time-varying policy paths in Ramsey problems, such as in Dyrda and Pedroni (2023) or Acikgoz et al. (2018), is computationally demanding. Though such exercises are rich and informative, we understand them to be beyond the scope of our paper, which focuses on partial equilibria and one-off policy changes due to the nature of the state variation in UI policies used in our empirical analysis. We leave these type of exercises for future research.

8 Conclusion

In this paper, we addressed the question of what are the optimal levels of the two types of requirements used in the UI benefits program in the US. We developed an infinite horizon partial equilibrium model with incomplete markets and heterogeneous agents that includes a UI system that closely mimics the rules observed in the data. The model has a rich individual state space that includes workers' assets, idiosyncratic shocks, and labor supply and income histories. Furthermore, the economy has a structure of shocks that allows a moral hazard and information structure akin to the one studied in the theoretical literature about optimal UI design. Our analysis focuses on the impact of changes in the UI policy instruments on workers' labor market outcomes.

We conducted an empirical analysis to assess the UI requirements' effects on employment outcomes and obtained stylized facts for our quantitative exercises. We used discontinuities in the UI policies to identify the requirements' causal effect on different labor market outcomes. The monetary requirement has a stronger effect than the tenure requirement in discouraging UI benefit applications and a negative effect on the number of employers and part-time jobs. The tenure requirement has an opposite impact on the latter. The intuition for these results comes from the fact that a tenure requirement does not influence workers to stay at the same job. In contrast, the monetary restriction gives workers an incentive to keep high-paying jobs.

We calibrated the model to the US data and conducted a series of counterfactual exercises by following a thought experiment thatkeeps the balance in the government's budget constraint. The model mechanism is able to capture the negative correlation between the monetary requirement and the employment outcomes and the associated positive correlation with the tenure requirement.

Finally, we have maximized a utilitarian social welfare function on a restricted Ramsey problem and assessed the welfare changes associated with the optimal parametric region for the tuple that characterizes the program. In our results, we found that the highest level of welfare is achieved by a monetary requirement when instruments are evaluated separately. A combination of the tenure and monetary requirement can achieve a higher welfare level than the *ceteris paribus* optimum.

Data Availability Statement

The data and codes that support the findings of this study are openly available in openICPSR at: https://doi.org/10.3886/E241088V1, reference number 241088.

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Online Appendix

"Optimal Unemployment Insurance Requirements"

Gustavo de Souza André Victor D. Luduvice

A Data

The time period used in our sample is from 1963 to 2016. The data on the labor market are taken from the IPUMS source for the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS) (Flood et al., 2021). All the data used regarding the unemployment insurance law for the US states are taken from the US Department of Labor (USDOL). We do not perform any sample selection for the current analysis but rely on demographic controls in our regressions. For the county-level data, we are able to identify respondents' county only after 1996, as further discussed in C.4.

A.1 Revisions on Federal UI Laws

One of the last substantial revisions to the federal UI law was in 2009 with the American Recovery and Reinvestment Act, which largely extended the duration of benefits due to the Great Recession with the emergency unemployment compensation (EUC) and extended benefits (EB) measures. The baseline period for most of the states was 26 weeks, which the act extended by an additional 13 to 20 weeks. The most recent significant revision was in 2012, which extended the programs from the previous revision and added provisions on self-employment eligibility and the possibility of short-term compensation for employers. The EUC and EB were last extended until 2014. As mentioned previously, these revisions have focused solely on the duration of the payment of benefits and have received due attention in the literature.

Recently, in the COVID-19 pandemic there has been a shift of the focus to the eligibility requirements with the expansion of the program reach allowed by the Coronavirus Aid, Relief, and Economic Security Act (CARES) with the Pandemic Unemployment Assistance (PUA). Most notably, it has authorized self-employed and gig workers to receive unemployment benefits as well as workers with reduced work hours due to the lockdown measures, starting at the end of March of 2020. These groups were most likely before barred from the enrollment in the UI program due to the minimum weekly wage and tenure requirements. Alongside with the requirement lifts, the CARES Act also increased the weekly benefit with the Federal Pandemic Unemployment Compensation (FPUC) and extended the duration with the Pandemic Emergency Unemployment Compensation (PEUC).[13]

A.2 Construction of Historical UI Requirements

Data on UI requirements are hand-collected and standardized from the USDOL historical archives. The USDOL collects data on unemployment insurance (UI) laws for all US states and publishes it in a document called "Comparison of State Unemployment Laws." This document provides detailed information on the financing schemes, eligibility criteria, employer requirements, and replacement ratios of each state's UI regulation. The USDOL also provides the formula for determining UI eligibility and the minimum earnings required to qualify for UI. We have hand-collected and standardized the data on UI requirements for all states since 1950.

Each state has its eligibility formula and criteria. In many cases, it is a function of total earnings in the 6 months before unemployment (called the base period), the earnings on the quarter with the highest wage, and weeks of employment. But, in general, there are 4 types of eligibility formulas: (i) multiple of high-quarter earnings; (ii) multiple of weekly benefit amount; (iii) flat qualifying amount; or (iv) weeks of employment. On the first eligibility formula, multiple of high-quarter earnings, workers are eligible if their base period earnings are above a multiple of their highest quarter earnings. For instance, for a worker to be eligible for UI in Alabama in 2006, she needs her earnings in the base period to be above 1.5 times her earnings in her highest quarter. On the second type of eligibility

[13] More detailed discussion of these programs can be found in Chao (2025) and Michaud (2023).

formula, the multiple of weekly benefit amount, a worker's earnings in the base period must be higher than a multiple of its weekly benefit amount. For instance, to qualify for UI in Connecticut in 2006, workers would need a base period earning above 40 times their weekly benefit amount. The third type of eligibility formula requires workers to have earnings in the base period above a certain dollar amount. For instance, West Virginia required workers to have earnings above $2,200 to be eligible for UI. Finally, some states require workers to have a minimum number of employment weeks to be eligible.

Given how complex and diverse the UI requirements are across states and over time, we need to make assumptions to make them compatible. We estimate the tenure requirement by calculating the minimum amount of employment weeks a full-time worker continuously employed and with constant wages would need to become eligible. If a state uses an eligibility formula based on a multiple of high-quarter wages, the minimum amount of weeks a worker has to work is this multiple times twelve.[14] If the state has a requirement based on a minimum number of weeks or hours of work, we can directly calculate the tenure requirement. The tenure requirement is one week if the state is using an eligibility formula based on a flat qualifying amount or a multiple of the weekly benefit amount.

We estimate the monetary requirement by calculating the minimum weekly earnings that a full-time worker continuously employed and with constant wages would need to become eligible. We use three statistics to calculate that: the minimum wages needed to qualify in the highest earning quarter, the minimum wages needed to qualify in the base period, and the minimum weekly wage to qualify, if the state has such a requirement.[15] The monetary requirement is the maximum weekly wage required between the three different requirement types.

[14] Twelve is the number of weeks in a quarter. In other words, if a worker needs to have earnings in the base period equal to c times the earnings in the highest quarter, a worker who has constant weekly earnings needs to work for $c \times 12$ weeks to become eligible for UI.

[15] These variables are already provided by the USDOL.

A.3 Statistics of UI Requirements

In this section, we show statistics of the tenure and monetary requirements over time. Table A.1 shows that the average tenure requirement in the sample is 16 weeks with considerable variation on it across time and states. The second column shows the monetary requirement in weekly earnings in 2015 dollars. The average weekly monetary requirement is US$89 with an also large standard deviation.

Table A.1: Summary statistics of tenure and monetary requirements.

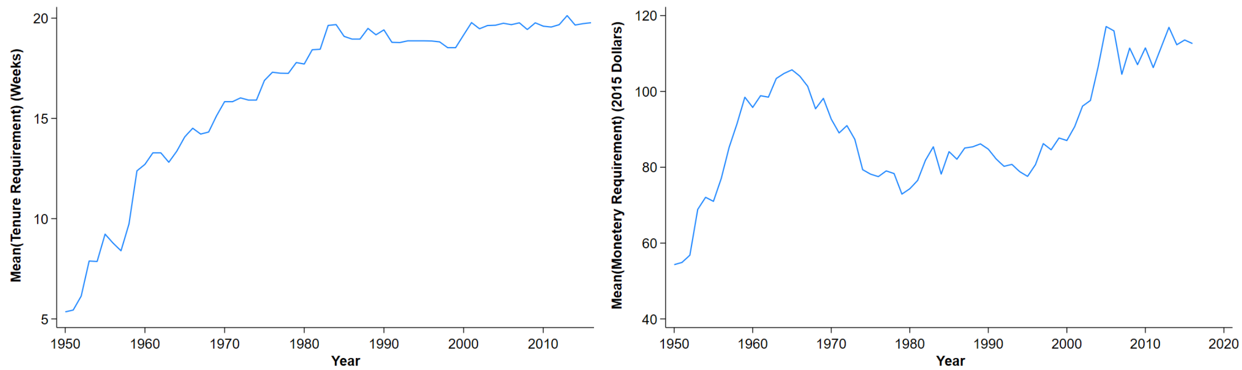
	Tenure Requirement (Weeks)	Monetary Requirement (US$)
Mean	16.39	89.14
Std. Dev.	7.79	48.93
Median	18.00	82.35
Min	1.00	0.00
Max	36.00	531.45

Notes: This table shows statistics of the tenure and monetary requirements. The tenure requirement is in weeks and the monetary requirement in 2015 dollars.

Figures A.1a and A.1b show the average tenure and monetary requirements over time. The tenure requirement has been increasing since the 50's and slowing down in more recent years. The monetary requirement, on the other hand, has fluctuated significantly over time. The stabilization of the increase in the two requirements after the 2000's suggests that the UI eligibility in the US is at an all-time high.

Figure A.1: Tenure and monetary requirements over time

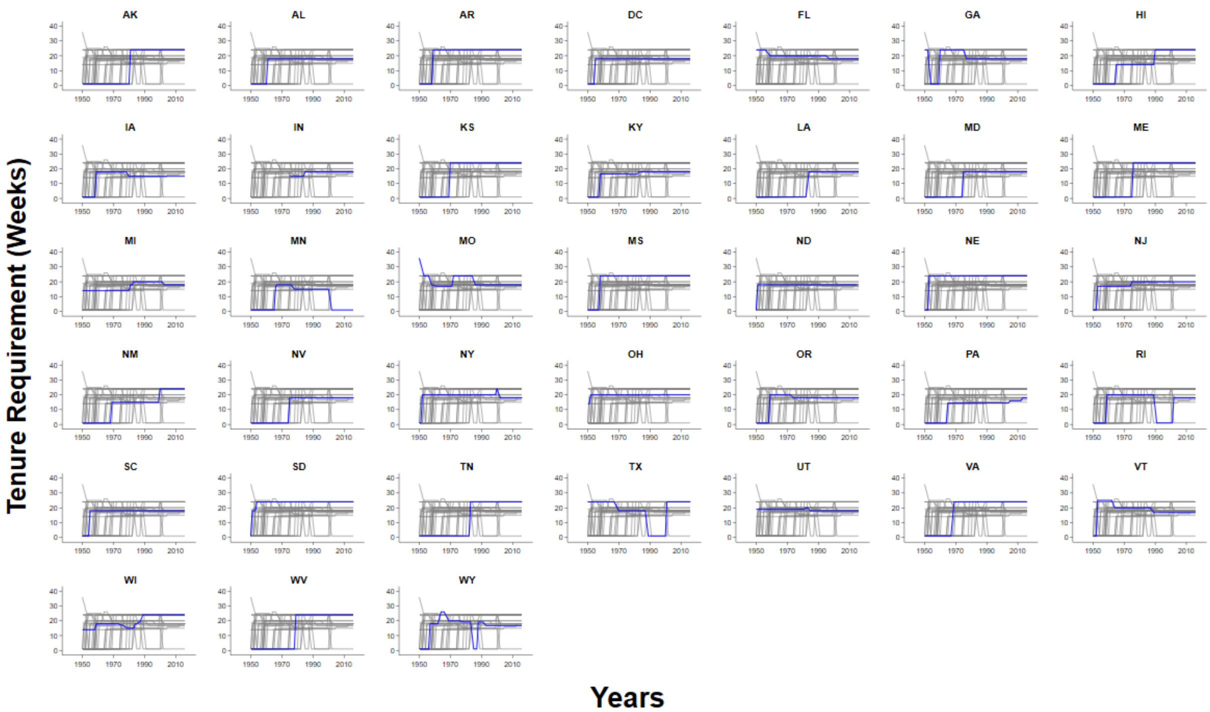
(a) Tenure Requirement Over Time (b) Monetary Requirement Over Time



Notes: The figure shows the average tenure and monetary requirements over time. The tenure requirement is in weeks and the monetary requirement in 2015 dollars.

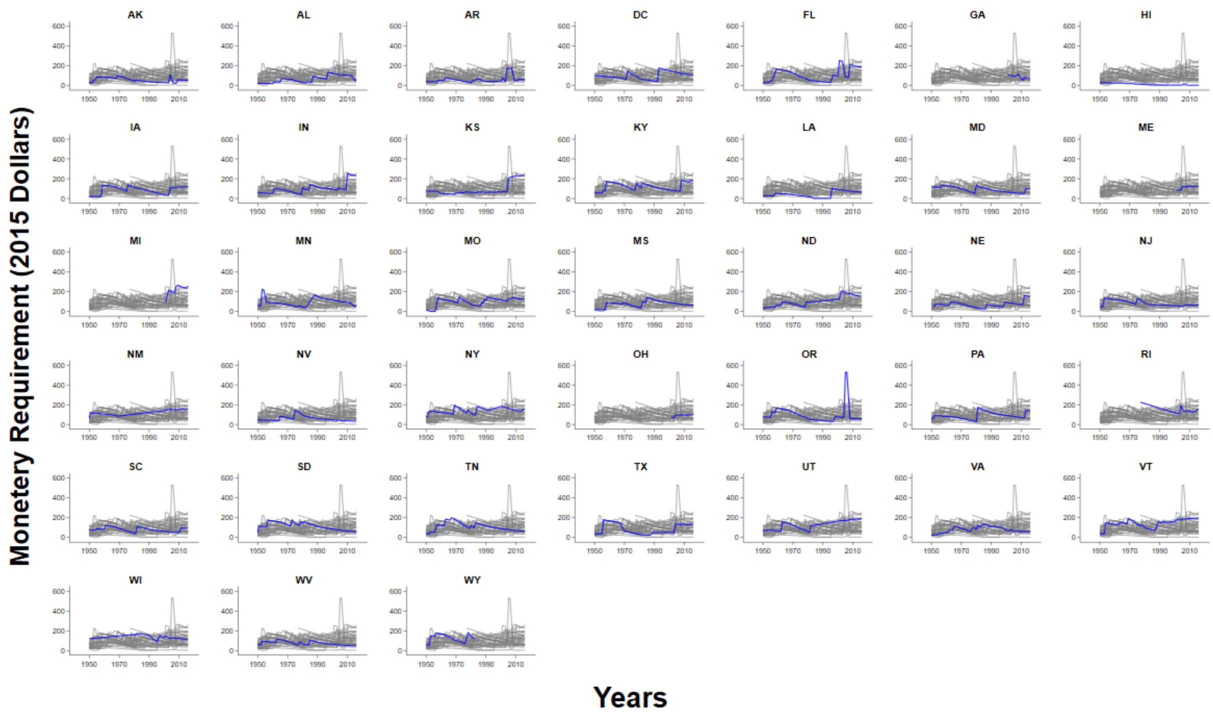
The average tenure and monetary requirements described in Figures A.1a and A.1b hide a large degree of heterogeneity on UI requirement reforms. Figures A.2 and A.3 show the tenure and monetary requirements over time for different states, respectively, diving deeper into the variation of the requirements and their reforms. These figures highlight the fact that UI requirements tend to be sticky but exhibit several state-level reforms that introduce large fluctuations in them. Finally, to further highlight the heterogeneity of requirements, Figure A.4 plots the histogram of tenure and monetary requirements across our whole sample.

Figure A.2: Tenure requirement over time across different states



Notes: The figure shows the tenure in weeks in different states.

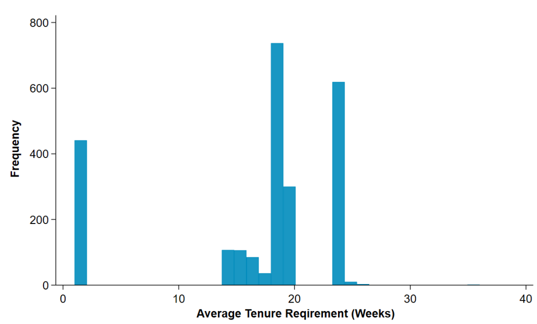
Figure A.3: Monetary requirement over time across different states



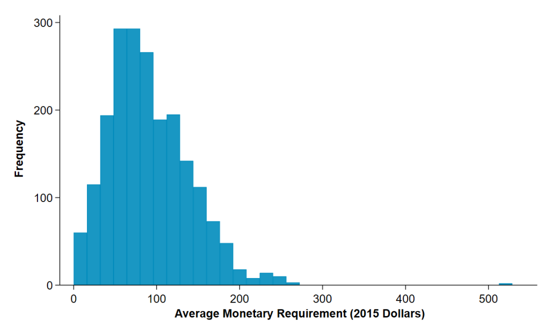
Notes: The figure shows the monetary requirement of different states in 2015 dollars.

Figure A.4: Distribution of tenure and monetary requirements

(a) Distribution of tenure requirements in weeks



(b) Distribution of monetary requirements



Notes: The figure plots the histogram of tenure and monetary requirements over the whole sample. The tenure requirement is in weeks and the monetary requirement in 2015 dollars.

B Details of the Model

B.1 Firm's Problem

The price of the consumption good is normalized to one and aggregate investment in physical capital, I_t, is defined by the following law of motion:

$$K_{t+1} = (1 - \delta_k)K_t + I_t, \tag{A.1}$$

where δ_k is the depreciation rate of physical capital.

This technology is used by a representative firm that ex-ante to the partial equilibrium behaves competitively, maximizing profits by choosing labor and capital given factor prices. The profit maximization problem is:

$$\Pi_t = \max_{K_t, N_t} K_t^{\alpha} N_t^{1-\alpha} - w_t N_t - (r_t + \delta_k)K_t. \tag{A.2}$$

which yields the following first-order conditions:

$$r_t = \alpha \left(\frac{K_t}{N_t}\right)^{\alpha - 1} - \delta_k \tag{A.3}$$

$$w_t = (1 - \alpha)\left(\frac{K_t}{N_t}\right)^{\alpha} \tag{A.4}$$

In the partial equilibrium setting with an exogenously given and fixed r^*, we recover K_t/N_t via equation (A.3) and, thus, use equation (A.4) to determine the associated fixed wage rate w^*.

B.2 Reduction of the State Space

We can start by reducing the size of the agents' labor supply history $\tilde{\mathbf{n}}$. Given that the UI program needs to keep track of how many periods the agent has been working, the effective time span needed in the state space at any period t is completely determined by the minimum tenure requirement μ_t. Hence, the agent satisfies this requirement if, at any period t, $n_\ell = 1$ for all $\ell \in \{t - \mu_t - 1, ..., t-1\}$. Let $\bar{n}_t \in \{0, \ldots, \mu_t\}$ denote the number of periods the worker has been working during her relevant labor supply history $\{n_\ell\}_{\ell=t-\mu_t-1}^{t-\mu_t}$. Hence, we can update $\bar{n}$ with the following law of motion

$$\bar{n}_{t+1} = (\bar{n}_t + 1)\mathbb{1}_{\{n_t=1\}} \tag{A.5}$$

where the notation $\mathbb{1}$ stands for the indicator function, which also takes into account the fact that the worker loses all of her labor history points whenever $n_t = 0$.

Analogously, define $\bar{m} \in \{0, \ldots, \mu_t\}$ as the number of periods the worker has been receiving benefits during her relevant UI recipiency history, $\{m_\ell\}_{\ell=t-\mu_b-1}^{t-\mu_b}$. We can then compute the next period's benefit eligibility in terms of periods received using the following law of motion:

$$\bar{m}_{t+1} = (\bar{m}_t + 1)\mathbb{1}_{\{\bar{m}_t \leq \mu_b\}} \tag{A.6}$$

With the variables introduced above, we then have collapsed all of the relevant information from $(\tilde{\mathbf{n}}, \tilde{\mathbf{m}})$ into $(\bar{n}, \bar{m})$.

In order to tackle the reduction in the dimensionality of the agents' labor income history $\tilde{\mathbf{y}}$, we construct the variable $\bar{y} \in \mathbb{R}_{++}$. It captures the average labor income history of an agent who has worked for t consecutive periods:

$$\bar{y}_t = \begin{cases} \sum_{i=1}^{t} \frac{y_i}{t}, \text{ if } t \leq \mu_t \\ \sum_{i=1}^{t-\mu_t} y_{\mu_t+i} \frac{\mu_t^{t-\mu_t} - i}{(\mu_t+1)^{t-\mu_t-i+1}} + \frac{\mu_t^{t-\mu_t}}{(\mu_t+1)^{t-\mu_t+1}} \sum_{i=1}^{\mu_t} \frac{y_i}{\mu_t}, \text{ o.w.} \end{cases} \tag{A.7}$$

which can be updated recursively as

$$\bar{y}_{t+1} = wz_t \frac{1}{t+1} + \bar{y}_t \frac{t}{t+1} \tag{A.8}$$

With this summary statistic, we can implement a reduction in the state space of the labor income history from $\tilde{\mathbf{y}}$ to $\bar{y}$.

The set $\{\bar{n} = \mu_t\} \cap \{\bar{m} \leq \mu_b\} \cap \{\bar{y} \geq z_{min}\}$ is thus able to fully determine whether the agent satisfies all requirements to receive UI benefits at a given period and we can then define an indicator function $\mathbb{1}$ over it. This allows us to write a proper algebraic characterization of the formula for the UI benefits $b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})$ as it is implemented in the quantitative solution of the model:

$$b^{UI}(\bar{n}, \bar{m}, \bar{y}) = \theta \, \bar{y} \, \mathbb{1}_{\{\bar{n}=\mu_t\} \cap \{\bar{m} \leq \mu_b\} \cap \{\bar{y} \geq z_{min}\}} \tag{A.9}$$

It is important to notice that, following US tax regulations, the benefits are subject to income taxation. The law of motion takes into account that $\bar{y}_{t+1}$ will be the last relevant earnings level before the worker enters a UI spell, as mentioned in problem (9).

Finally, in order to computationally solve our model, it is possible to further collapse a part of the reduced the state space into one single variable that contains all the relevant information in $(\bar{n}, \bar{m})$. If we take into account that a worker only accrues counts of $\bar{n}$ whenever she is not accruing counts of $\bar{m}$, and vice-versa, we can define a variable $j \in \{1, \ldots, N_c\}$, where $N_c = \mu_t + \mu_b$, that summarizes all possible cases of "points" accrued toward benefits.

B.3 Partial Equilibrium

Agents are heterogeneous at each point in time in the state $s \in S$. The agents' distribution among the states s is described by a measure of probability Φ defined on subsets of the state space S. Let $(S, \mathcal{B}(S), \Phi)$ be a space of probability, where $\mathcal{B}(S)$ is the Borel σ-algebra on S. For each $\omega \subset \mathcal{B}(S)$, $\Phi(\omega)$ denotes the fraction of agents who are in ω. There is a transition function $M(s, \omega)$ that governs the movement over the state space from time t to time $t+1$ and that depends on the invariant probability distribution $\Pi(z)$ and on the decision rules obtained from the household's problem. We define such distributional shares as stationary when $\Phi_{t+1} = \Phi_t = \Phi$.

The definition below stands for a stationary partial equilibrium and we omit the arguments of the distribution for notational convenience. Furthermore, for expositional purposes, the definition is written using the notation associated with the full state space as initially defined in the description of the model.

Definition 1 (Stationary Recursive Partial Equilibrium)**.** *Given a UI program $\{\theta, z_{min}, \mu_t, \mu_b\}$, a tax τ, and exogenous prices $\{r^*, w^*\}$, a stationary partial equilibrium for this economy is an allocation of value function v, policy functions, production plans for the firm $\{K, N\}$, residual expenditure G, and universal transfer T_u, such that:*

1. *Given prices $\{r^*, w^*\}$, the UI program, fiscal policy, and government transfer, v solves the workers' problems in (4) to (3), and $\{c, a', n\}$ are the associated policy functions;*
2. *The individual and aggregate behaviors are consistent:*

$$K = \int_S a'(s)\, d\Phi(s), \quad N = \int_S z \cdot n(s)\, d\Phi(s)$$

3. *The government's budget constraint is satisfied:*

$$G + T_u + \int_S b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})\, d\Phi(s) =$$
$$\tau \left(r^* \int_S a_t'(s)\, d\Phi(s) + w^* \int_S z \cdot n(s)\, d\Phi(s) + \int_S b^{UI}(\tilde{\mathbf{n}}, \tilde{\mathbf{y}}, \tilde{\mathbf{m}})\, d\Phi(s) \right)$$

4. *Given the decision rules, Φ satisfies:*

$$\Phi(\omega) = \int_S M(s,\omega) d\Phi, \ \forall \omega \subset \mathcal{B}(S)$$

where $M : (S, \mathcal{B}(S)) \to (S, \mathcal{B}(S))$, *can be written as follows:*

$$M(s,\omega) = \begin{cases} \pi_{z,z'}\ , \ \ \textit{if} \ \ a'(s) \in \mathcal{A}, \ \tilde{\mathbf{n}}'(s) \in \mathcal{N}^t, \ \tilde{\mathbf{y}}'(s) \in \mathcal{Y}^t, \ \tilde{\mathbf{m}}'(s) \in \mathcal{M}^t \\ 0\ , \textit{ otherwise.} \end{cases}$$

C Robustness of the Empirical Analysis

The main takeaway from the empirical section is that the monetary requirement reduces the number of workers in part-time jobs and employer-to-employer transitions, while the tenure requirement increases them. In this section, we show that this conclusion is robust across several tests, including controls for aggregate shocks and other policy variables, adding or removing individual controls, using alternative functional forms, applying county discontinuity, and excluding highly interconnected commuting zones.

C.1 Aggregate Shocks.

The estimated effect of UI requirements could be biased if changes in these requirements correlate with state-specific shocks. To address this concern, we demonstrate in this section that our results remain consistent when controlling for lagged aggregate outcomes and shocks to neighboring states. Table A.2 replicates the main regressions, adding the lagged left-hand side variable aggregated at the state level as a control. If aggregate state-specific shocks correlated over time were influencing the results, we would expect significant changes when accounting for these lagged outcomes. However, the results in Table A.2 remain unchanged.

Table A.2: Effect of UI requirements on the labor market with aggregate lags as controls

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0220***	-0.0171***	-0.0648***	-0.0525***
	(0.00350)	(0.00282)	(0.0110)	(0.00940)
$\mathbb{I}$ {Tenure Req.}	-0.0596***	-0.00263	0.0124**	0.0760***
	(0.00526)	(0.00428)	(0.00476)	(0.0139)
N	128015	128015	117935	116070
R^2	0.050	0.025	0.095	0.057

Notes: This table shows the estimated parameters of model (1) adding as control the lagged average of the left-hand side variable at the MSA-MSA-state level. Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. As controls each regression contains the lagged average of the left-hand side at the MSA-state level on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

The main identification concern is that changes in UI requirements may correlate with state-specific shocks, potentially biasing our estimates. Inspired by Blanchard and Katz (1992), Mian and Sufi (2014), and Autor et al. (2013), we address this by controlling for a Bartik shock that captures local exposure to broader national shocks. If our results were driven by bias due to correlation with aggregate shocks, controlling for the Bartik shock would be expected to alter our conclusions.

The Bartik shock is defined as

$$\tilde{y}_{s,t} = g_{-s,t} \times \bar{y}_{s,t-1} \tag{A.10}$$

where $\bar{y}_{s,t-1}$ is the average of the left-hand side variable of interest at the state-level in $t-1$, such as the unemployment rate or share of part-time workers, and $g_{-s,t}$ is the average growth rate of the left-hand side variable in all states except s.

Table A.3 presents the main results with controls for labor market shocks. The findings remain consistent: the monetary requirement reduces the number of workers in part-time jobs and employer-to-employer transitions, while the tenure requirement increases them.

Table A.3: Effect of UI requirements on the labor market controlling for labor market shocks

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0239***	-0.00729***	-0.0984***	-0.0539***
	(0.00250)	(0.00201)	(0.00237)	(0.00438)
$\mathbb{I}$ {Tenure Req.}	-0.0649***	-0.00301	0.0231***	0.0501***
	(0.00498)	(0.00382)	(0.00456)	(0.00736)
N	129428	129428	119257	117412
R^2	0.051	0.026	0.096	0.058

Notes: This table shows the estimated parameters of model (1) adding as control variable (A.10). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. As controls each regression contains (A.10) on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

Since the identification of the parameter of interest relies on comparisons between neighboring regions following the change in requirements, the parameter would be biased if changes in UI requirements correlate with shocks in neighboring states. To deal with that, we add as control to specification (1) the average of variable $y_{i,m,s,b,t}$ among individuals on the same MSA but the other side of the state border:

$$\bar{y}_{m,s,b,t} = \frac{\sum_{i',s' \neq s} y_{i',m,s',b,t}}{N_{m,s,b,t}} \tag{A.11}$$

where the summation is over i' and s'. $N_{m,s,b,t}$ is the number of observations. Table A.4 shows the results of controlling for shocks to neighboring states, which are similar to the baseline results.

Table A.4: Effect of UI requirements on the labor market with aggregate lags as controls

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}\{$Monetary Req.$\}$	-0.0136***	-0.0282***	-0.127***	-0.0332***
	(0.00211)	(0.000905)	(0.00162)	(0.00463)
$\mathbb{I}\{$Tenure Req.$\}$	-0.0296***	-0.000418	0.00293	0.0915***
	(0.00555)	(0.00377)	(0.00258)	(0.00813)
N	136617	136617	126019	123643
R^2	0.053	0.028	0.099	0.060

Notes: This table shows the estimated parameters of model (1) adding as control variable (A.11). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI in the current year, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job in the current year, and $\#Employers$ is the number of employers the worker had in the current year. As controls each regression contains (A.11) on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

To address the potential bias from states with UI policy reforms being overrepresented in specific industries (or occupations) where industry (or occupation) shocks may correlate with UI reforms, Table A.10 includes controls for occupation-year and sector-year fixed effects. The results remain robust, and the conclusions are unchanged.

In conclusion, controlling for lagged aggregate outcomes, local exposure to aggregate shocks, shocks to neighboring regions, or sector and occupational shocks does not alter our main results. These findings support the robustness of our conclusions, indicating that they are not driven by aggregate shocks correlated with changes in UI requirements.

C.2 Other Policy Variables

If UI requirements correlate with other policy reforms, the estimates in Table 1 may be biased, capturing not only the effects of UI requirements but also those of other correlated policies that vary at state borders. To address this, Table A.5 simultaneously controls for the log of the minimum wage, each state's expenditure share on cash transfers, and tax revenue. Table A.6 adds controls for the UI replacement rate and benefit duration, and Table A.7 excludes periods with extended UI benefits triggered by economic crises. Across all specifications, the results remain consistent: the monetary requirement reduces the number of part-time workers, while the tenure requirement increases employer-to-employer transitions. Although with larger standard errors, it is also true that the tenure requirement increases the number of part-time workers, while the monetary requirement decreases employer-to-employer transitions.

Table A.5: Effect of UI requirements on the labor market controlling for other state policies

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.00710	-0.0211***	-0.121***	-0.0169
	(0.00891)	(0.00361)	(0.0112)	(0.0148)
$\mathbb{I}$ {Tenure Req.}	0.0232***	0.0336***	0.0127	0.0834***
	(0.00683)	(0.00294)	(0.0107)	(0.0123)
N	91306	91306	85301	87162
R^2	0.048	0.026	0.095	0.060

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. As controls each regression include the log minimum wage, the expenditure share with cash transfers of each state, and the tax revenue on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

Table A.6: Effect of UI requirements on the labor market controlling for UI replacement ratio, benefit duration, and other state policies

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0386***	-0.00930*	-0.0622***	0.0118
	(0.0104)	(0.00492)	(0.0118)	(0.0210)
$\mathbb{I}$ {Tenure Req.}	-0.0221**	0.0514***	0.0838***	0.142***
	(0.00866)	(0.00362)	(0.0106)	(0.0195)
N	71825	71825	66978	68435
R^2	0.045	0.020	0.091	0.055

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS and UI requirement data are hand collected from USDOL reports. The sample is from 1963 to 2016, varying according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. As controls each regression include the UI replacement rate, the benefit duration, the log minimum wage, the expenditure share with cash transfers of each state, and the tax revenue on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

Table A.7: Effect of UI requirements on the labor market removing extended UI benefits during crises

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0161***	-0.0200***	-0.113***	-0.0327***
	(0.00195)	(0.00130)	(0.00137)	(0.00425)
$\mathbb{I}$ {Tenure Req.}	-0.0536***	-0.00326	0.0160***	0.0902***
	(0.00840)	(0.00369)	(0.00418)	(0.00862)
N	121306	121306	111905	109575
R^2	0.050	0.026	0.097	0.058

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. We drop from the analysis state-year pairs with extended UI benefit. Standard errors are clustered at the MSA level. See details in Appendix A.

C.2.1 Controls

In this section, we demonstrate that the results are robust to the inclusion or exclusion of individual controls. Table A.8 presents the main regressions with all individual controls removed, while Table A.9 includes occupation and sector fixed effects among the controls. For the sector and occupation fixed effects we use the three digits Census classification. In Table A.10, we control for sector-year and occupation-year fixed effects. Across all specifications, we continue to find that the monetary requirement reduces the number of workers in part-time jobs and employer-to-employer transitions, while the tenure requirement increases them.

Table A.8: Effect of UI requirements on the labor market without any control

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}\{\text{Monetary Req.}\}$	-0.0218***	-0.0272***	-0.147***	-0.0440***
	(0.00201)	(0.000988)	(0.000645)	(0.00579)
$\mathbb{I}\{\text{Tenure Req.}\}$	-0.0467***	-0.00305	0.0287***	0.0876***
	(0.00718)	(0.00420)	(0.00235)	(0.00791)
N	136617	136617	126019	123643
R^2	0.017	0.023	0.019	0.014

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. The regression doesn't contain any control other than the fixed effects. Standard errors are clustered at the MSA level. See details in Appendix A.

Table A.9: Effect of UI requirements on the labor market controlling for sector and occupation

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0224***	-0.0288***	-0.145***	-0.0414***
	(0.00730)	(0.00545)	(0.00461)	(0.00990)
$\mathbb{I}$ {Tenure Req.}	-0.0421***	0.00396	0.0195***	0.0916***
	(0.0144)	(0.00864)	(0.00550)	(0.0117)
N	132866	132866	122265	123636
R^2	0.159	0.049	0.210	0.075

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. The controls are 3-digits occupation fixed effects, 3-digits sector fixed effects. Standard errors are clustered at the MSA level. See details in Appendix A.

Table A.10: Effect of UI requirements on the labor market controlling for sector-year and occupation-year fixed effects

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}$ {Monetary Req.}	-0.0161	-0.0257**	-0.141***	-0.0650**
	(0.0120)	(0.0109)	(0.0130)	(0.0243)
$\mathbb{I}$ {Tenure Req.}	-0.0339***	0.00294	0.0668***	0.0569**
	(0.0120)	(0.00633)	(0.00723)	(0.0213)
N	131115	131115	120512	122103
R^2	0.300	0.215	0.344	0.238

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. As controls each regression contains occupation-year and sector-year fixed effects on top of the baseline controls. Standard errors are clustered at the MSA level. See details in Appendix A.

C.3 Alternative Functional Forms

In this section, we focus on marginal changes in UI requirements rather than the introduction of new requirements. Marginal changes often yield smaller and less precise estimates. They represent minor and less salient adjustments to existing policies rather than significant shifts. Consequently, they tend to elicit less pronounced responses from individuals.

Table A.11 presents the main estimates. We observe weaker effects of UI requirements on unemployment and UI recipiency rates. However, we still find that the tenure requirement increases the share of part-time workers and the number of employer-to-employer transitions, while the monetary requirement decreases the share of part-time workers.

Table A.11: Effect of log UI requirements on the labor market

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
log (Monetary Req.)	0.00856	0.00152	-0.00975*	0.00107
	(0.00537)	(0.00253)	(0.00539)	(0.0101)
log (Tenure Req.)	-0.0159***	-0.000129	0.00589***	0.0391***
	(0.00226)	(0.00140)	(0.00119)	(0.00606)
N	136617	136617	126019	123643
R^2	0.051	0.026	0.097	0.058

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS, and UI requirement data are hand collected from reports of the US Department of Labor. The sample is from 1963 to 2016 and the number of observations varies according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and *#Employers* is the number of different employers the worker had in the current year. *Monetary Req* is the monetary requirement in weekly earnings and *Tenure Req* is the tenure requirement in weeks. Standard errors are clustered at the MSA level. See details in Appendix A.

C.4 County Discontinuity and Marginal Variation in Requirements

A worker's county is available in the CPS only from 1996 onward. However, since there were no new monetary requirements introduced after 1996 and only a few states implemented tenure requirements, we are unable to use county-level border discontinuity to identify the effect of UI requirement introductions on the labor market.

To study if our results are robust at the county-level border discontinuity, we exploit the marginal variation in the tenure and monetary requirements after 1996. Due to the smaller variation in requirements in this period, we expect standard errors to be larger. Table A.12 displays the estimated effect of UI requirements using county-level state border discontinuities. The main takeaway is still that the monetary requirement reduces the number of workers in part-time jobs and employer-to-employer transitions, while the tenure requirement increases them, albeit standard errors are larger.

Table A.12: Effect of UI requirements on the labor market using county discontinuities

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
log (Monetary Req.)	0.00395	-0.00159	-0.0444**	-0.0365***
	(0.719)	(0.799)	(0.014)	(0.006)
log (Tenure Req.)	-0.00618	0.0116**	0.0288*	0.00434
	(0.509)	(0.015)	(0.076)	(0.723)
N	108310	108310	98034	100761
R^2	0.048	0.025	0.087	0.042

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS and UI requirement data are hand collected from USDOL reports. The sample is from 1996 to 2016, varying according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. Standard errors are clustered at the county level.

C.5 Dropping highly interconnected commuting zones

If individuals respond to UI requirements by commuting to another state to work, the estimated effects could be biased due to compositional changes in the pool of workers. To assess this possibility, we exclude from the analysis the top quartile of the most interconnected border pairs.[16] We define interconnectedness between MSA-state pairs by the share of workers commuting between the two MSA-state pairs. If commuting significantly impacts the results, dropping these highly connected regions should yield noticeable changes. However, as shown in Table A.13, this is not the case, and we still conclude that the monetary requirement reduces the number of workers in part-time jobs and employer-to-employer transitions, while the tenure requirement increases them, albeit standard errors are larger due to smaller sample.

Table A.13: Effect of UI requirements on the labor market using county and MSA discontinuities

	(1) $\mathbb{I}\{Unemployed\}$	(2) $\mathbb{I}\{Unemp\ Benefit\}$	(3) $\mathbb{I}\{Part\ Time\}$	(4) $\#\ Employers$
$\mathbb{I}\{\text{Monetary Req.}\}$	-0.0151***	-0.0277***	-0.123***	-0.0331***
	(0.00437)	(0.00214)	(0.00108)	(0.00464)
$\mathbb{I}\{\text{Tenure Req.}\}$	-0.0362**	0.00232	0.0148***	0.0920***
	(0.0176)	(0.00936)	(0.00299)	(0.00814)
N	98961	98961	91558	91551
R^2	0.053	0.027	0.096	0.059

Notes: This table shows the estimated parameters of model (1). Labor data are from the CPS and UI requirement data are hand collected from USDOL reports. The sample is from 1996 to 2016, varying according to variable availability. $\mathbb{I}\{Unemployed\}$ is a dummy taking a value of one if the worker is unemployed, $\mathbb{I}\{UnempBenefit\}$ is a dummy taking a value of one if the worker received UI, $\mathbb{I}\{PartTime\}$ is a dummy taking one if the worker worked at a part-time job, and $\#Employers$ is the number of different employers the worker had in the current year. Standard errors are clustered at the MSA level.

D Robustness of the Model

D.1 Change in Employment Probabilities - Partial Equilibrium

In this robustness exercise we show the change in key model statistics when conducting a 10 percent reduction and increase in the parameters of the probability of a job offer and

[16] Unfortunately, no dataset records where individuals worked going back to 1963. To calculate interconnectedness within MSA across states we average the share of workers moving to the other state in each side of the MSA between 2001 and 2022 using data from the CPS.

the probability of losing a job, p_e and p_u, respectively. In Table A.14 we conduct these changes in our benchmark economy in partial equilibrium to measure the movement in the aggregates relative to the ones of the calibrated benchmark. We can observe that, as expected, our calibration targets are highly sensitive to the initially calibrated values of p_e and p_u.

Given how the probabilities affect the entire transition matrix of the productivity process, including the zero productivity and super-star states, the model requires the joint calibration of the probabilities with the other parameters of our model in order to properly match the targets. This highlights the key role of the unemployment friction, especially when moving in and out of the unemployed state, created by our augmented productivity process.

Table A.14: Comparison of model statistics for different employment probabilities.

Variable	**Benchmark**	$\mathbf{0.9 * p_e}$	$\mathbf{1.1 * p_e}$	$\mathbf{0.9 * p_u}$	$\mathbf{1.1 * p_u}$
Duration UI	100	102.9	102.9	102.9	104.6
Job Destruction	100	143.6	69.2	116.6	117.2
Beneficiaries	100	70.8	58.3	62.9	69.0
Share Exhausting UI	100	113.0	124.4	116.1	117.3

Notes: The table shows model-generated statistics. The results are generated in partial equilibrium and without recalibration. The column "Benchmark" shows the normalized reference; the column "$0.9 * p_e$" shows the results for the model with 90 percent of the calibrated value for the probability p_e. All other columns are analogous.

D.2 Change in Employment Probabilities - Optimal Requirements

In the next robustness check for the model, we repeat the 10 percent changes in p_e and p_u, exactly as done in the previous exercise but for the calculation of the optimal unemployment insurance requirements with simultaneous choice of both the tenure and the monetary requirement as shown in the last column of Table 6. Table A.15 shows that the variation in the unemployment and employment probabilities does not alter the direction of the optimal choice of requirements.

Table A.15: Comparison of optimal requirements for different employment probabilities.

Variable	**Optimal Benchmark**	**$0.9 * p_e$**	**$1.1 * p_e$**	**$0.9 * p_u$**	**$1.1 * p_u$**
Monetary Requirement	24%	37%	37%	37%	37%
Tenure Requirement	6	6	6	6	6
CEV	0.9%	1.6%	0.7%	1.0%	1.0%

Notes: The table shows model-generated statistics. The column "Optimal Benchmark" shows the results of the benchmark model; the column "$0.9 * p_e$" shows the results for the model with 90 percent of the calibrated value for the probability p_e, with other columns being analogous. The CEVs shown for all columns that are not "Optimal Benchmark" are calculated in comparison with the average welfare of the benchmark economy generated with the associated modified parameter and generated without recalibration.

D.3 General Equilibrium Effects

In this robustness check, we solve the general equilibrium version of the model economy for the benchmark calibration and policies and also for each of the optimal policies identified in partial equilibrium. We have done so following the algorithm described in Section 7.3 of the main text without recalibrating the model.

The first result we can observe in Table A.16 across all changes in UI instruments is that the general equilibrium effect shown by the change in the wage rate w is of a small magnitude. The margin that changes the most is the one captured by the UI budget as shown by the changes in the tax rate τ_{UI}.

Table A.16: Comparison of different UI requirements in general equilibrium

Variable	Bench. GE	Replacement Ratio	Benefit Duration	Monetary Requirement	Tenure Requirement	Requirements
Optimal Policies						
Replacement Ratio	46%	0.6%	46%	46%	46%	46%
Benefit Duration	24	24	12	24	24	24
Monetary Requirement	4.4%	4.4%	4.4%	24%	4.4%	24%
Tenure Requirement	24	24	24	24	6	6
Statistics GE						
CEV	-	0.4%	0.3%	0.9%	-0.02%	1.1%
w	4.12	4.12	4.12	4.14	4.12	4.16
τ_{UI}	3.0%	2.2%	2.6%	2.7%	3.1%	3.0%
Expenditure/GDP	0.6%	0.0%	0.4%	0.5%	0.7%	0.7%
Benef.	1.1%	1.0%	0.7%	0.2%	1.2%	0.2%

Notes: The table displays the computed results for the general equilibrium economy at the optimal policies. The top part of the table repeats the optimal policies found in partial equilibrium steady-state analysis shown in Table 6. The bottom part of the table shows the statistics calculated after solving for the general equilibrium at such policies. The benefit duration and the tenure requirements are denoted in weeks. The monetary requirement is in percentage of six-week average earnings. The expenditure/GDP is shown net of added UI revenue. The CEVs shown for all columns are calculated in comparison with the average welfare of the benchmark economy generated in general equilibrium and without recalibration.

Since these characteristics were already present in our analysis with the partial equilibrium concept, we are able to conclude that the extension to a general equilibrium setting does not bring much relative difference at the aggregate level. Moreover, we can observe that the effect of the change in the instruments is straightforward in terms of the UI budget, as less expansionary policy options, such as a lower replacement rate θ, induce the system to require a smaller τ_{UI}. Finally, we can observe that the relative improvement in terms of welfare is preserved in a similar way as shown in our optimality analysis in Table 6. The result that the increase in the monetary requirement has the highest gradient is preserved.

D.4 Transitional Dynamics

In this robustness check, we solve for the transition path of τ_{UI}, clearing the government budget constraint period-by-period in the partial equilibrium fashion described in the main text. We show results for a path of 100 periods. Due to the partial equilibrium nature of the exercise with both prices fixed, the convergence in τ_{UI} is slow. The results do not change substantially with added periods. For the immediate transition between the initial steady-state and the enacted period of the transition, whenever workers are moving to a policy in which the size of the state-space changes and/or they immediately lose benefits - all of them except the change in the replacement ratio - we calculate welfare applying a rule where we allow for the most generous UI recipiency reassignment.

Table A.17: Optimal policies and statistics at $t = 1$ for each of the UI program instruments

	Benchmark	Replacement Ratio	Benefit Duration	Monetary Requirement	Tenure Requirement	Requirements
Optimal Policies						
Replacement Ratio	46%	0.6%	46%	46%	46%	46%
Benefit Duration	24	24	12	24	24	24
Monetary Requirement	4.4%	4.4%	4.4%	24%	4.4%	24%
Tenure Requirement	24	24	24	24	6	6
Statistics at $t = 1$						
CEV	0	0.12%	0.09%	0.03%	-0.03%	0.02%
τ_{UI}	0	-0.7%	-0.3%	-0.2%	0.2%	-0.02%
Expenditure/GDP	0.9%	0.0%	0.6%	0.7%	1.1%	0.9%
Beneficiaries	1.1%	1.1%	0.7%	0.3%	1.2%	0.4%

Notes: The table displays the computed results for the transitional dynamics to the optimal policies. The top part of the table repeats the optimal policies found in partial equilibrium steady-state analysis shown in Table 6. The bottom part of the table shows the statistics calculated at the initial period of the transition to the optimal policies. The benefit duration and the tenure requirements are denoted in weeks. The monetary requirement is in percentage of six-week average earnings. The expenditure/GDP is shown net of added UI revenue.

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