Unemployment Insurance and Macro-Financial (In)Stability*

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Abstract

Do unemployment insurance (UI) policies always stabilize the macroeconomy? This paper highlights a key trade-off between two opposing channels. Ex post, UI acts as a liquidity provider by offering income support that sustains consumption among the unemployed during downturns. Ex ante, however, more generous UI alters the balance sheets of households and banks in ways that heighten systemic vulnerability. On the household side, more generous UI reduces precautionary savings and increases household mortgage debt. On the banking side, higher mortgage debt raises the share of long-term assets on bank balance sheets. These shifts increase the vulnerability of households and banks to adverse aggregate shocks. We quantify these mechanisms using a quantitative heterogeneous-agent general equilibrium model with housing and banking sectors and provide loan- and county-level empirical evidence from U.S. housing and mortgage markets.

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1 Introduction

Automatic stabilizers are fiscal policies, such as progressive taxes and means-tested transfers, that automatically adjust to economic conditions, cushioning household income and consumption without new legislative action. Unemployment insurance (UI) is a textbook example of such a policy. The predominant view holds that UI stabilizes economic downturns through an ex-post liquidity channel: it provides a direct cash-flow injection to households who have lost their jobs. This support reduces income risk and reallocates resources toward households with high marginal propensities to consume (MPC), thereby cushioning household consumption and stimulating aggregate demand in a downturn.[1]

In this paper, we argue that focusing exclusively on this ex-post channel misses an equally important ex-ante balance sheet channel that can offset or even reverse the stabilizing effects of UI. First, on the household side, the promise of a stronger safety net compresses left-tail income risk, which households internalize ex-ante. This reduces their motive for precautionary savings (liquid assets) and allows them to increase mortgage borrowing and household leverage. Second, the decline in left-tail income risk reduces households' default risk, hence induces banks to loosen credit terms and expand mortgage lending, increasing the share of long-term assets (mortgages), with high loan-to-income ratios, on their balance sheets.

These ex-ante shifts leave both household and bank balance sheets more exposed to adverse aggregate shocks. When a downturn hits, the negative consequences of this heightened vulnerability, driven by the majority of households (i.e., employed households) who are now more leveraged but receive no UI benefits, can overturn the positive ex-post liquidity effects for the minority of households (i.e., unemployed households). Consequently, downturns can be deeper, with larger drops in output and consumption, despite the cushioning effects of UI transfers for a fraction of the population.

[1] See, for example, Brown (1955), Blinder (1975), McKay and Reis (2016), and McKay and Reis (2021) for earlier and more recent discussions of these mechanisms.

We quantify these channels in a quantitative heterogeneous-agent general equilibrium model and corroborate them with household- and county-level empirical evidence from U.S. housing and mortgage markets. Our model combines (i) households, with an overlapping-generations structure, who face idiosyncratic income and unemployment risks under incomplete markets and make housing and mortgage decisions; (ii) banks that issue short-term loans to firms and long-term mortgages to households, and are subject to capital constraints; (iii) firms that produce output using capital and labor but must finance a portion of their working capital through short-term bank loans; (iv) real estate companies that own a part of the housing stock and rent it to households; and (v) the government that manages the UI policy.

Households can default on their mortgages at any time. Mortgage contracts internalize the default risk: terms are borrower-specific, and borrowing limits arise endogenously from limited commitment by households. Consequently, higher UI reduces default risk, ceteris paribus, allowing households to access better credit terms and leading to increased borrowing.

Banks extend short-term risk-free loans to firms and long-term defaultable mortgages to households. They finance these assets with bank equity and short-term borrowing. We assume bankers can default and retain a fraction of assets.[2] To preclude such behavior in equilibrium, bank creditors condition their funding on bank equity. Hence, bank credit supply is equity-dependent: any losses in bank balance sheets reduce credit supply, raise the equilibrium bank lending rate, and thereby increase borrowing costs for both households and firms.

To quantify the importance of the balance sheet channel, we calibrate the steady state of the model to match pre-1998 U.S. data moments, importantly those regarding household and bank balance sheets, unemployment risk by earnings, and aggregate macro moments. We first analyze the steady-state effects of more generous UI. Raising the UI replacement rate from 20 to 60 percent increases the mortgage-debt-to-GDP ratio from 44.7 to 58.9 percent and lowers

[2] See Gertler and Kiyotaki (2015).

the average down payment from 7.3 to 6.5 percent. The share of mortgages in bank assets rises from 37.9 to 44.6 percent. Average household financial assets fall by 1.4 percent, but this masks distributional effects: the impact is concentrated among low-asset households, and the share of "hand-to-mouth" households (with little or no liquid savings) climbs significantly, from 6 to 13 percent.

In the steady state, UI delivers its insurance role for the unemployed: despite their higher leverage, the unemployed enjoy higher consumption and fewer foreclosures under more generous UI systems. By contrast, employed households are more leveraged, receive no UI benefits, and face higher taxes to fund the program, leaving them worse off. This employed–unemployed asymmetry is central to understanding why, when aggregate shocks hit, UI can ultimately contribute to instability rather than dampen it.

To study how UI shapes economic dynamics over booms and busts, we introduce two unanticipated, permanent shocks to the exogenous bank borrowing rate. First, starting from the initial steady state, a boom begins with the rate declining from 1997 through 2006 and is expected to remain low thereafter. Second, in 2008, the bust starts when the bank borrowing rate unexpectedly and permanently reverts to its initial steady-state level.[3] To capture UI's stabilizing role, we add an unemployment shock in 2008 that declines linearly through 2013, mirroring the U.S. experience around 2008.[4] These shocks generate a boom-bust in the housing market and the broader economy similar to the U.S. experience. During the boom, the equilibrium bank lending rate gradually falls in parallel with bank funding costs. Lower borrowing costs stimulate mortgage borrowing and housing demand among households, leading to higher house prices. Lower borrowing costs also reduce cost of labor, resulting in an increase in labor demand. This raises labor income and output, amplifying the

[3]We use shocks to the bank borrowing rate as the driver of the boom-bust cycle in the benchmark. However, we also show that UI's destabilizing effects arise under productivity and house price expectation shocks.

[4]We show that the destabilizing effects of UI are even larger without this unemployment shock, reinforcing our main conclusions.

initial increase in house prices. Together, rising house prices and labor income increase aggregate consumption.

During the bust, key aggregate variables fall below their initial steady-state levels, and bank capital deteriorates sharply primarily due to the decline in mortgage valuations. Since bank lending capacity is tied to equity, banks are forced to contract credit, leading to a sharp but temporary spike in the equilibrium bank lending rate. Elevated borrowing costs prompt firms to scale back employment, depressing household income. In turn, households cut consumption in response to lower income and house prices and higher borrowing costs, reinforcing the downturn.

To evaluate the (de)stabilizing role of UI, we compare the boom-bust transitions generated by the shocks above in economies with permanently different levels of UI generosity. Because household and bank balance sheets are more vulnerable to adverse shocks in more generous UI systems, owing to higher borrowing, the downturn is amplified in the bust: foreclosures and bank lending rates rise more sharply, while bank net worth, house prices, household debt, consumption, and output decline more severely.

Aggregate destabilization from UI is driven primarily by effects on the employed. Balance sheet vulnerabilities affect both employed and unemployed; however, during the bust the unemployed receive larger benefits in more generous UI regimes, whereas the employed do not. As a result, the consumption and the foreclosures of the unemployed are stabilized in the bust under more generous systems. By contrast, the employed experience larger declines in consumption and greater increases in foreclosures under more generous UI. Because the employed constitute the majority, these responses dominate the aggregate.

The weakening effects of UI on both household and bank balance sheets drive our results. On the household side, two forces matter. First, in more generous UI economies, precautionary saving is lower, so households are less able to self-insure against income losses during the bust. Second, because households in these economies enter the bust with a higher leverage, a given decline in house prices produces a larger negative wealth effect. On the banking side, a higher share of mortgages on bank balance sheets and higher mortgage debt-to-income (DTI) ratios in higher UI economies make banks more vulnerable to adverse shocks for two reasons. Because mortgages are long-term assets, their market value falls when the equilibrium bank lending rate rises; this price effect is amplified in more generous UI systems since the fraction of mortgages is higher in bank balance sheets. In addition, higher mortgage DTI ratios increase banks' exposure to foreclosure losses when a negative shock reduces house prices and income. Consequently, bank net worth declines more during the bust in more generous UI economies, prompting a sharper contraction in credit supply and a larger jump in the equilibrium bank lending rate. Borrowing costs rise more for both households and firms, deepening the recession.

To gauge the role of household and bank balance sheets, we re-run the bust experiment while shutting down the general equilibrium feedback from bank balance sheets to the bank lending rate—that is, we decouple the bank lending rate from bank equity so it does not spike when bank balance sheets deteriorate. In this counterfactual, higher UI no longer destabilizes consumption and household debt. Output and house prices still fall more, and foreclosures still rise more under more generous UI, but the effects are relatively smaller. Taken together, these results show that both household and bank balance sheets are essential to UI's destabilizing impact.

The central role of the general equilibrium feedback from bank balance sheets to the bank lending rate in amplifying UI's destabilizing effects implies that raising UI generosity nationwide creates a systemic vulnerability in the U.S. banking system.[5] By contrast, when a single state raises UI, it does not generate a system-wide risk in the banking system. Accordingly, empirical strategies that rely on cross-state variation in UI may underestimate (overestimate) the destabilizing (stabilizing) effects of UI because they do not capture the systemic

[5] This distinction between a local and a national policy change highlights a critical challenge when extrapolating from regional studies to aggregate outcomes, often referred to as the "missing intercept" problem (Moll and Hanney (2025)). This issue is part of a broader literature examining the limitations of using cross-sectional variation to answer macroeconomic questions (e.g., Nakamura and Steinsson (2014), Chodorow-Reich (2020), and Guren et al. (2021)).

risk induced by a nationwide increase in UI generosity.[6]

The destabilizing effects of UI that we find are not an a-priori unambiguous outcome. Indeed, we find that unexpected and temporary increases in UI stabilize downturns. By contrast, permanent differences in UI reshape household and bank balance sheets in ways that heighten vulnerability to adverse shocks, ultimately outweighing UI's direct stabilizing effects.

In the second part of the paper, we provide empirical support for our model's predictions. We exploit cross-state heterogeneity in UI generosity—arising from states' discretion over benefit levels—and combine it with detailed U.S. housing and mortgage market data.

Our first empirical finding is that greater UI generosity, measured by the maximum potential benefit amount, is associated with larger mortgage amounts and lower mortgage rates. Using loan-level CoreLogic data, we find that as UI generosity increases by 10 percent, mortgage origination amounts increase by about 1.69 percent and mortgage rates decline by roughly 5 basis points, conditioning on county and year fixed effects and a battery of county- and state-level controls. To account for lender heterogeneity, we turn to HMDA data and estimate specifications with bank and bank-by-year fixed effects, yielding similar elasticities for mortgage amounts.[7]

To identify the causal effect of UI on mortgage terms, we exploit Missouri's unexpected 2011 cut in UI benefit duration: the maximum UI duration fell from 73 to 57 weeks (about a 20 percent decline) (Johnston and Mas, 2018; Karahan, Mitman and Moore, 2019). As documented by Johnston and Mas (2018), the cut was driven by a filibuster and was unrelated to contemporaneous economic conditions in Missouri, providing a plausibly exogenous shock to UI generosity. We implement a border-county difference-in-differences design, comparing Missouri counties neighboring another state with adjacent counties just across the border. Supporting the parallel pre-trends assumption, counties

[6] Cross-state designs capture the effect of higher UI on bank balance sheets to the extent that banks operate locally and households and firms borrow significantly from local lenders.

[7] HMDA data do not report interest rates during our sample period.

in Missouri do not differ from the control counties prior to the cut. Yet, after the cut in UI, Missouri county mortgage amounts fall by 2 percent and interest rates rise by 4 basis points, demonstrating a causal impact of UI on mortgage terms.

After establishing UI's effect on balance sheets, we test the model's prediction that UI policies may amplify housing downturns rather than stabilize them, acknowledging that our estimates, which rely on cross-state variation, do not fully capture the bank balance sheet channel and should be interpreted as lower bounds. Using the Global Financial Crisis (GFC) as the adverse shock, we examine mortgage credit volume, foreclosure rates, and house prices. To control for confounding factors, we again implement a state-border discontinuity design, comparing adjacent counties that straddle state lines. We find that counties with 10 percent more generous UI as of late 1990s experienced, in the post-GFC period, a 6.7 percent higher foreclosure rate, a 1-percentage point larger decline in mortgage volume, and a 1.8-percentage point larger decline in house prices relative to their cross-border counterparts. Overall, these results indicate that UI benefits might fail to operate as automatic stabilizers.

Related Literature: There is ample evidence that supports the balance sheet channels that we highlight in this paper. Mian and Sufi (2010) and Mian, Rao and Sufi (2013) show that U.S. counties with higher household leverage as of 2006 experienced a deeper 2007–09 recession. Kaplan and Violante (2014) highlight the importance of "hand-to-mouth" consumers for the response of aggregate consumption to income/wealth shocks. In our model, a more generous UI increases household leverage and the fraction of hand-to-mouth households, making individual consumption more dependent on individual income, increasing the economy's response to adverse shocks. On the banking side, the role of mortgages in the Great Recession is well documented (Bernanke (2018), Gertler and Gilchrist (2018), and Brunnermeier and Reis (2023)).

Our paper contributes to the literature on the automatic stabilization effects of UI. McKay and Reis (2016, 2021) merge a standard incomplete-markets consumption model with a New Keynesian framework and show that tax-and-transfer programs reduce aggregate volatility. Di Maggio and Kermani (2016) use cross-sectional variation in UI benefit payments and show that more generous UI benefits attenuate the impact of adverse shocks on employment and consumption. Hsu, Matsa and Melzer (2018) show that more generous UI benefits smooth the housing market by lowering mortgage defaults among the unemployed. We also reproduce these stabilizing effects for the unemployed in our quantitative model.

Our departure is to shift the focus from the ex-post effects of realized UI payments on the unemployed (liquidity channel) to the ex-ante effects of UI generosity on household and bank balance sheets (balance sheet channel). We study how more generous UI in normal times raises household borrowing and shapes lenders' exposures, thereby creating a leverage-based amplification mechanism that can destabilize housing markets in downturns. Specifically, we differ from Di Maggio and Kermani (2016) and Hsu, Matsa and Melzer (2018) by emphasizing these destabilizing balance-sheet channels—operating especially through the employed, who constitute the majority and thus dominate aggregates—rather than contemporaneous responses to realized UI payments. Both our quantitative model as well as our empirical analysis reflect the balance sheet effects that are ignored in these papers. Overall, we contribute by identifying new channels that can overturn the stabilizing effects of UI and showing their importance both quantitatively and empirically. In fact, when we shut down these balance-sheet channels in the model, we confirm the stabilizing effects emphasized in the prior literature.

We also contribute to the literature that investigates the costs and benefits of UI benefits. Most studies have focused on the negative impact of UI on the labor market. While Chodorow-Reich, Coglianese and Karabarbounis (2018) report small effects, Hagedorn et al. (2013), Hagedorn, Manovskii and Mitman (2015), and Nakajima (2012) find significant adverse effects on employment. Recently, Arslan, Degerli and Kabas (2024) study the negative impact of UI on bank funding. They find that more generous UI lowers bank deposits, banks' safest and most stable funding source, reducing their lending to firms. A vast literature studies the moral hazard aspects of UI (Shavell and Weiss (1979), Hansen and Imrohoroglu (1992), Atkeson and Lucas (1995), Hopenhayn and Nicolini (1997), and Abdulkadiroglu, Kuruscu and Sahin (2002)).

We do not model job search and/or job creation, moral hazard, or bank funding choice, which have been the main mechanisms considered in these studies, and have already been shown to hinder the risk-sharing benefits or the stabilizing effects of UI. Instead, we focus on the negative effects of UI on household and bank balance sheets.

Our paper shares similarities with Hubbard, Skinner and Zeldes (1995), Athreya and Simpson (2006), and Bornstein and Indarte (2023). Consistent with our steady-state findings, Hubbard, Skinner and Zeldes (1995) find that precautionary savings decline significantly with the presence of social insurance; Athreya and Simpson (2006) find that increases in public insurance generosity might lead to more unsecured household debt; and Bornstein and Indarte (2023), leveraging zip code heterogeneity in staggered expansions of Medicaid, find that the expansion led to a significant increase in household debt. Our finding that more generous UI leads to higher mortgage debt echoes the findings in these studies. However, we go a step further and show that this leads to the destabilization of housing and mortgage markets as well as the aggregate economy in response to adverse aggregate shocks.

The mechanisms in our paper are similar to those with the financial frictions and pecuniary externalities present in Lorenzoni (2008) and Brunnermeier and Sannikov (2014). In their framework, contracts that improve risk-sharing may lead to higher leverage and amplified crises. Similarly, in our framework, higher UI benefits insure households against risk, and households respond by borrowing more for mortgages, amplifying booms and busts.

Our framework combines key elements from two strands of literature. One strand has modeled the pricing of household default risk in the mortgage market without considering its consequences on bank balance sheets.[8] Another

[8] See Jeske, Krueger and Mitman (2013), Corbae and Quintin (2015), Chatterjee and Eyigungor (2015), Arslan, Guler and Taskin (2015), Guler (2015), Hatchondo, Martinez and

strand has studied the importance of the bank balance sheet channel without taking into account the effect of household foreclosures on bank balance sheets.[9] In addition to addressing a different question from those explored in these papers, our theoretical contribution is to combine household, firm, and bank balance sheets into one framework. This approach has been employed in recent related work, such as Elenev, Landvoigt and Van Nieuwerburgh (2021), which studied optimal capital buffers on banks; and Diamond and Landvoigt (2022) and Arslan, Guler and Kuruscu (2023), who studied the drivers of the US boom-bust cycle around 2008. We differ from these studies by illustrating how unemployment insurance (UI) makes household and bank balance sheets vulnerable to shocks and could (de)stabilize the economy.

2 Quantitative Analysis

2.1 The Model

The model is composed of five sectors: (i) finitely-lived households, (ii) a continuum of identical banks, (iii) real estate companies, (iv) good-producing firms, and (v) the government. There is no aggregate uncertainty. Boom-bust transitions are generated by unexpected shocks, which are perceived as permanent. Other than the shock periods, there is perfect foresight. In this section, we provide a description of each sector. Detailed formulations of all the problems are provided in the Appendix A.

2.1.1 Households

Households live until age J, retire at age $J_r < J$, and receive utility from consumption and housing services. Households receive social security benefits during retirement. These benefits are financed through taxes on the working-age households.

Income and Unemployment Risk: Working-age households can be either employed or unemployed. When they are employed, they supply labor inelasti-

Sanchez (2015), Garriga and Hedlund (2020), Boar, Gorea and Midrigan (2021), Kaplan, Mitman and Violante (2020), and Guren, Krishnamurthy and McQuade (2021).

[9] See Mendoza and Quadrini (2010), Gertler and Kiyotaki (2010, 2015), Bianchi and Bigio (2022), and Corbae and D'Erasmo (2013, 2021).

cally. The efficiency unit of a household's labor takes the form $\exp(f(j) + z_j)$, where $f(j)$ is the life-cycle component and z_j is the stochastic component that follows an AR(1) process: $z_j = \rho z_{j-1} + \varepsilon_j$, where ε_j is the innovation (independently and identically distributed as $N(0, \sigma_\varepsilon^2)$, '$j$' is age, ρ is the persistence of the stochastic process.

In addition to the labor efficiency shocks, employed households receive age- and income-dependent unemployment shocks and unemployed households receive age-dependent job opportunities. We also assume that unemployment results in a drop of efficiency level by χ^u with a one-time downward adjustment to the stochastic component of the labor efficiency, $z_j - \chi^u$. Those households without a job opportunity stay unemployed and receive UI benefits. Following McKay and Reis (2016), we assume that UI benefits are given as a fraction of current period potential income (income that would have been earned if the household were employed). UI benefits are financed through taxes on the employed. Thus, a household's income process $y(j, z_j)$ can be summarized by

$$y(j, z_j) = \begin{cases} (1 - \tau_u - \tau_s) \exp(f(j) + z_j), & \text{if } j \leq J_r, \text{ while employed} \\ (1 - \tau_s)\, \theta \exp(f(j) + z_j) & \text{if } j \leq J_r, \text{ while unemployed} \\ y_R(z_{J_r}), & \text{if } j > J_r \end{cases} \tag{1}$$

where θ is the UI replacement rate, τ_u is the unemployment insurance tax, τ_s is the social security tax, and $y_R(z_{J_r})$ is the social security benefit that approximates the US retirement system and depends on the realization of the income shock in the last working-age period.

Household's Decisions: Households obtain housing services either by renting or owning a house. Households do not have access to unsecured borrowing, but they can finance the purchase of a house through long-term defaultable mortgages offered by banks. Banks price these mortgage contracts by taking into account the household default risk—a function of household characteristics, house value, and mortgage amount. This is one mechanism by which more generous UI benefits affect the economy: by reducing income risk, and thus default risk, UI encourages banks to offer better mortgage terms, leading to increased household borrowing.

Households are born as active renters, facing two housing tenure choices: to continue renting or purchase a house. If they continue to rent, they choose the rental size, make consumption and saving choices, and enter the next period as active renters. If they decide to purchase a house, they can finance the purchase through a mortgage contract from a set of contracts offered by the bank, make consumption and saving decisions, and begin the next period as homeowners. Mortgage origination is subject to fixed and variable costs.

Homeowners must pay δ_h fraction of the house value as the maintenance cost each period. A homeowner has four options: (i) remain a homeowner, (ii) refinance, (iii) sell, and (iv) default. Homeowners remaining in their existing house make the consumption and saving decisions after paying the maintenance cost and periodic mortgage payment, if any, given their income shock, housing, mortgage debt, and assets. Those who refinance must pay the outstanding balance on any existing debt and obtain a new mortgage. Those selling their houses are subject to a transaction cost of φ_s fraction of the selling price, must repay the outstanding mortgage debt, and choose to become an active renter or purchase a new house.

Those who default are released from their obligations to the lender. The lender seizes and sells the house, incurring a foreclosure transaction cost (φ_e of the house value, where $\varphi_e > \varphi_s$). Any remaining proceeds after covering the outstanding debt and costs are returned to the defaulter. Since defaulting is more costly than selling, a homeowner with positive home equity will choose selling over defaulting. Hence, negative equity is a necessary condition for default in the model, and defaulters receive no funds from the bank.

After defaulting, households temporarily lose access to the housing market and become inactive renters. Inactive renters regain access with an exogenous probability π. Since they cannot buy a house, they only choose rental size and make consumption and saving decisions.

Amortization of mortgages: For tractability, we assume that mortgages are due by the end of life, so that the household's age captures the maturity of the mortgage contract. We only allow for fixed-rate mortgages, which is the dominant mortgage type in the U.S. We assume that the mortgage payments follow the standard amortization formula computed at the bank lending rate r_ℓ.

In reality, the amortization schedule of mortgages is computed at their individual-specific mortgage interest rates. However, to save from an additional state variable, we assume that mortgage amortization is computed at bank lending rate r_ℓ, following the approach of Hatchondo, Martinez and Sanchez (2015), and Kaplan, Mitman and Violante (2020). Individual default risk will show up in the pricing of the mortgages at the origination rather than in the mortgage interest rate.

Good-Producing Firms: A perfectly competitive firm produces final output by renting from households capital K at rate r_k and labor N at rate w. The firm also chooses the utilization rate (or hours) u per worker. The labor income earned per efficiency unit of a worker $w(\overline{w}, u)$ (same as w) is assumed to depend on the hours worked.[10] Following Cooley and Quadrini (1999, 2004), Neumeyer and Perri (2005), Mendoza (2010), and Jermann and Quadrini (2012), we assume that the firm finances a fraction μ of the wage payment in advance from banks and pays interest on that portion.

$$\max_{K,N,u} \mathbb{Z}K^\alpha (Nu)^{1-\alpha} - (r_k + \delta_k)K - (1 + \mu r_\ell)\, w(\overline{w}, u)\, N,$$

where $\mathbb{Z}$ is TFP, r_k is the rate of return, and δ_k is the depreciation rate of capital. The working capital requirement makes the firm's labor demand and production decision dependent on the bank lending rate r_ℓ. Thus, labor income and output decline when the firm reduces work hours in response to an increase in the bank lending rate.

[10] As shown in Arslan, Guler and Kuruscu (2023), this formulation is equivalent to assuming no labor utilization on firms but flexible labor supply for households together with GHH preferences over consumption and labor.

Real estate companies: Real estate companies are owned by households. They own part of the housing stock (subject to depreciation), and rent it to the households at the rental rate p_r. In each period they choose how much new housing to purchase (or sell). They face quadratic adjustment costs to change their housing stock. Since both capital and real estate company shares are riskless in a deterministic equilibrium, i.e., in the steady-state and along the transition path except for the unanticipated shock periods, both assets have to pay the same rate of return in equilibrium. Given this, the first-order condition of the real estate company gives the rental rate as $p_r = \kappa + p_h \left(1 + H_r' - H_r\right) - \frac{p_h'(1-\delta_h+H_r''-H_r')}{1+r_k}$, where κ is the maintenance cost, p_h and p_h' are house prices in the current and next periods, δ_h is the depreciation rate of housing, and H_r, H_r', H_r'' are the housing stock of the real estate companies in the current and next two periods, respectively.

Banks: We assume a competitive banking industry with a unit of continuum of identical banks that are risk-averse and maximize the discounted lifetime utility $\sum_{t=0}^{\infty} \beta^t \log\left(c_t^B\right)$ where c_t^B is the bank's dividends. There is no entry to the banking sector. Banks fund their operations from their equity and by borrowing short-term at an exogenous risk-free interest rate r, referred to as the bank funding rate. They lend to firms at the bank lending rate r_ℓ, and issue mortgages and purchase existing mortgages.

Following Gertler and Kiyotaki (2015), we assume that bankers can walk away at the beginning of a period without paying back their creditors. In that case, they can keep a fraction, ξ, of their assets but are excluded from banking operations in the future and can only invest those assets at rate r. Knowing this, creditors lend to banks to the point where banks do not walk away, which generates a collateral constraint with a haircut.

We focus on a symmetric equilibrium where all banks hold the market mortgage portfolio (see Appendix A.6 for details). This allows simple aggregation despite the fact that banks hold a rich set of heterogeneous mortgages.

Government: The government runs two balanced-budget social programs: (i) a pay-as-you-go social security program which transfers income to retired individuals (ii) a UI program which transfers income to unemployed individuals. The social security program is funded through taxes on working-age individuals, while UI program is funded through taxes on the employed.

2.2 Calibration

The model period is one year. Households enter the economy at age 21, work until age 65, and live until age 85. We calibrate the steady state of the benchmark model to match US data moments in 1995, assuming a UI replacement rate of 0.4. This corresponds to 0.2 in the model since the model period is one year, and unemployment benefit duration is typically 6 months.

Preferences: Households derive utility from consumption and housing services captured by the CES utility specification: $u(c,s) = \left((1-\gamma)c^{1-\epsilon}+\gamma s^{1-\epsilon}\right)^{\frac{1-\sigma}{1-\epsilon}}/(1-\sigma)$. Consistent with Piazzesi, Schneider and Tuzel (2007), we set $\epsilon = 0.8$ implying an elasticity of substitution between consumption and housing services as $1/\epsilon = 1.25$. Following Guerrieri and Lorenzoni (2017), we set $\sigma = 4$. γ is calibrated to match a 15 percent share of housing services in GDP. Households' discount factor is calibrated to match a capital-output ratio of 2.

Income and unemployment risk: The job separation rate depends on age and labor efficiency: $s_j(z_j) = \bar{s}_j + \delta_0 z_j$. We estimate δ_0 from Survey of Income and Program Participation (SIPP) data as -0.0015, implying that a 100 percent increase in income reduces the job separation rate by 0.15 percentage points.[11]

Following Menzio, Telyukova and Visschers (2016), the monthly job separation rate is 0.03 at age 21 ($\bar{s}_{21}$), and 0.001 at age 65 ($\bar{s}_{65}$). We then posit that the age component of the job separation rate evolves in accordance with the following functional form: $\bar{s}_j = \bar{s}_{65} + (\bar{s}_{21} - \bar{s}_{65})\left(\frac{65-j}{44}\right)^{\delta_1}$, where δ_1 governs the curvature of the change in the job separation rate throughout the life-cycle.

In accordance with Jarosch and Pilossoph (2019), we incorporate duration dependency by adopting the following functional form for the monthly job finding probability: $f_t = \left(\alpha_0 + (1-\alpha_0)e^{-\alpha_1 t}\right) f_0$, where t is the month in a

[11] We use the 1996 wave of SIPP. We limit the sample to white males between the ages 25 and 55. The income refers to the households earned income (labeled as THEARN) in the survey.

Table 1 – Externally Set Parameters

Parameter	Explanation	Value
σ	Risk aversion	4
ϵ	Elasticity of intratemporal substitution	0.8
α	Capital share	0.3
θ	Unemployment benefit	0.2
χ^u	Job scarring effect	0.15
ρ	Persistence of income	0.955
σ_ε	Standard deviation of innovation to AR(1)	0.198
φ_s	Selling cost of a house for a household	7%
φ_e	Selling cost for foreclosures	25%
φ_f	Fixed cost of mortgage origination	2%
φ_v	Variable cost of mortgage origination	0.75%
ψ	Curvature on hours in the wage function	0.5
δ_h	Housing depreciation rate	2.5%
ϕ	Minimum down payment requirement	0%
π	Probability of being an active renter	0.14
Parameters that govern the Unemployment-Employment and Employment-Unemployment transitions		
δ_0	Degree of income dependence in job separation rate	-0.0015
δ_1	Age dependence curvature in job separation rate	3.08
α_0	Weight parameter in job finding rate	0.49
α_1	Speed of change in job finding rate with unemployment duration	0.36
f_0	Job finding probability in the first month of unemployment	0.292

year and f_0 is the job finding probability in the first month. Consistent with Jarosch and Pilossoph (2019), we assign values of 0.49 to α_0 and 0.36 to α_1.

We adopt the methodology of Krueger, Mitman and Perri (2016) to transform monthly transition probabilities into annual transition probabilities.[12] Specifically, we calculate the annual unemployment-to-unemployment transition probability as the likelihood of an individual who is unemployed at the beginning of the year being unemployed at the end of the year. Note that individuals may experience multiple transitions within a single year, including periods of employment, during this aggregation process. We compute the annual employment-to-employment probability using the same methodology.[13]

[12] Different from Krueger, Mitman and Perri (2016), we incorporate age and income dependencies in job separation rates.

[13] The resulting annual employment-to-unemployment transition probabilities are 0.15, 0.04, and 0.02 for individuals aged 21, 41, and 61 years, respectively. Correspondingly, the annual unemployment-to-employment transition probabilities for these age groups are 0.80, 0.88, and 0.90.

We calibrate δ_1 and f_0 to match an unemployment rate of 5.5 percent and an average probability of long-term unemployment of 10 percent (defined as not finding a job within a year). This calibration implies that the average job finding probability is 25 percent in a month, which is consistent with the estimates provided in Menzio, Telyukova and Visschers (2016). Following Shiro and Butcher (2022), we also assume that upon unemployment shock, the stochastic component of the labor efficiency, z_j, drops by 15% to mimic the job scarring effect of unemployment, i.e. $\chi^u = 0.15$.

After calibrating the unemployment process and unemployment income, we proceed to calibrate the parameters governing the stochastic labor efficiency process in order to ensure that the implied income process within the model aligns with the estimates presented by Storesletten, Telmer and Yaron (2004). Specifically, we postulate that the implied income in the model comprises both a transitory component and a persistent component, as in Storesletten, Telmer and Yaron (2004). We calibrate the autocorrelation coefficient of the persistent component and its standard deviation to match the estimates presented in row C of Table 2 in Storesletten, Telmer and Yaron (2004). The resulting persistence of the income process, ρ is 0.955 and its standard deviation, σ_ε is 0.198.

We follow Guvenen and Smith (2014) to approximate US retirement income, adjusting the mean to ensure a 12 percent tax rate for working-age households.

Housing and mortgage markets: Consistent with the estimates in Gruber and Martin (2003), we set the house selling cost, φ_s to 7 percent. Foreclosed properties can be sold by banks at a $\varphi_e = 25$ percent discount, aligning with the estimates provided by Campbell, Giglio and Pathak (2011). We set the fixed mortgage origination cost to $\varphi_f = 2$ percent of the average income, and variable cost of mortgage origination to $\varphi_v = 0.75$ percent of the mortgage loan (Federal Reserve Board (2008)). The minimum downpayment requirement is set to 0%.[14]

[14] Although the minimum downpayment is set to 0, mortgage pricing by the banks impose household-specific endogenous borrowing limits.

The default flag tends to persist for an average of 7 years on a defaulted household. To achieve this, we calibrate the per-period probability of transitioning from default to being an active renter to 0.14. We calibrate rental maintenance cost, κ, to match the house price-to-rent ratio to 11 (Sommer, Sullivan and Verbrugge (2013)). Housing units depreciate at rate $\delta_h = 2.5$ percent (Harding, Rosenthal and C.F. (2007)). The aggregate house supply is fixed and normalized to 1. Finally, we calibrate the minimum house size for owner-occupied units to match a homeownership rate of 64 percent.

Production sector: We normalize total labor N and steady-state labor utilization to 1. We set the share of capital in production as $\alpha = 0.3$. We calibrate the depreciation rate of capital to match the share of non-residential investment to output ratio as 20 percent. Together, these parameters imply that the capital's return is $r_k = \alpha Y/K - \delta_k = 0.05$.

We assume the wage function takes the following form: $w\left(\overline{w}_t, u_t\right) = \bar{w}_t + \vartheta \frac{u_t^{1+\psi}}{1+\psi}$, where $\bar{w}$ is determined in equilibrium. The parameter ψ controls the response of labor income $w\left(\overline{w}_t, u_t\right)$ to the change in the bank lending rate in the model. Following Arslan, Guler and Kuruscu (2023) we set this parameter to 0.5, and calibrate ϑ so that labor utilization rate is normalized to 1: $u_t = 1$.

Financial Sector: "Banks" include deposit-taking institutions, issuers of asset-backed securities, GSEs, and GSE-backed pools (Shin (2009)). We target the composition of bank balance sheets in our model to the 1985–1994 averages reported in the Federal Reserve's Z.1 Financial Accounts. According to Tables L.218 and L.219, banks held on average 93 percent of all home and multifamily residential mortgages during this period. To calculate lending to non-financial firms, we draw on the balance sheets of these firms (Table L.102), considering total loans (from depository institutions, mortgages, and other sources) as well as miscellaneous liabilities. Based on these data, residential mortgages account for approximately 49 percent of banks' balance sheets when focusing on loans only and 34 percent when including miscellaneous liabilities as part of firms' total financing from banks. We therefore take the ratio of mortgages to total bank financial assets as 42 percent, the midpoint of these two measures, and

Table 2 – Internally Calibrated Parameters

Parameter		Value
β	Discount factor	0.87
$\underline{h}$	Minimum house size	0.63
r	Deposit rate	3.22%
γ	Weight of housing services in utility	0.22
μ	Share of wage bill financed from banks	1.04
δ_k	Capital depreciation rate	0.1
κ	Rental maintenance cost	0.05
ϑ	Weight on hours in the wage function	0.90
β_L	Bank discount factor	0.83
ξ	Bank seizure rate	0.21

calibrate μ, the fraction of the wage bill financed by bank lending, to match this target.

We assume that bankers have log utility. We calibrate bank funding rate, r, to match debt-output ratio of 53 percent, and fraction of assets banks can keep after defaulting, ξ, to match mortgage interest premium $r_\ell - r = 1.5$ percent representing average annual gap between 30-year mortgage interest rate and treasury rate in the data. Lastly, we calibrate bank's discount factor, β_L, to match steady-state bank leverage as 10.

After externally setting some of the parameters as described above, we internally calibrate the remaining 10 parameters shown in Table 2 to jointly match the following 10 data moments reported in Table 3: 64 percent average home-ownership rate, capital-output ratio of 2, mortgage debt-to-GDP ratio as 53 percent, share of housing services in GDP as 15 percent, share of non-residential investment in GDP as 20 percent, house price to rental price ratio of 11, leverage ratio of 10 for banks, 1.5 percent premium for mortgages, the share of mortgages in bank balance sheet as 42 percent, and $u_t = 1$ (normalized in the steady-state).

Table 3 – Moments

Statistic	Data	Model
Capital-output ratio	2	2
Homeownership rate–aggregate	64%	64%
Mortgage Debt-GDP ratio	53%	53%
Share of housing services in GDP	15%	15%
Ratio of mortgage loans to total loans in bank assets	0.42	0.42
Share of non-residential investment in GDP	20%	20%
House price-rental price ratio	11	11
Labor utilization rate	1.0	1.0
Mortgage premium	1.5%	1.5%
Bank leverage ratio	10	10

Shocks: We study how the model economy reacts to changes in interest rates, corresponding to the bank-funding rate in our framework.[15] For our analysis, we assume that the economy is in steady state before 1998. In 1998, the bank funding rate starts to decline linearly until 2008 and is expected to remain at the 2008 level thereafter. We assume that shocks are expected to be permanent. However, in 2008, the bank funding rate unexpectedly reverts to its initial steady state (Figure 1, left panel). We choose the size of the interest rate shock as one percentage point, consistent with the decline in mortgage rates during this period (Justiniano, Primiceri and Tambalotti (2019)). These two unexpected shocks to the bank funding rate generate a sizable boom-bust cycle in the housing, banking, and real sectors.

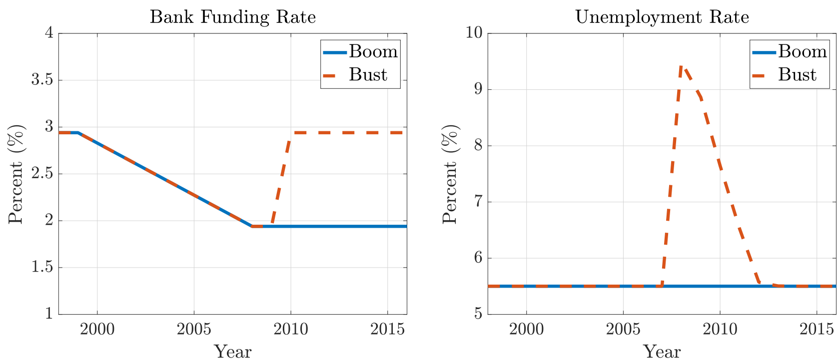
In addition, to incorporate a stabilizing role for UI during the bust, we assume that the unemployment rate rises unexpectedly in 2008 and then declines linearly until 2013 (Figure 1, right panel).[16][17] The destabilizing effects of UI

[15] In Online Appendix D.1, we demonstrate that the destabilizing effects of UI carry when the economy is hit with aggregate productivity and house price expectation shocks.

[16] We implement the increase in the unemployment rate by multiplying the job separation rate for all age groups, $\bar{s_j}$, by $1+\chi_t^u$ and multiplying the job arrival rate, f_0, by $1-\chi_t^u$, and calibrate χ_t^u to match the time path of the unemployment rate.

[17] Our framework does not include endogenous labor supply decisions. While modeling

FIGURE 1 – Boom-bust shocks



Notes: The graph plots the shocks that generate the boom-bust episode. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady-state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

would be even larger in the absence of this shock (Appendix D.1).

3 Quantitative Results

There is a large variation in UI generosity across US counties (Figure C.2 in Appendix C.1). Motivated by this, in the simulations that follow, we compare economies with permanently different UI levels, focusing on UI replacement rates of 20, 40, and 60 percent. We first present the steady-state comparison of these economies. Then, we analyze the transitional dynamics across these economies in response to a boom-bust shock.

3.1 Steady-State Analyses

To quantify the effects of UI benefits on balance sheets, we first solve the steady-state of the model with different UI benefit levels and report the corresponding balance sheet strength measures. We then compare the effects of UI generosity on unemployed and employed households and examine life-cycle dynamics.

3.1.1 The Effects of UI on Household and Bank Balance Sheets

We show the mechanism through which UI generosity translates into more favorable mortgage terms in Panel A of Figure 2. By lowering income risk due to

job search, job creation, and destruction, and accepting/rejecting job offers would certainly enrich the model, it would also introduce a large computational burden. Consequently, we exogenously generate an increase in the unemployment rate.

unemployment spells, generous UI lowers the ex-ante probability of household default. Banks internalize this reduced risk by offering lower interest rates for any given loan-to-value (LTV) ratio. This effect is particularly pronounced at higher LTV ratios, where the risk of default is larger. For instance, among young households, moving from a 20 percent to a 60 percent replacement rate lowers the interest rate on a mortgage with a 100 percent LTV ratio by approximately 4 percentage points. The effect of UI on mortgage terms gets smaller as consumers get older, since the unemployment risk declines (top-left and middle panels).

Furthermore, the impact of UI on mortgage terms interacts significantly with the household's life cycle (top-right panel). Younger households, who typically have lower asset accumulation and higher unemployment risk, face higher borrowing costs. UI generosity disproportionately benefits these riskier young borrowers by compressing the risk premia.

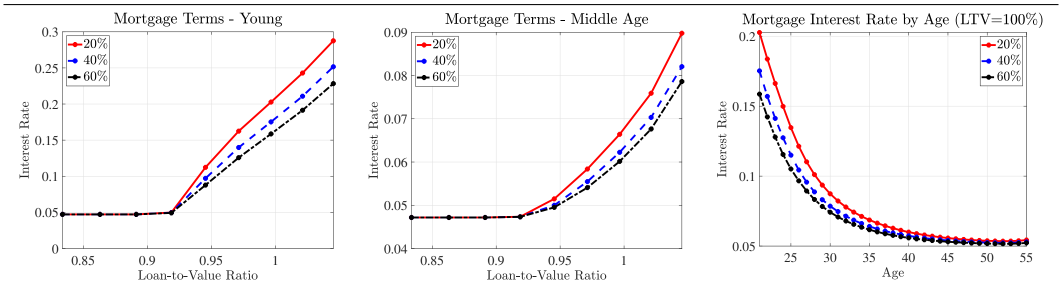
Panel B in Figure 2 illustrates how UI generosity weakens the balance sheets of households and banks in the steady state. As UI becomes more generous, households' income risk declines. Consequently, they reduce their precautionary savings (see top left panel). Moving from an economy with a 20 percent replacement rate to one with a 60 percent replacement rate reduces household financial assets by 1.4 percent. The fraction of hand-to-mouth households, on the other hand, increases from below 6 percent to about 13 percent.[18] As a result, a larger fraction of households' consumption is now more sensitive to income shocks.

The combination of lower income risk and improved credit terms allows households to borrow more in the mortgage market, increasing their leverage (the middle-right panel). As a result, the average mortgage debt-to-output ratio increases around 31.7 percent from 44.7 percent to 58.9 percent (the bottom-left panel) when UI increases from 20 to 60 percent. This is comparable (albeit smaller) to the changes in mortgages implied by our estimates in Table 4.

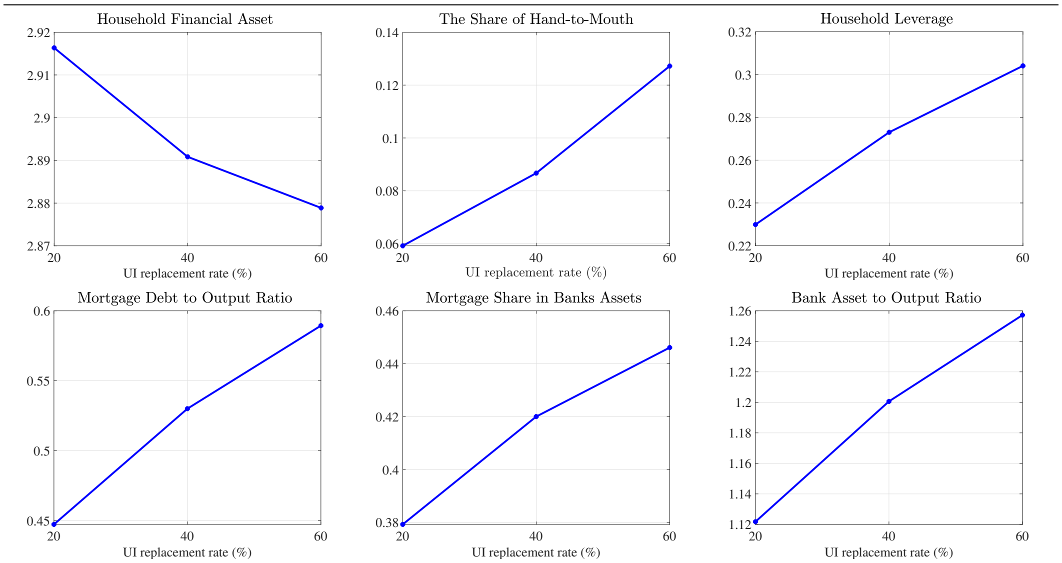
[18] We define "hand-to-mouth" households as those holding financial assets worth less than half of their annual labor income.

FIGURE 2 – Steady State Effects of UI

Panel A: UI and Mortgage Terms



Panel B: UI and Balance Sheets

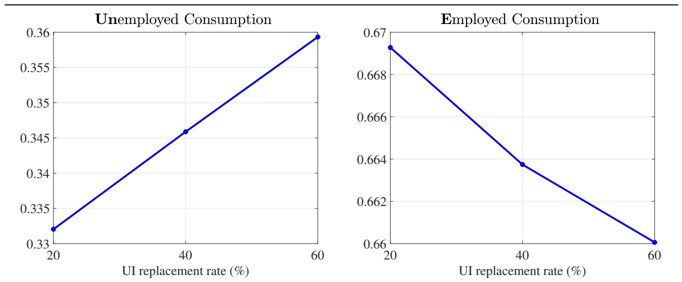


Notes: This figure shows the steady-state values of several household and bank balance sheet items for a range of UI generosity levels. “Hand-to-mouth” households are the ones with financial assets less than half of their annual labor income. Household leverage is defined as mortgage debt/house price.

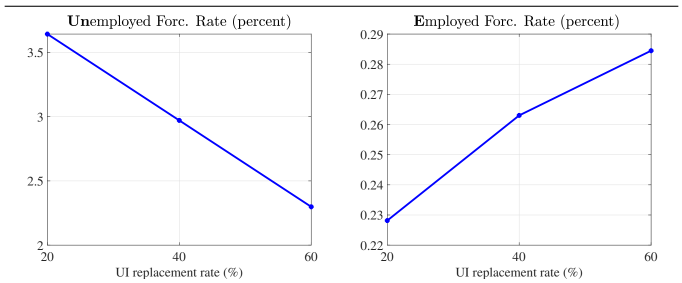
Household mortgage liabilities are assets on bank balance sheets. The mortgage debt-to-output ratio is the product of the mortgage share in bank assets and the bank asset-to-output ratio. As shown in the bottom two panels, both the share of mortgages in banks' assets and the size of the banking sector (measured by the bank asset-to-output ratio) increase with UI generosity. This higher share of mortgages increases banks' vulnerability to adverse aggregate shocks, as these long-term assets decline in market value when credit markets tighten and bank lending rates increase. Therefore, even with constant foreclosure

Figure 3 – Steady State Effects of UI on Unemployed and Employed

Panel A: Consumption



Panel B: Foreclosure Rate



Notes: The graph plots the steady-state averages of consumption and foreclosure rates of unemployed and employed for a range of UI generosity levels.

effects, the banks with a higher share of mortgages will reduce credit more during recessions. Furthermore, higher loan-to-income ratios increase mortgage default, further amplifying banks' vulnerability.

3.1.2 Unemployed versus Employed

UI affects unemployed and employed individuals differently. A more generous UI system weakens the balance sheets of both employed and unemployed. However, while the unemployed enjoy more generous benefit payments during unemployment, the employed do not get this benefit and they will pay higher taxes. Therefore, we expect to have relatively more favorable effects of more generous UI on the unemployed, compared to the employed.

The left plot in Panel A of Figure 3 illustrates that the unemployed indeed enjoy higher average consumption in more generous UI economies: going from a 20 percent replacement rate to a 60 percent replacement rate increases the average consumption of the unemployed by 9 percent. On the other hand, the employed experience slightly lower consumption (about 1 percent) in more generous economies because of higher taxes (the right plot).

Panel B of Figure 3 compares foreclosure rates, revealing two key patterns. First, while the foreclosure rate for the unemployed is around 3.0 percent, it is only around 0.25 percent for the employed. Thus, foreclosures in the steady state are primarily driven by the unemployed.[19] Second, the foreclosure rate among the unemployed declines with UI generosity, whereas the foreclosure rate among the employed slightly increases.

Overall, these patterns suggest that higher UI provides the unemployed with better insurance against consumption losses and foreclosures in the steady state, while it has a slightly opposite effect on the employed. As we demonstrate in Section 3.2.2, these differences become more pronounced in the bust.

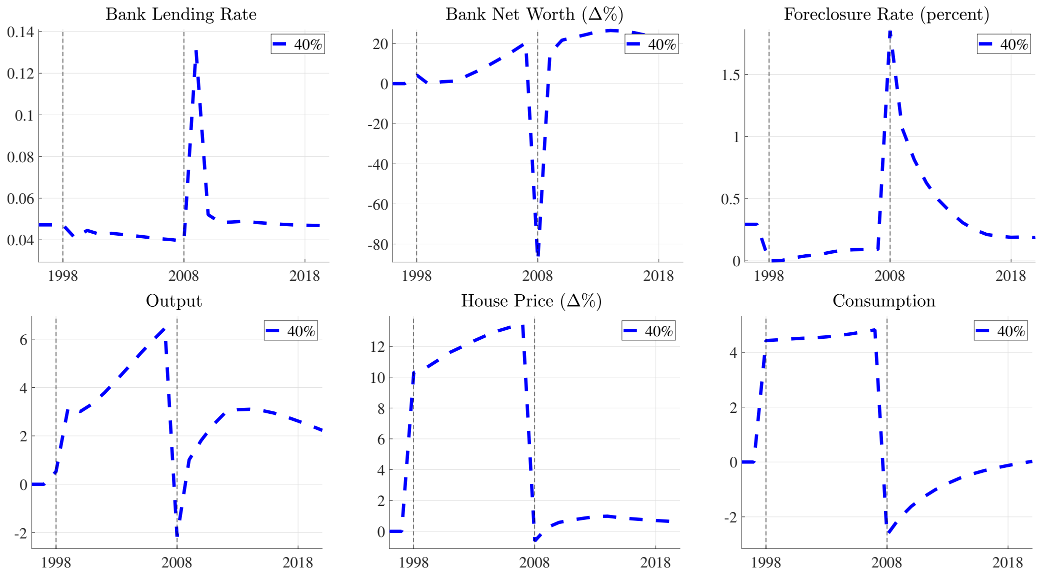
3.1.3 Life-Cycle Dynamics in the Steady State

The model generates consumption, homeownership, and mortgage debt profiles that increase concavely over the life cycle, consistent with data (Figure B.1 in Appendix B). With less generous UI, consumption and homeownership start at lower levels and increase more steeply due to a stronger precautionary saving motive. The higher default risk under less generous systems lowers mortgage demand across all age groups.

The model generates a significant decline in consumption upon unemployment, consistent with the data. For example, Ganong and Noel (2019) document that household consumption declines by roughly 10 percent upon unemployment. In the model, as well, consumption declines by about 10 percent upon unemployment. The effect of UI on mitigating this decline also aligns with existing estimates. Gruber (1997) and, more recently, Kroft and Notowidigdo (2016) find that a 10 percentage point increase in UI generosity reduces this consumption drop by about 2.8 percent. Our model generates comparable (4.2 percent) effects (Figure B.1 in Appendix, lower left panel). Finally, a substantial refinancing activity is observed among the unemployed, which is

[19]This is consistent with the findings of Rendon and Bazer (2021).

FIGURE 4 – Benchmark (UI=40 percent) Boom-bust



Notes: The graph plots the model's boom-bust dynamics for the 40 percent UI economy. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state, and the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

more prevalent in economies with lower UI benefits, indicating a substitution effect between UI and refinancing.[20]

3.2 The Boom-Bust Analysis

Before we compare how aggregate fluctuations in economies with different UI levels differ, it is instructive to illustrate how the shock to the bank borrowing rate, r, transmits to the economy. For this purpose, we present the boom-bust dynamics of some key aggregate variables from our benchmark economy with the 40 percent replacement rate in Figure 4.

Transmission of the Shock: Changes in the bank lending rate (r_ℓ) drive the boom-bust cycle. During the boom, r_ℓ closely follows exogenous bank funding costs, falling gradually and expected to remain low. This fuels housing demand, increasing house prices. Simultaneously, firms hire more, raising labor income

[20]The widespread use of refinancing among the unemployed is consistent with recent findings in Braxton, Herkenhoff and Phillips (2020), which suggest that unemployed individuals have significant access to credit.

and output, further boosting house prices and, consequently, consumption.

The bust is triggered by an unexpected, permanent reversion of bank funding costs to their initial steady-state level, causing a permanent increase in r_ℓ. This shock reduces all aggregate variables of interest below their initial steady state, while bank capital deteriorates sharply from declining mortgage valuations and increased foreclosures. Constrained by their diminished capital, banks cut lending, causing a temporary spike in r_ℓ.[21] High borrowing costs force firms to cut labor demand, lowering household income. Households then reduce consumption in response to lower income, lower house prices, and higher borrowing costs.[22]

3.2.1 (De)stabilizing Effects of Unemployment Insurance

We study the effects of UI on the boom-bust cycle. Our results indicate that more generous UI systems lead to more severe busts in the financial, housing, and real sectors.

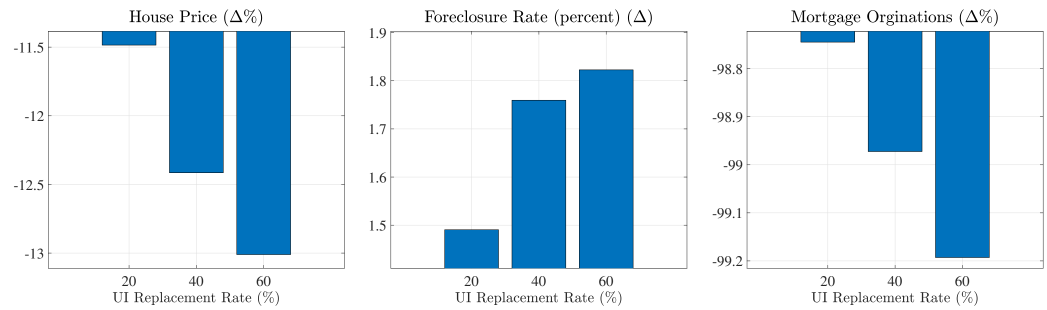
Housing Market Dynamics: More generous UI amplifies the bust in the housing market (Figure 5). For example, house prices decline more in the more generous UI economy: 13.0 percent in the 60-percent UI economy versus 11.5 percent in the 20-percent UI economy. Foreclosure rates increase more with 60-percent UI, exceeding 1.8 percent, while remaining below 1.5 percent with 20-percent UI. This difference in foreclosure rates is driven by the larger decline in house prices, higher household debt, lower liquid asset holdings, and lower down payment rates associated with generous UI.[23] Household mortgage

[21]An iterative approach demonstrates how this mechanism works: the increase in bank funding cost causes an increase in the equilibrium bank lending rate $r_{\ell,t+1}$, which reduces mortgage prices. Since mortgages are long-term assets and all assets have to pay the same rate of return in a perfect foresight equilibrium, mortgage prices drop to reflect the higher $r_{\ell,t+1}$. As mortgages are banks' collateral, this results in a decline in loan supply L_{t+1} and further increases in $r_{\ell,t+1}$. With higher $r_{\ell,t+1}$, mortgage prices and bank net worth decline further, generating further increases in $r_{\ell,t+1}$. Foreclosures also contribute to the declines in bank net worth and credit supply.

[22]The elasticity of consumption to house price changes is in line with Berger et al. (2018).

[23]Negative equity is a necessary condition for default in our framework. Otherwise, it would be optimal to sell the house. However, negative equity is not sufficient because of the cost of default. Additional triggers, such as low liquidity and lower income (both of which worsen as UI becomes more generous), are also important for the foreclosure dynamics.

FIGURE 5 – Bust in the Housing Market



Notes: The graph plots the dynamics of key housing market variables during the bust episode. Each bar measures the change of a variable during the time of the bust compared to its value at the peak of the boom. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state, and the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

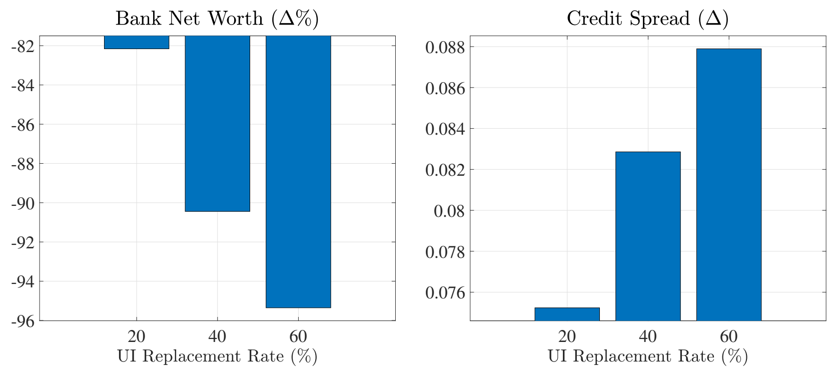
origination also declines more as UI gets more generous.

Banking Sector Dynamics: The banking sector also performs worse with more generous UI (Figure 6). Bank net worth declines more because mortgages, whose prices decline with higher bank lending rates, constitute a larger fraction of banks' assets, and each mortgage is riskier due to lower down payments. Additionally, the bigger increase in foreclosure rates contributes to the larger decline in the bank net worth. However this effect remains quantitatively small.[24] The larger decline in bank net worth generates a bigger spike in the bank lending rate $r_{\ell,t}$ (a more than 1 percentage point greater increase in the bank lending rate with 60-percent UI than the 20-percent), which further lowers bank net worth. The resulting larger decline in credit supply and the greater increase in the bank lending rate in more generous UI economies make borrowing more costly for both households and firms, deepening the recession.

Real Sector Dynamics: The bust in the real sector (household labor income, output, and consumption) is also stronger under more generous UI systems (Figure 7). One of the main factors behind the more severe bust in higher UI economies is the larger increase in the bank lending rate, raising borrowing

[24] In the Online Appendix we report the results where we close the foreclosures channel. Our results do not change significantly, suggesting that the rise in foreclosures is not the driving force.

FIGURE 6 – Bust in the Banking Sector



Notes: The graph plots the dynamics of key banking market variables during the bust episode. Each bar measures the change during the time of the bust compared to the peak of the boom. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state, and the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

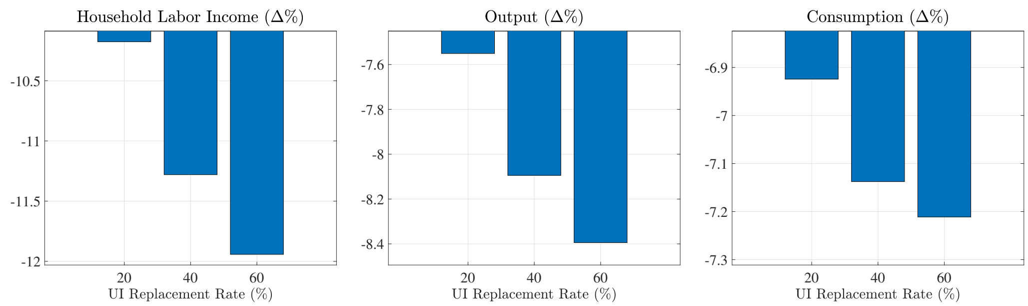
costs for households and firms. This, in turn, causes firms to cut back on labor demand more, resulting in larger declines in labor income and output. The larger drop in income, coupled with the higher borrowing costs, leads households to reduce consumption more.

The other main factor that causes a deeper bust is the weaker household balance sheets in more generous UI economies. The declines in house prices and labor income (assuming the declines are the same across different UI economies) generate bigger declines in household consumption and housing demand in higher UI economies because of higher household leverage, and lower savings. As a result of weaker demand, house prices and consumption decline more, and foreclosures increase more in higher UI economies.

3.2.2 Unemployed versus Employed

The aggregate destabilizing effects of UI mask significant heterogeneity between the employed and the unemployed. While more generous UI increases ex-ante balance sheet vulnerabilities for all households—potentially amplifying their negative response to the bust—it simultaneously provides direct income support (the insurance channel) exclusively to the unemployed. Figure 8 shows how these competing forces affect consumption and foreclosure dynamics for each

Figure 7 – Bust in the Real Sector



Notes: The graph plots the dynamics of key goods market variables during the boom-bust episode. Each bar measures the percent change during the time of the bust compared to the peak of the boom. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state, and the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

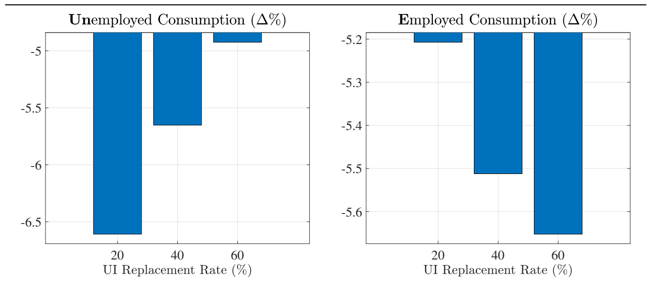
group.

For the unemployed, the insurance channel clearly dominates the balance sheet vulnerability channel. As shown in Panel A (left), consumption stabilization improves significantly as UI generosity increases: the decline in consumption during the bust is above 6.5 percent in the economy with a 20 percent replacement rate, but less than 5.0 percent when the replacement rate is 60 percent. The insurance effect is also powerful in mitigating foreclosures (Panel B, left). The increase in the foreclosure rate among the unemployed is substantial in the 20-percent and 40-percent UI economies (around 9.6 percentage points). However, this increase drops significantly to 7.9 percentage points in the 60-percent UI economy. Thus, UI successfully fulfills its intended role of stabilizing consumption and housing outcomes of the unemployed during the bust.

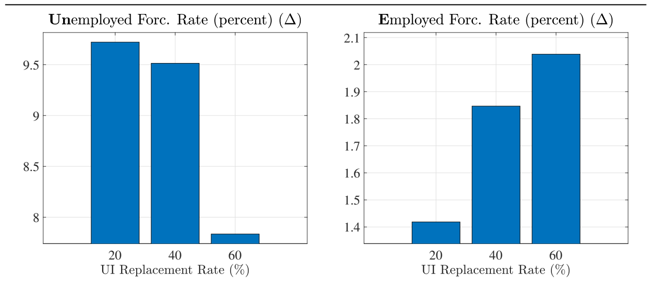
The opposite is true for the employed. They enter the recession with weaker balance sheets in high-UI economies (higher leverage and lower liquidity) but do not benefit from UI payments during the downturn. Consequently, the balance sheet vulnerability channel dominates. The employed experience larger declines in consumption under more generous UI systems (Panel A, right), with the drop increasing from 5.2 percent to 5.7 percent as the replacement rate rises from 20 to 60 percent. The destabilizing effect is even more pronounced

Figure 8 – (De)stabilizing Effects: Unemployed versus Employed

Panel A: Consumption



Panel B: Foreclosure Rate



Notes: The graph plots the dynamics of foreclosures and consumption for the employed and unemployed during the bust. Foreclosure rates are normalized by each group's homeownership rate. Consumption for employed and unemployed are normalized by the employment and unemployment rates for the respective groups. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state, and the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

for foreclosures (Panel B, right): the increase in the foreclosure rate during the bust is 1.4 percentage points in the low-UI economy, rising significantly to more than 2.0 percentage points in the high-UI economy.

Since the employed constitute the vast majority of the population, the aggregate dynamics discussed in the previous sections are primarily driven by their behavior. The amplified distress of the employed outweighs the stabilization experienced by the unemployed, resulting in deeper aggregate recessions in more generous UI economies.

3.2.3 The Role of Bank Balance Sheet

In the previous experiments, we compared economies with permanently differing UI levels. These economies vary in the vulnerabilities of their banking systems, resulting in larger declines in bank net worth and larger increases in the equilibrium bank lending rate during the bust in more generous systems. Increasing UI for the entire economy thus generates a systemic vulnerability in the banking system.

In contrast, when a single U.S. state increases its UI benefits, it does not create systemic risk for the national banking system. Therefore, empirical studies relying on cross-state variation in UI may underestimate the destabilizing—or overestimate the stabilizing—effects of UI, since they do not capture this systemic risk created by increasing UI for the entire economy.[25] This distinction between a local and a national policy change highlights a critical challenge when extrapolating from regional studies to aggregate outcomes, often referred to as the "missing intercept" problem (Moll and Hanney (2025)).[26]

In this section, we shut down the bank balance sheet channel and isolate its role in the destabilizing effects of UI. To achieve this, we fix the credit spread $(r_\ell - r)$ to its steady state level, ensuring that r_ℓ moves one-for-one with the change in r. This essentially eliminates the spike in r_ℓ at the time of the bust. As a result, all bank balance sheet weaknesses that would arise due to more generous UI benefits do not affect the model dynamics, and the differences across different economies are driven solely by the household balance sheet channel.

Figure 9 presents the results of this exercise. In the left column, we present our benchmark results as the decline in a variable in an economy relative to the economy with a 20 percent replacement rate. This left column shows that the decline in output, consumption, house prices, and household mortgage debt is higher in economies with higher UI. The figure reports the negative of the foreclosure rate, so the increase in the foreclosure rate is larger in more generous systems.

[25] Cross-state variation in UI would capture the bank balance sheets effects in our model only to the extent that banks are local and local households and firms rely on local banks.

[26] This issue also relates to a broader literature highlighting the limitations of using cross-sectional variation to address macroeconomic questions (e.g., Nakamura and Steinsson (2014), Chodorow-Reich (2020), and Guren et al. (2021)).

We divide variables of interest into two groups. In the top row, we report consumption and output. The middle panel of that row presents the results when the bank balance sheet channel is shut down, showing that the destabilizing role of UI on output is substantially reduced. In fact, without the bank balance sheet channel, consumption declines less at the time of the bust in more generous UI systems. Thus, if we were not to take into account the bank balance sheet channel, we would have concluded that higher UI stabilizes consumption in the bust. Output, however, remains more destabilized in more generous UI economies, though a smaller extent, highlighting that the bank balance sheet channel amplifies the destabilizing impact of higher UI on output.

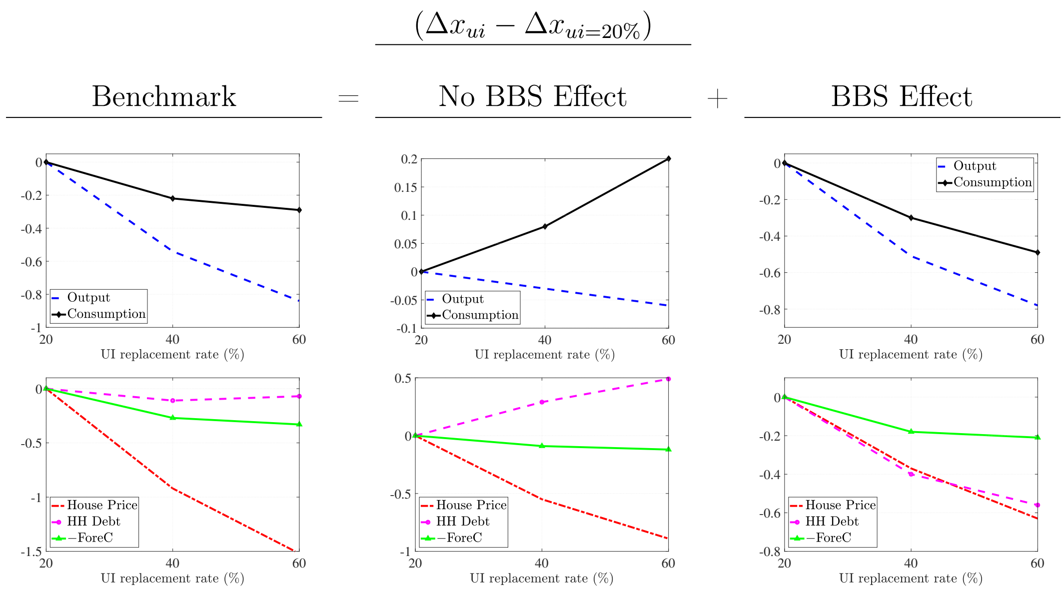
The second row reports the dynamics of house prices, household mortgage debt, and foreclosures, revealing that higher UI destabilizes house prices and foreclosures even in the absence of the bank balance sheet channel. Mortgage debt, on the other hand, becomes more stable once the bank balance channel is closed.

Overall, this exercise underscores the important role of the bank balance sheet channel for the destabilizing effects of UI on macroeconomic variables. However, note that the U.S. banking sector is partially segmented, as documented by Kroszner and Strahan (1999), Becker (2007), and Gilje, Loutskina and Strahan (2016). This segmentation implies that some banks tend to operate within specific geographic or regulatory boundaries. As a result, empirical studies that exploit cross-state variation in UI generosity may still capture effects related to the bank balance sheet channel. Therefore, while our model shows that shutting down the bank balance sheet channel at the aggregate level can mute or reverse destabilizing effects of UI, it might still be possible to observe destabilizing effects in cross-sectional studies because of local credit supply effects. Acknowledging that such analyses likely underestimate the overall destabilizing effects of UI, we conduct a cross-sectional analysis in Section 4.

3.2.4 Unexpected Changes versus Permanent Differences in UI

The destabilizing effects of UI that we find are not an a-priori unambiguous outcome. In fact, the mechanisms by which UI can stabilize the economy

FIGURE 9 – The Role of Bank Balance Sheets (BBS)



Notes: The graph plots the dynamics of some of the key variables during the boom-bust episode where we decompose the bank and household balance sheet mechanisms. We compare the declines in variables to the decline in the 20-percent UI economy. The negative of the foreclosure rate is shown, so a more negative value for foreclosure indicates a larger increase.

exist in our model. However, the balance sheet effects dominate the stabilizing effects. To illustrate this point, instead of comparing economies that are permanently different in UI generosity, we conduct an experiment in which, in the benchmark economy with a 40 percent replacement rate, the replacement rate is unexpectedly and temporarily increased to 60 percent during the bust period.

We report the results of this experiment in Figure 10. Under each variable name, the left panel replicates our benchmark results. For example, the decline in consumption in the bust in the economy with a 60 percent replacement rate is larger than the one with a 40 percent replacement rate. The right panel shows that the decline in consumption in the economy in which the replacement rate is unexpectedly increased to 60 percent in the bust period is smaller than the one in our benchmark (7.0 percent versus 7.14 percent). Thus, an unexpected increase in UI actually stabilizes the economy in the downturn.

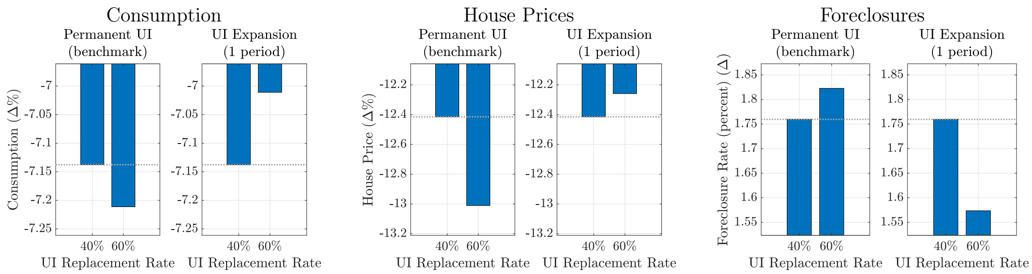


FIGURE 10 – Unexpected and Temporary Increase in UI

Notes: The graph plots the dynamics of some of the key variables during the bust episode where we compare the benchmark results with the case where UI benefits unexpectedly and temporarily increased to 60 percent (for one period) during the bust period.

The same conclusion applies to house prices and foreclosures.

Overall, temporary and unexpected increases in UI generosity stabilize downturns. But once the generosity becomes permanent, the economy enters the next recession with weaker balance sheets, which destabilizes the economy.

Our findings corroborate recent studies by Coglianese (2015), Hsu, Matsa and Melzer (2018), Kekre (2023), and Mitman and Rabinovich (2021).Coglianese (2015) examines the impact of UI extensions during the Great Recession and finds evidence of UI benefits boosting aggregate demand. Similarly, Hsu, Matsa and Melzer (2018) document that these extensions reduce foreclosures in the aftermath of the Great Recession, limiting the influence of labor market shocks on the housing market. Kekre (2023) argues that even a marginal increase in UI generosity can enhance aggregate demand, as the unemployed have a higher marginal propensity to consume. Mitman and Rabinovich (2021) study the optimal (Ramsey) UI policy in response to a shock that imitates the COVID-19 recession and conclude that a substantial and transitory increase in UI is optimal. Like these studies, we demonstrate that unexpected and temporary extensions of UI benefits can stabilize downturns. However, permanent differences in UI weaken household and bank balance sheets, outweighing their stabilizing effects. A related literature suggests that implementing counter-cyclical UI benefits, which are more generous during recessions, may be beneficial (Kroft and Notowidigdo (2016),Landais, Michaillat and Saez (2018*a*,*b*), and Gorn and Trigari (2024)).

However, we refrain from drawing a policy conclusion that discretionary increases in UI during a bust or counter-cyclical UI stabilize the economy. Our results highlight the importance of ex-ante risk-taking effects of UI benefits. Absent those, unemployment benefits smooth downturns. However, policymakers cannot consistently surprise households and banks with temporary increases in benefits during recessions. If households and banks expect governments to expand the generosity of UI benefits in every deep recession, they will adjust their balance sheets accordingly. Thus, quantifying whether counter-cyclical UI policies stabilize or destabilize the economy requires proper modeling of aggregate risk.

4 Evidence from Micro Data

Our quantitative model yields two key testable predictions about UI's potential destabilization. First, in regions with more generous UI benefits, households obtain larger mortgage debt with lower mortgage interest rates. Second, following an adverse aggregate shock, regions with more ex-ante generous UI experience deeper housing busts—higher foreclosure rates and larger declines in mortgage credit and house prices.

In this section, we test the two predictions using U.S. loan-level data from complementary sources. Our primary dataset is CoreLogic's Loan-Level Market Analytics (LLMA) data set, which records the mortgage interest rate at origination and rich loan performance outcomes—including foreclosure events—allowing us to assess both price effects (interest rates) and longer-run stability implications (foreclosures) of UI generosity. Because CoreLogic LLMA lacks lender identifiers, we cannot directly control for lender heterogeneity. We therefore supplement LLMA with Home Mortgage Disclosure Act (HMDA) data, which provide near-universal coverage of U.S. mortgage originations and include detailed lender identifiers. This lender information enables us to control for time-invariant and time-varying bank covariates by incorporating bank and bank-by-year fixed effects, which are crucial for isolating the effect of UI generosity on mortgage size.

UI benefit payments vary across U.S. states, enabling us to exploit this variation to test our model's predictions. States retain discretion over the weekly UI benefit cap and the maximum benefit duration. The weekly cap is the maximum dollar amount an unemployed person can receive per week, and the maximum benefit duration is the number of weeks he/she can receive this payment. Consistent with the literature, we measure a state's UI generosity as the product of these two components—maximum potential payout an unemployed person can receive during his/her unemployment spell. In addition to cross-state heterogeneity, in a separate analysis, we exploit Missouri's unexpected 2011 reduction in benefit duration as an exogenous shock to UI generosity.

We also use a comprehensive set of county- and state-level covariates measuring labor market conditions, economic activity, and complementary social policies. Detailed data sources and summary statistics are reported in Appendix C.

4.1 UI and Mortgage Borrowing

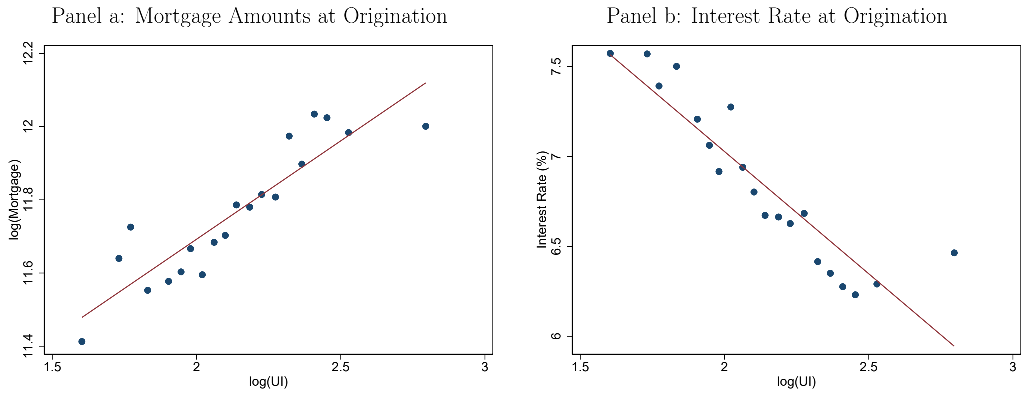
Our empirical strategy regarding the first prediction proceeds in two complementary steps. First, we exploit cross-sectional variation in UI generosity across U.S. states. Second, we leverage a quasi-experimental reduction in Missouri's UI benefit duration unexpectedly enacted in 2011. Taken together, these strategies allow us to test whether UI generosity affects household balance sheets.

4.1.1 Evidence from cross-state variation in UI

We begin by showing the association between mortgage amounts at origination and UI generosity. Figure 11 presents a bin-scatter of the log mortgage amount and interest rates (from CoreLogic LLMA) against the log of UI generosity.[27] We find a positive slope for mortgage amounts and a negative slope for interest rates, providing preliminary support for our model's first prediction. Yet, these associations could be driven by confounding factors. Therefore, we exploit the

[27] Figure F.12 in Appendix depicts the same bin-scatter plot of the log mortgage amount, obtained from the HMDA data.

FIGURE 11 – Mortgage terms and UI Generosity



Notes: This figure plots a binned scatter of the log mortgage amounts and interest rates against the log of UI generosity (i.e., weekly benefit cap x maximum duration). Each dot represents the mean of 6,347,302 loans after residualising the variables for county income. The solid line shows the linear fit.

granularity of our data and estimate the following regression specification:

$$y_l = \beta \ \log(UI)_{sy} + Controls_{s(c)y} + Fixed\ Effects + \epsilon_l \quad (2)$$

where y_l denotes either the log mortgage amount or the interest rate at origination for loan l, and $\log(UI)_{sy}$ is the log of UI generosity in state s and year y. The control vector includes county-level log average income, log labor force size, HHI for both industry and deposit market concentration, as well as state-level union coverage, logs of minimum wage, health insurance payments, and non-UI transfer payments. We also include county, year, and when using HMDA data, bank, and bank-by-year fixed effects. Standard errors are clustered at the state-year level, as this is the treatment level.[28]

Table 4 shows the results. In column (1), we use log mortgage amount from CoreLogic LLMA as the dependent variable and include county and year fixed effects with county income as controls. We find a positive and significant coefficient for UI generosity. The magnitude of the coefficient indicates an elasticity of 0.231 for mortgage size with respect to UI generosity. Column (2)

[28] As a robustness, we use loan-to-income ratio (from HMDA data) at the loan level as the dependent variable. The results reported in Table F.2 in online Appendix support our findings here.

Table 4 – Mortgage terms and UI Generosity

	log(Mortgage)		Interest Rate		log(Mortgage)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(UI)	0.231***	0.169***	-0.521***	-0.564***	0.263***	0.220***	0.282***	0.244***
	(0.068)	(0.062)	(0.191)	(0.175)	(0.072)	(0.068)	(0.071)	(0.065)
Controls & Fixed Eff:								
County FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓	✓	✓
Bank FE							✓	
Bank × Year FE								✓
Obs.	115,155,647	115,155,647	113,136,053	113,136,053	115,716,494	115,716,494	115,716,494	115,716,494
R^2	0.394	0.395	0.288	0.288	0.237	0.237	0.337	0.362
Mean(Dep. var.)	11.80		6.77		11.84			

Notes: This table reports the regression results on the relationship between UI generosity and mortgage terms. The first four columns use data from CoreLogic, and the last four columns use data from HMDA. In the first two columns, the dependent variable is the log mortgage amount at the origination. In columns (3) and (4), the dependent variable is the mortgage interest rate and the observations are weighted by loan amounts. In the last four columns, the dependent variable is the log mortgage amount. The main independent variable is UI generosity, which is the log of UI generosity. Control variables and fixed effects are indicated at the bottom of each column. Control variables are county-level log average income, log labor force size, HHI for industry and deposit market concentration, state-level union coverage, and logs of minimum wage, health insurance payments, and non-UI transfer payments. Standard errors are clustered at the state-year level and reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

adds additional county- and state-level controls and yields a similar elasticity. Columns (3) and (4) switch the dependent variable to the mortgage interest rate and show that as UI generosity increases by 10 percent mortgage interest rates decrease by slightly more than 5 basis points. To address lender heterogeneity, columns (5)–(8) use HMDA. Columns (5) and (6) mirror the first two specifications and deliver consistent effects on mortgage size. Columns (7) and (8) add bank and bank-by-year fixed effects to absorb time-invariant and time-varying lender characteristics, respectively; the positive and significant elasticity between mortgage amounts and UI generosity persists.[29]

4.1.2 Evidence from Missouri's unexpected cut in UI duration

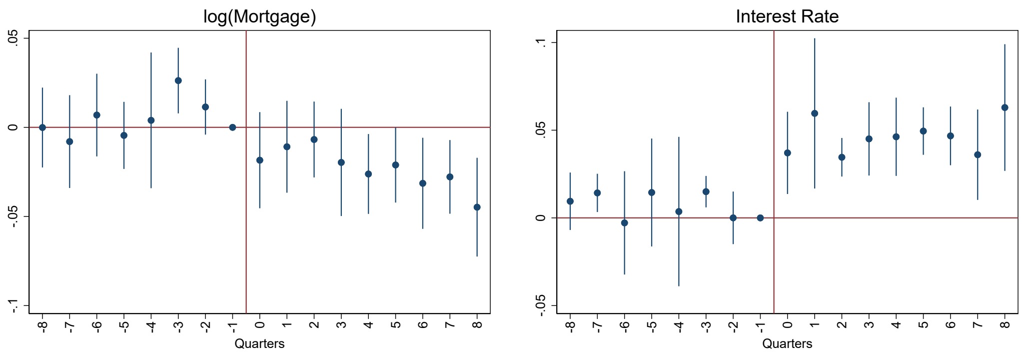
Although the cross-state results reported in Table 4 are robust to various controls and fixed effects, UI policy is not randomly assigned. To address endogeneity more effectively, we exploit Missouri's unanticipated 2011 reduction in benefit duration—a quasi-experimental policy shock documented by Johnston and Mas (2018) and Karahan, Mitman and Moore (2019).

[29] HMDA data does not report interest rates during our sample period.

Figure 12 – Dynamic effects of Missouri's 2011 UI Duration Cut

Panel a: Mortgage Amounts at Origination

Panel b: Interest Rate at Origination



Notes: This figure presents the coefficients from the estimation of a dynamic difference-in-differences model based on Equation 3. As the dependent variable, Panel (a) uses the log of mortgage amounts at origination and Panel (b) uses mortgage interest rate. The sample consists of only loans from counties located on state borders. Treated counties are located in Missouri; control counties are located in adjacent states: Illinois, Iowa, Kansas, Kentucky, Nebraska, Oklahoma, and Tennessee. Panel (b) weights the observations by loan amounts at origination. Both regressions include county, and county-pair×quarter fixed effects, and control for a linear time trend interacted with the Missouri treatment indicator. Standard errors are clustered at the county level. The bars indicate 95 percent confidence intervals. .

Following the Global Financial Crisis (GFC), two federal programs expanded state UI systems: Extended Benefits (EB) and Emergency Unemployment Compensation (EUC). EB, typically co-funded by federal and state governments, was temporarily fully federally funded by the 2009 Recovery Act. As a result, Missouri increased EB duration from 13 to 20 weeks. EUC, a temporary federal program, could provide an additional 53 weeks of benefits, conditional on the state's regular benefits duration.

In spring 2011, four Missouri state senators filibustered a bill to accept federal EB funding. The compromise that ended the standoff reduced the regular UI duration from 26 to 20 weeks. Because EUC benefits are defined relative to regular state benefits, this change triggered an additional 10-week cut in EUC benefits, reducing total potential duration from 73 to 57 weeks. As documented in detail by Johnston and Mas (2018) the episode unfolded unexpectedly and rapidly and was unrelated to economic conditions in Missouri, making it a credible source of exogenous variation in UI generosity.

We exploit this cut using a state-border discontinuity design at the county level. The treatment group consists of border counties on the Missouri side of the border, and the control group consists of neighboring counties on the other side of the border.[30] Being located next to the border counties in Missouri, the control counties are likely to have comparable economic conditions and are affected by the economic shocks similarly (see for example Dube, Lester and Reich (2010), Hagedorn et al. (2013), Hagedorn, Manovskii and Mitman (2015), and Arslan, Degerli and Kabas (2024)). Yet, being located in other states, the UI generosity in these counties is not affected by Missouri's 2011 cut in UI duration. This allows us to estimate the causal effect of UI on household balance sheets by comparing the mortgage outcomes across treatment and control counties. To make this comparison, we form county pairs that consist of two neighboring counties located in different states and include county-pair×quarter fixed effects.

Specifically, we estimate the following difference-in-differences model:

$$y_l = \beta \left(Missouri_s \times Post_q \right) + Controls_{sq} + Fixed\ Effects + \epsilon_l \qquad (3)$$

where y_l is either the log mortgage amount or the mortgage interest rate at origination, $Missouri_s$ is an indicator for Missouri counties, and $Post_q$ equals 1 from 2011:Q2 onward. For this exercise, we use loan-level data obtained from CoreLogic's LLMA. The sample includes eight quarters before and after the policy change. The standard errors are clustered at the county level, following Johnston and Mas (2018).[31]

The key identification assumption is that, absent the policy change, the treated and control counties would have followed similar trends. To assess the validity of this parallel trends assumption, we estimate a dynamic version of the difference-in-differences model by interacting the $Missouri_s$ treatment indicator with quarter dummies. Using the quarter immediately before the policy change, 2011:Q1, as the benchmark period, we report the full set of coefficients in

[30]The control counties are located in Illinois, Iowa, Kansas, Kentucky, Nebraska, Oklahoma, and Tennessee. We exclude counties located in Arkansas since Arkansas reduced the UI duration during the sample period.

[31]Specifically, we follow the specifications reported in Table 7 of Johnston and Mas (2018), which uses a comparison of the bordering counties.

Table 5 – Impact of Missouri's 2011 UI Duration Cut on Mortgage Outcomes

	log(Mortgage)			Interest Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Missouri × Post	-0.030***	-0.029***	-0.020**	0.032**	0.040***	0.039***
	(0.007)	(0.003)	(0.009)	(0.014)	(0.013)	(0.007)
Controls & Fixed Effects:						
County FEs	✓	✓	✓	✓	✓	✓
County-Pair FEs	✓			✓		
Quarter FEs	✓			✓		
County-Pair × Quarter FEs		✓	✓		✓	✓
Missouri × trend			✓			✓
Obs.	1,095,698	1,095,698	1,095,698	1,095,698	1,095,698	1,095,698
R^2	0.083	0.084	0.084	0.598	0.599	0.599
Mean(Dep. var.)	11.874			4.290		

This table reports results from difference-in-differences regressions estimating the effect of Missouri's 2011 unexpected cut in UI duration on household mortgage outcomes. As the dependent variable, columns (1)-(3) use the log of mortgage amounts at origination; columns (4)-(6) use mortgage interest rate, weighted by loan amount at origination. The sample consists of only loans from counties located on state borders. Treated counties are located in Missouri; control counties are located in adjacent states: Illinois, Iowa, Kansas, Kentucky, Nebraska, Oklahoma, and Tennessee. *Post* indicator equals 1 for quarters after April 2011. Control variables and fixed effects are indicated at the bottom of each column. Standard errors are clustered at the county level and reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Figure 12. The figure illustrates that pre-trends are flat, with no statistically significant differences between treated and control counties prior to the policy change. Following the reduction in UI duration, however, we observe a decline in mortgage sizes and a corresponding increase in mortgage interest rates in Missouri counties relative to their neighbors. These findings reinforce the predictions of our model and support a causal interpretation of the estimated effects: generous UI benefits raise mortgage debt.

We evaluate the robustness of the causal effects of UI generosity on mortgage outcomes in Table 5. Columns (1) and (4) estimate the baseline specification from Equation 3, with county, county-pair, and quarter fixed effects to absorb time-invariant difference across counties and county-pairs, as well as time effects. Columns (2) and (5) further saturate the model with county-pair×quarter fixed effects, enabling more precise control for potential confounding factors by comparing neighboring counties within the same quarter. Finally, columns (3) and (6) allow for differential time trends by interacting the $Missouri_s$ treatment indicator with a linear time trend, relaxing the parallel trend assumption. Across all specifications, the results remain consistent: we estimate negative effects on mortgage size and positive effects on interest rates of a reduction in UI generosity. Given that the policy change represents a roughly 20 percent reduction in UI generosity, the coefficients in columns (3) and (6) imply a 2 percent decrease in mortgage amounts and an increase of nearly 4 basis points in mortgage interest rates. Overall, these results are in line with our model's predictions and confirm the effects of UI generosity on household balance sheets.

4.2 UI and the Global Financial Crisis

In this section, we test whether UI acts as a stabilizer during recessions or instead amplifies downturns, focusing on housing and mortgage market variables that are central to our theoretical framework. As argued in Section 3.2.3, the systemic risk associated with higher UI across the entire economy is not fully captured in cross-sectional analyses. Therefore, our empirical analysis, which leverages cross-sectional variation in UI, should be interpreted as providing lower-bound estimates of UI's potential destabilizing effects.

Following our earlier strategy, we exploit UI generosity variation across border counties and use the GFC as a laboratory. As in the Missouri analysis, we use CoreLogic data, which allows us to observe foreclosure rates, in addition to loan amounts and house prices. However, unlike in the Missouri setting, we aggregate loan-level observations to the county-month level to focus on county-level changes.

We estimate the following cross-sectional regression model:

$$y_c = \beta \ log(UI)_{s,94-99} + County - Pair \ FEs + Controls_{s(c)} + \epsilon_c \qquad (4)$$

where y_c is the dependent variable, for which we use three different measures to capture recession severity: ΔForeclosure is the change in the average county-level foreclosure rate from 2005-2007 period to 2008-2013 period; decline in mortgages is the drop in average mortgage amounts from the 2005-2007 peak to the 2008-2011 trough; decline in house prices is the corresponding peak-to-trough drop in house prices.[32] The main independent variable for this analysis is $\log(\text{UI})_{s,94-99}$, the log of average UI generosity between 1994 and 1999—the period preceding the housing boom–bust—which corresponds to the steady state in our theoretical model.[33] Control variables include other state-level policies that might be correlated with UI (i.e., minimum wage, health insurance payments, non-UI transfer payments, and union coverage) as well as county-level labor market variables such as average income, labor force size, and HHI for industry and deposit market concentration. All controls are averaged over 1994-1999 to match the UI measure. We cluster the standard errors at both state and border-segment level.[34]

Table 6 presents the estimation results. Each column includes county-pair fixed effects to compare counties within the same border pair. Columns (1)-(3) use ΔForeclosure as the outcome; columns (4)-(6) use the decline in mortgage amounts; and columns (7)-(9) use the decline in house prices. The baseline regressions in columns (1), (4), and (7) include only county-pair fixed effects. We find that counties with more generous UI benefits experienced larger increases in foreclosure rates, and larger declines in mortgage volumes and house prices in the aftermath of the GFC. To rule out confounding effects due to correlated state-level policies, columns (2), (5), and (8) include labor market-related state-level controls. Finally, columns (3), (6), and (9) add county-level labor-market and housing-market characteristics. Because counties within the same pair are likely to face similar economic shocks, these additional controls address residual differences in demographics or credit markets that might otherwise

[32] The reason why we use different recession end times is that, as shown in Figure F.13, the foreclosure rates stay elevated longer than the decline in mortgage volumes and house prices. In the Online Appendix, we show that our findings do not change when we use the same recession end times.

[33] As shown in the Online Appendix, our results are robust to using the pre-crisis period, i.e., 1999-2002 average, instead of 1994-1999 average.

[34] "A border segment is defined as the set of counties on both sides of a shared state "(footnote 17, (Dube, Lester and Reich, 2010)).

Table 6 – UI Generosity and Housing Market Dynamics During the GFC

	ΔForeclosure			Decline in Mortgages			Decline in House Prices		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\log(\mathrm{UI})_{94-99}$	0.007**	0.008**	0.008**	0.099*	0.105**	0.099**	0.180**	0.185**	0.183**
	(0.003)	(0.003)	(0.003)	(0.053)	(0.047)	(0.047)	(0.080)	(0.072)	(0.071)
County-Pair FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other state policies		✓	✓		✓	✓		✓	✓
County controls			✓			✓			✓
Obs.	1,966	1,966	1,966	1,966	1,966	1,966	1,966	1,966	1,966
R^2	0.668	0.675	0.679	0.682	0.684	0.687	0.687	0.690	0.692
Mean(Dep. var.)	0.012			0.498			0.684		

Notes: This table reports the relationship between UI generosity and the severity of housing market outcomes during the GFC. Columns (1)-(3) use changes in foreclosure rates as the outcome, columns (4)-(6) use the decline in mortgage amounts, and columns (7)-(9) use the decline in house prices. ΔForeclosure is defined as the change in average foreclosure rates from 2005-2007 period to 2008-2013 period. *Decline in Mortgages* and *Decline in House Prices* are defined as the difference between the peak value of each variable in 2005-2007 and the trough value in 2008-2011. The main independent variable is $\log(\mathrm{UI})_{94-99}$, the log of the average UI generosity between 1994 and 1999. Control variables and fixed effects are indicated at the bottom of each column. Other state policies include state-level log minimum wage, log health insurance payments, log non-UI transfer payments, and union coverage. County-level controls include the log average income, log labor force size, HHI for industry and deposit market concentration. Standard errors are two-way clustered at the state and border segment level and reported in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

bias the results. The estimated coefficients remain stable across specifications, supporting a causal interpretation.[35]

Our estimates suggest that counties with a 10 percent more generous UI benefits experience an 8 basis points larger change in foreclosure rates (about 6.7 percent of the sample mean), a 1 percentage point larger decline in mortgage amounts, and a 1.8 percentage point larger decline in house prices. Taken together, these results provide robust evidence that, consistent with our model's amplification mechanism, UI benefits may fail to act as an automatic stabilizer and instead exacerbate the severity of a recession by fueling excessive borrowing in the preceding boom.

[35] In the Appendix, we also report the results of the models, in which the end of the recession period is 2010 for the outcome variables, instead of 2011 and 2013.

5 Conclusion

This paper contrasts the two faces of unemployment insurance: its well-known role as an ex-post liquidity provider and its novel, destabilizing role as an ex-ante source of balance sheet vulnerability. We show that contrary to the common view, the ex-ante channel can dominate the ex-post liquidity effect, leading to a net destabilizing impact on the macroeconomy.

Our findings do not imply that UI is "bad," but rather that policymakers should not consider automatic stabilization as an additional reason for increasing benefits as this logic may backfire. We therefore refrain from making any normative arguments but instead provide a new perspective on the trade-offs inherent in designing social insurance.

Two interconnected mechanisms drive our results. First, higher UI reduces individual income risk, leading households to reduce precautionary savings and increase mortgage borrowing. Since default risk for households is also lower, banks offer better credit terms, further increasing household borrowing. As a result, household balance sheets become more vulnerable to adverse aggregate shocks. Second, since mortgages are assets on bank balance sheets, these balance sheets also become more susceptible to adverse aggregate shocks.

Our quantitative model demonstrates that these ex-ante balance sheet channels can dominate the ex-post liquidity effects of UI, leading to more significant economic downturns in more generous UI economies in response to negative aggregate shocks. We also confirm the predictions of the quantitative model for house prices and mortgage debt by providing evidence from the U.S. micro data.

Although we focus on UI in this paper to exploit cross-state variation, other government policies that provide insurance, such as welfare programs, social security, or progressive taxation, may similarly reduce precautionary savings and increase household leverage. Thus, taken together, the broader social safety net could have more substantial destabilizing effects. Extending the analysis to include such policies represents an interesting avenue for future research.

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APPENDIX

A Model Details

A.1 Household Decision Problems

The rate of return on household liquid wealth a is denoted by r_k. A household can be in one of three housing tenure status in the beginning of a period: (i) active renter, (ii) inactive renter, (iii) homeowner. Below we define the value functions and choices for each case.

Active Renters: An active renter entering the period with asset a, income shock z and employment status $k \in \{e, u\}$ has two choices: to continue to rent or purchase a house, i.e. $V^r = \max\left\{V^{rr}, V^{rh}\right\}$ where V^{rr} is the value function if she decides to continue renting and V^{rh} is the value function if she decides to purchase a house. An active renter who chooses to rent only makes housing services (s), consumption (c), and saving decisions (a') and continues to the next period as an active renter.1896.58

$$V_j^{rr}(a,z,k) = \max_{c,s,a' \geq 0} \left\{u(c,s) + \beta E V_{j+1}^r(a',z',k')\right\} \tag{A.1}$$
$$\text{s.t.} \quad c + a' + p_r s = wy(j,z) + a\left(1 + r_k\right)$$

where p_r the rental price and r_k is the rate of return on capital.

If an active renter chooses to purchase a house, she can access the mortgage market to finance her purchase. She chooses a mortgage debt level d that determines $q^m(d; a, h, z, j, k)$, the price of the mortgage at the origination, which will be a function of the current state of the household (current wealth a, income realization z, employment status k, and age j), house size h, and the amount of debt d. The housing services of the homeowner is assumed to be equal to the housing size: $s = h$. The value function of an active renter who buys a house is given by

$$V_j^{rh}(a,z,k) = \max_{c,d,h,a' \geq 0} \left\{u(c,h) + \beta E V_{j+1}^h(a',h,d,z',k')\right\} \tag{A.2}$$
$$\text{s.t.} \quad c + p_h h + \varphi_f I\left(d > 0\right) + a' = wy(j,z) + a\left(1 + r_k\right) + d\left(q^m(d; a, h, z, k, j) - \varphi_v\right)$$
$$d \leq p_h h\left(1 - \phi\right),$$

where w is the wage rate per efficiency unit of labor, p_h is the house price, δ_h is the house depreciation rate, φ_v is the variable cost of mortgage origination, φ_f is the fixed cost of mortgage origination, ϕ is the minimum downpayment requirement, and I is an indicator function.

Inactive Renters: Inactive renters are not allowed to purchase a house because of their default in previous periods. However, they can become active renters with probability π. Since they cannot buy a house, they only make housing services, consumption, and saving decisions. The value function of an inactive renter is given by

$$V_j^d(a,z,k) = \max_{c,s,a' \geq 0} \left\{u(c,s) + \beta\left[\pi E V_{j+1}^r(a',z',k') + (1-\pi) E V_{j+1}^d(a',z',k')\right]\right\} \tag{A.3}$$
$$\text{s.t.} \quad c + a' + p_r s = wy(j,z) + a\left(1 + r_k\right).$$

Homeowners:

A homeowner has four options: i.e., $V^h = \max\left\{V^{hh}, V^{hf}, V^{hr}, V^{hd}\right\}$, where V^{hh} is the value of staying as homeowner, V^{hf} is the value of refinancing,V^{hr} is the value of selling, and V^{hd} is the value of defaulting.

Stayer: A stayer, after making house maintenance payment and periodic mortgage payment, if there is any, makes consumption and saving decisions given her income shock, housing, mortgage debt, and assets

$$\begin{aligned} V_j^{hh}(a,h,d,z,k) &= \max_{c,a'\geq 0}\left\{u(c,h)+\beta E V_{j+1}^{h}\left(a',h,d',z',k'\right)\right\} \\ \text{s.t.}\quad c+\delta_h p_h h + a' + m &= wy(j,z) + a(1+r_k) \end{aligned} \tag{A.4}$$

where m is the periodic mortgage payment. Given the assumptions on the mortgage structure, the relation between mortgage debt d and mortgage payment m in a period is given by

$$d = m\left(1+\frac{1}{1+r_\ell}+\frac{1}{(1+r_\ell)^2}+...+\frac{1}{(1+r_\ell)^{J-j}}\right) \Leftrightarrow m(d) = d\frac{r_\ell(1+r_\ell)^{J-j}}{(1+r_\ell)^{J-j+1}-1} \tag{A.5}$$

Then, the remaining mortgage debt in the following period will be $d' = (d-m)(1+r_\ell)$. Notice that the homeowner needs to pay δ_h fraction of the house value as the maintenance cost to cover the depreciation of the house.

Refinancer: Refinancing requires paying the full balance of any existing debt and getting a new mortgage. We assume that refinancing is subject to the same transaction costs as new mortgage originations.

$$\begin{aligned} V_j^{hf}(a,h,d,z,k) &= \max_{c,d',a'\geq 0}\left\{u(c,h)+\beta E V_{j+1}^{h}(a',h,d',z',k')\right\} \\ \text{s.t.}\quad c+d+\delta_h p_h h+\varphi_f + a' &= wy(j,z)+a(1+r_k)+d'\left(q^m(d';a,h,z,k,j)-\varphi_v\right) \\ d' &\leq p_h h(1-\phi). \end{aligned} \tag{A.6}$$

Seller: Selling a house is subject to a transaction cost that equals fraction φ_s of the selling price. Moreover, a seller has to pay the outstanding mortgage debt, d, in full. A seller, upon selling the house, can either rent a house or buy a new one. Her problem is identical to a renter's problem.

$$V_j^{hr}(a,h,d,z,k) = V_j^r(a+p_h h(1-\varphi_s)-d,z,k)$$

Defaulter: A defaulter has no obligation to the bank. The bank seizes the house, sells it on the market, and returns any positive amount from the sale of the house, net of the outstanding mortgage debt and transaction costs, back to the defaulter. For the lender, the sale price of the house is assumed to be $(1-\varphi_e)p_h h$. Therefore, the defaulter receives $\max\{(1-\varphi_e)p_h h - d, 0\}$ from the lender. The defaulter starts the next period as an active renter with probability π. With probability $1-\pi$, she stays as an inactive renter

$$V_j^{hd}(a,d,z,k) = \max_{c,s,a'\geq 0}\left\{u(c,s) + \beta E\left[\pi V_{j+1}^{r}\left(a',z',k'\right) + (1-\pi)V_{j+1}^{d}\left(a',z',k'\right)\right]\right\} \tag{A.7}$$

$$\text{s.t.}\quad c + a' + p_r s = a(1+r_k) + wy(j,z) + \max\left\{(1-\varphi_e)p_h h - d, 0\right\}.$$

A.2 Banks

The banking sector structure follows Arslan, Guler and Kuruscu (2023). Let total bank lending done in the previous period be $L = L^k + \int_\lambda p_\ell(\lambda)\,\ell(\lambda)$, where L^k denotes loans to firms and $\ell(\lambda)$ the amount of mortgage loans, new and existing, extended to households with characteristics $\lambda \equiv (a,d,h,j,z,k)$, and the price of a unit mortgage loan be $p_\ell(\lambda)$. Then, the bank maximizes

$$\Psi(L,B) = \max_{\left\{c^B, L_k', \ell'(\lambda), B'\right\}}\left\{\log\left(c^B\right) + \beta_L \Psi\left(L',B'\right)\right\} \tag{A.8}$$

subject to

$$c^B + L_k' + \int_\lambda p_\ell(\lambda)\,\ell'(\lambda) = \omega + B',$$

with c_B is the banker's consumption, B' is the bank's borrowing amount, $L' = L_k' + \int_\lambda p_\ell(\lambda)\,\ell'(\lambda)$ is the bank's total lending amount, ω is the bank's current period net worth, r is the bank's borrowing rate, r_ℓ is the bank's lending rate, and

Net worth evolves according to $\omega' = \int_\lambda\int_{\lambda'} v^\ell(\lambda')\,\Pi(\lambda'|\lambda)\,\ell'(\lambda) + L_k'(1+r_\ell') - B'(1+r')$,with $v^l(\lambda) = m_\ell(\lambda) + p_\ell(\lambda)$ and $\Pi(\lambda'|\lambda)$ is governed by exogenous household characteristics and choices. Mortgage cash flow $m_\ell(\theta)$ depends on the homeowner's action:

$$m_\ell(\lambda) = \begin{cases} d & \text{if sell/refinance} \\ p_h h(1-\varphi_e) & \text{if default} \\ \frac{r_\ell(1+r_\ell)^{J-j}}{(1+r_\ell)^{J-j+1}-1}d & \text{if stay} \end{cases} \tag{A.9}$$

where the last line is the periodic payment for remaining maturity $J-j$, rate r_ℓ, and principal d.

Banks can default at the start of a period by diverting a fraction ξ of assets, refusing repayment; they are then excluded from banking but can save at rate r. Let the default value be $\tilde{\Psi}^D\left(\xi\tilde{L}'\right)$, where $\tilde{L}' = \int_\lambda\int_{\lambda'} v^\ell(\lambda')\,\Pi(\lambda'|\lambda)\,\ell'(\lambda) + L_k'(1+r_\ell')$. The expression $L' = L_k' + \int_\theta p_\ell(\lambda)\,\ell'(\lambda)$ is the investment, and $\tilde{L}'$ is the value of that investment after returns are realized. Investors lend so that default is not profitable in equilibrium. The enforcement constraint is therefore as $\Psi(L',B') \geq \tilde{\Psi}^D\left(\xi\tilde{L}'\right)$.

As shown in Arslan, Guler and Kuruscu (2023), the problem of bankers can be written as:

$$\Psi(L, B) = \max_{c_B, B', L'} \left\{ \log(c_B) + \beta_L \Psi\left(L', B'\right) \right\}$$

$$\text{s.t.} \quad c_B + L' = \omega + B' \tag{A.10}$$

$$(1-\eta)\left(1+r'_\ell\right) L' \geq \left(1+r'\right) B'. \tag{A.11}$$

η is the endogenous leverage constant which arises due to the possibility of bank default, and follows the law of motion: $\eta = \xi^{1-\beta_L} \left(\left(1+r'\right) / \left(1+r'_\ell\right) - \left(1-\eta'\right)\right)^{\beta_L}$ derived from the possibility of bank default as in Gertler and Kiyotaki (2015). It limits the amount of borrowing the bank can make. The evolution of bank net worth, ω, is given by $\omega = L(1+r_\ell) - B(1+r)$, where the amount of loans,

$p_\ell(\lambda)$ is given by the present discounted value of mortgage payments:

$$p_\ell(\lambda) = m_\ell(\lambda) + \frac{1}{1+r'_\ell} \int_{\lambda'} p_\ell\left(\lambda'\right) \Pi\left(\lambda' | \lambda\right) \tag{A.12}$$

where Π denotes the transition matrix of the household state including the endogenous states such as asset, debt and housing together with the exogenous ones such as age and income shocks, m_ℓ denotes the current period payments of the loan, which includes either the periodic mortgage payment, $m(d)$, if the mortgage holder keeps the current mortgage, or the mortgage principal, d, if the mortgage holder prepays either by selling the house or refinancing the mortgage, or the value of the foreclosed property, $\min\{p_h h(1-\varphi_e), d\}$, if the mortgage holder defaults on the mortgage.

The price of a mortgage at origination is given by:

$$q^m(d; \lambda)\, d = p_\ell(\lambda) \tag{A.13}$$

The default risk will show up in q^m as the difference between the mortgage debt at origination and mortgage price, $1 - q^m(d; \lambda)$, and this difference is paid by the household to the lender at the origination as upfront fees to reduce the mortgage interest rate to the risk free mortgage rate. In the absence of any default risk $q^m(\lambda) = 1$.

A.3 Good-producing Firms

A perfectly competitive firm maximizes

$$\max_{K, N, u} \mathbb{Z} K^\alpha (Nu)^{1-\alpha} - (r_k + \delta) K - (1 + \mu r_\ell)\, w(\bar{w}, u)\, N. \tag{A.14}$$

where $\mathbb{Z}$ is the aggregate productivity, N is the number of workers, u is the labor utilization rate (average hours per worker), K is capital, and w is the wage per labor efficiency unit, given by $w(\bar{w}, u) = \bar{w} + \vartheta \frac{u^{1+\psi}}{1+\psi}$, with $\bar{w}$ representing the base wage rate.

A.4 Real Estate Companies

The objective of the company is to maximize its total market value $V^{rc}(H_r)$:

$$\begin{aligned} V^{rc}(H_r) &= \max_{H_r'} \frac{1}{1+r_k}\left(d_r + V\left(H_r'\right)\right) \\ s.t. \quad d_r &= (p_r - \kappa) H_r' + p_h (1-\delta_h) H_r - p_h H_r' - \frac{p_h (H_r - H_r')^2}{2}. \end{aligned} \tag{A.15}$$

where H_r is the units of housing stock that rental company owns, $p_h (H_r - H_r')^2$ is the quadratic adjustment cost proportional to house price, κ is the per-period maintenance cost, and d_r is the dividend to shareholders.

The solution to this problem gives us the equation for the rental prices:

$$p_r = \kappa + p_h\left(1 + H_r' - H_r\right) - \frac{p_h' (1 - \delta_h + H_r'' - H_r')}{1+r_k} \tag{A.16}$$

A.5 Government

Government runs the social security and the UI programs. Both programs are balanced-budget programs, i.e. the costs of the programs are solely financed through taxes. Social security program taxes are collected from working age population including the unemployed. UI taxes are collected from employed individuals. Thus, these taxes need to satisfy the government's budget constraints:

$$\sum_{j=1}^{J_R}\sum_{k\in\{e,u\}}\sum_{z^k}\tau_s \exp(f(j)+z_j^k)\Gamma_{j,k}\left(z^k\right) = \sum_{j=J_R+1}^{J}\sum_{z} y_R(j,z)\Gamma_j(z) \tag{A.17}$$

$$\sum_{j=1}^{J_R}\sum_{z^e}\tau_u \exp(f(j)+z_j^e)\Gamma_{j,e}(z^e) = \theta\sum_{j=1}^{J_R}\sum_{z^u}\exp(f(j)+z_j^u)\Gamma_{j,u}(z^u) \tag{A.18}$$

where $\Gamma_{j,k}$ represents the marginal distribution of individuals over labor efficiency shocks conditional on age j and employment status k.

A.6 Definition of Equilibrium

We provide the definition of equilibrium for the steady state. The equilibrium definition for the transition is similar.

Definition 1. A Stationary Competitive Equilibrium is a collection of value functions for households, V^o ($o \in \{h,r,d\}$), for banks V^B, for real estate companies, V^{rc}, policy functions for households' consumption (g_c), saving (g_a), housing services (g_s), housing stock (g_h), mortgage debt (g_d), tenure decisions (g_o), firms' labor (N), capital (K), utilization (u), real estate companies' housing stock (H_r), banks' consumption (c_B), loans $\left(\ell, L^k, L\right)$, borrowing ($B$), prices for labor ($w$), capital ($r_k$), houses ($p_h$), rental properties ($p_r$), loans ($r_\ell, q^m$), taxes ($\tau_s, \tau_u$), and a stationary distribution (Γ) such that

1. Given prices and taxes, policy functions for households solve households' problems in equations A.1-A.7, and V^o is the associated value functions for households.

2. Given prices, firms' policy functions (K, N, u) solve firms' problem in equation A.14.

3. Given prices, real estate companies' policy function (H_r) solves equation A.15.

4. Given prices, banks' policy functions(c_B, L, B) solve equation A.11.

5. q^m solves equation A.13.

6. Given stationary distribution Γ, markets clear:

$$\text{asset market: } \int a d\Gamma(\lambda) = A = K + V^{rc}(H_r)$$
$$\text{labor market: } N = 0.945$$
$$\text{housing market: } \int h d\Gamma(\lambda) + H_r = H = \bar{H}$$
$$\text{credit market:} L^k + \int_{\lambda} p_{\ell}(\lambda)\, \ell(\lambda) = L$$

   where $L^k = \mu w(\bar{w}, u) N$ is the firm's borrowing, $\ell(\lambda) = \Gamma(\lambda)$, i.e. banks' mortgage holding is equal to the demand for mortgages by households, and p_ℓ is given by equation A.12.

7. Given stationary distribution Γ, the government runs balanced-budget, i.e. $\{\tau_s, \tau_u\}$ solve equations A.17 and A.18.

8. The distribution Γ is stationary and consistent with the policy functions of households:

$$\Gamma = G(\Gamma)$$

   where the mapping G is obtained through the policy functions of households and evolution of exogenous states.

B Auxiliary Quantitative Results

B.1 Life-Cycle Dynamics in the Steady-state

Consistent with the earlier literature, consumption is hump-shaped and more than doub1897.29les from age 21 to 55 in all economies. But the rise of consumption is higher in lower UI economies (Figure B.1, top-left panel). Homeownership rate and mortgage debt start lower in the 20-percent UI economy (Figure B.1, top-middle and -right panels).

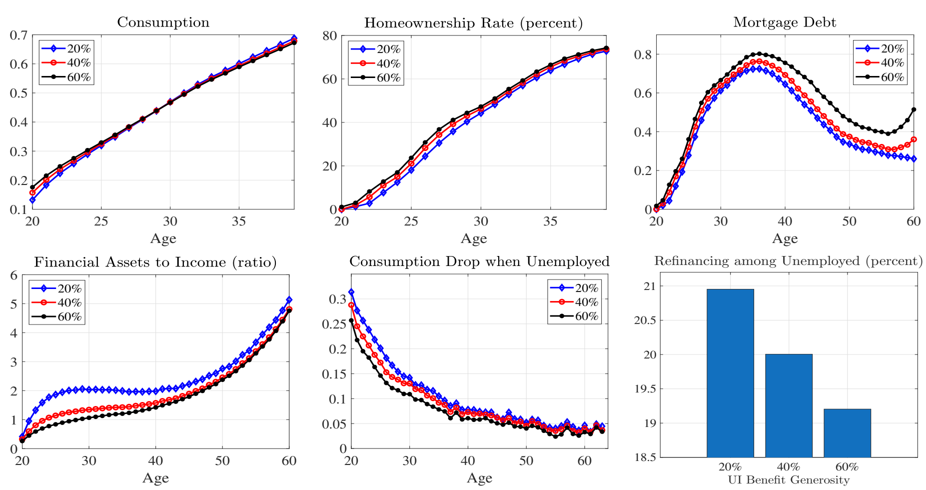
Liquid asset holdings of households decline as UI gets more generous (Figure B.1, middle panels). Over the life-cycle, households in the 20-percent UI economy accumulates financial assets faster. A similar picture arises when we compare financial assets to debt (for both owners and new buyers).

For all these results, the dynamics of income risk plays a crucial role. When UI generosity declines, the precautionary saving motive becomes more powerful, which keeps consumption and housing low at young ages. As unemployment risk declines with age, consumers start to consume their savings. On top of that, default cost lowers the mortgage demand over the life cycle.

Both the decline in consumption when unemployed and the effect of benefits on the consumption drop are in line with the estimates found in the literature (Figure B.1, lower-left panel). For example, Ganong and Noel (2019) document that household consumption declines by about 10 percent upon unemployment. Regarding the effects of UI generosity, Gruber (1997) and more recently Kroft and Notowidigdo (2016) find that a 10 percentage point increase in UI generosity leads to about a 2.8 percent reduction in the fall in consumption upon job loss.

UI also affects the refinancing activity (Figure B.1, lower-right panel). Once unemployed, households tap into their home equity and refinance. However, refinancing is larger for lower

Figure B.1 – UI and Life-Cycle Dynamics



Notes: The graph plots life-cycle dynamics of key variables in the steady-state for different UI benefit levels. "Consumption drop" is the average of consumption drops of recently unemployed relative to their consumption when employed during the previous period. "Refinancing" is the percent of individuals who refinance. Consumption and homeownership rate graphs are plotted for ages between 20 and 40 to make the differences visible.

UI economies as the UI benefits are not enough to smooth the decline in consumption. This suggests that UI and refinancing act like substitutes. The widespread use of refinancing among unemployed is consistent with the recent findings in Braxton, Herkenhoff and Phillips (2020) that suggest unemployed individuals maintain significant access to credit.

C Micro Data

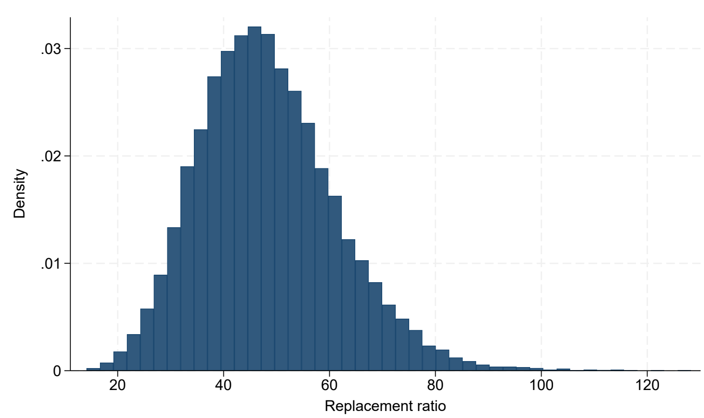
C.1 Summary Statistics and Additional Empirical Evidence

There is significant variation in effective replacements rates, measured by the ratio of the maximum UI benefit to 6-month median county income (Figure C.2). A significant part of this variation is attributable to the numerator (maximum benefit level), which increases by around two and a half-fold from the lowest to the highest maximum replacement rate. The remaining variation is accounted for by differences in county median income levels.

Next we describe the three samples that we use in our analyses and reports the summary statistics. In all three samples, we use both mortgages for purchases, second-lien and refinance mortgages as the mechanisms that our model illustrates also apply to them. We use mortgage values at the origination and remove mortgages with values below 10,000 USD and above 10,000,000 USD from our sample to reduce the influence of outliers. In addition, we remove county-month observations if the number of mortgages is lower than five in the county-month cell. Our results do not change when we do not apply these filters. We follow the literature and calculate the UI generosity by multiplying the maximum weekly amount of UI benefits a person can get with the UI duration measured in weeks.

Panels (a) and (b) of Table C.1 provide the summary statistics of the analysis reported in Table 4. The sample period in this analysis is between 1990 and 2008 for the CoreLogic sample and 1994 and 2008 for the HMDA sample. These samples end in 2008 due to the increases in UI duration after 2008, which change the automatic stabilizing nature of UI benefits. The mean value of the log(Mortgage) in this sample is 11.83 in the CoreLogic sample and 11.86 in the HMDA sample. The mean value of log(UI) is around 2.20. Reflecting the state-level heterogeneity in UI benefits, this variable has a standard deviation of 0.30. Panel (c) of Table

FIGURE C.2 – Variation in UI replacement rates ($\frac{\text{maximum UI benefit}}{\text{county median income}}$) in US Counties



C.1 provides the summary statistics of the analysis reported in Table 5. We use a symmetric sample duration of eight quarters surrounding the unexpected change in Missouri's UI duration, which happened in April 2011. Therefore, our sample starts in April 2009 and ends in June 2013. The sample includes counties located on state borders of Missouri, Illinois, Iowa, Kansas, Kentucky, Nebraska, Oklahoma, and Tennessee. Arkansas is not a part of the sample as it changed its UI duration in the same period. Panel (a) of FigureF.11 depicts the counties used in this analysis. The average mortgage value in this sample is around 162 thousand USD and the average mortgage interest rate is 4.29.

Regarding the analysis reported in Table 6, we first describe the sample and variables before discussing the summary statistics. As explained in Section 4.2, we use neighboring counties on the state borders, depicted in Panel (b) of FigureF.11, and estimate a cross-sectional regression model in this analysis. As we are interested in county-level behavior, we aggregate loan-level data to county-month level. We use the period between 1994 and 1999 as the base period. Reflecting this, we take the averages of the main independent variable and control variables during this period and include them in logarithms. The mean of log(UI) during this period is 1.90 with a standard deviation of 0.23. We use changes in foreclosure rates, mortgage amounts, and house prices before and after the GFC as the dependent variables. There are three details to be noticed. First, to keep the interpretation straightforward, we subtract post-GFC values from pre-GFC values for foreclosure, and pre-GFC values from post-GFC values for mortgages and house prices. Thus, the positive coefficients for all models would imply a deterioration in stability for all three dependent variables. Second, we use different post-GFC periods for foreclosures and mortgages and house prices, while using the period between 2005 and 2007 as the pre-GFC period. The reason is that the changes in foreclosure rates happened later than mortgages and house prices (Figure F.13). In particular, we use 2008 and 2013 for foreclosure rates and 2008 and 2011 for mortgages and house prices. Third, to capture the changes in the housing market more accurately, we use the maximum values during the pre-GFC period and the minimum values during the post-GFC period for mortgages and house prices. As reported in panel (d) of Table C.1, the mean values of changes in foreclosure rate, mortgage amounts, and house prices are 1, 50, and 68 percent, respectively.

Table C.1 – Summary Statistics

	N	Mean	SD	25^{th} perc.	Median	75^{th} perc.
Panel a-CoreLogic Sample						
log(Mortgage)	115,155,647	11.80	0.66	11.36	11.79	12.23
Interest Rate (%)	113,136,053	6.77	1.63	5.88	6.63	7.50
log(UI)	115,155,647	2.16	0.29	1.97	2.15	2.36
log(Income)	115,155,647	16.50	1.64	15.44	16.71	17.67
log(Health Insurance)	115,155,647	15.78	1.01	15.13	15.78	16.45
log(Non-UI Transfers)	115,155,647	15.22	1.10	14.46	15.24	16.06
Union Coverage (%)	115,155,647	14.46	6.11	8.40	16.10	18.60
log(Minimum Wage)	115,155,647	1.66	0.20	1.64	1.64	1.82
log(Labor Force)	115,155,647	12.35	1.52	11.36	12.54	13.40
HHI(emp.)	115,155,647	545.43	185.69	449.25	505.78	582.29
HHI(dep.)	115,155,647	1613.94	1024.82	981.58	1345.27	1900.89
Panel b-HMDA Sample						
log(Mortgage)	115,716,494	11.84	0.79	11.36	11.91	12.38
log(UI)	115,716,494	2.18	0.30	1.97	2.17	2.37
log(Income)	115,716,494	16.47	1.59	15.39	16.65	17.63
log(Health Insurance)	115,716,494	15.76	0.99	15.12	15.74	16.40
log(Non-UI Transfers)	115,716,494	15.17	1.08	14.42	15.15	15.95
Union Coverage (%)	115,716,494	14.77	5.98	8.90	16.40	18.70
log(Minimum Wage)	115,716,494	1.66	0.20	1.64	1.64	1.82
log(Labor Force)	115,716,494	12.32	1.47	11.33	12.48	13.33
HHI(emp.)	115,716,494	541.47	179.29	449.25	504.83	579.90
HHI(dep.)	115,716,494	1590.94	935.68	989.67	1356.96	1900.01
Panel c-Missouri Sample						
Mortgage	1,095,698	162978.47	83391.78	103344.00	145938.00	202257.00
Mortgage rate	1,095,698	4.29	0.76	3.75	4.25	4.88
Panel d-Stability Sample						
Δln(Mortgage)$^{08-11}$	1,966	0.50	0.32	0.27	0.45	0.68
Δln(House Price)$^{08-11}$	1,966	0.68	0.43	0.36	0.60	0.91
log(UI)$^{94-99}$	1,966	1.90	0.23	1.73	1.90	2.07
log(Income)$^{94-99}$	1,966	13.59	1.40	12.63	13.42	14.37
log(Minimum Wage)$^{94-99}$	1,966	1.54	0.21	1.56	1.64	1.64
log(Health Insurance)$^{94-99}$	1,966	14.75	0.98	14.17	14.84	15.28
log(Non-UI Transfers)$^{94-99}$	1,966	14.17	1.00	13.62	14.26	14.65
Union Coverage$^{94-99}$ (%)	1,966	13.57	5.25	9.00	12.30	17.90
log(Labor Force)$^{94-99}$	1,966	9.74	1.32	8.82	9.62	10.55
HHI(emp.)$^{94-99}$	1,966	674.60	479.55	471.14	556.45	711.15
HHI(dep.)$^{94-99}$	1,966	2916.85	1772.16	1721.81	2346.82	3558.81

Notes: This table provides summary statistics for the three analyses we perform. Panel A and B present the summary statistics for the analysis reported in Table 4. Panel B presents the summary statistics for the analysis reported in Table 5. Panel C presents the summary statistics for the analysis reported in Table 6.

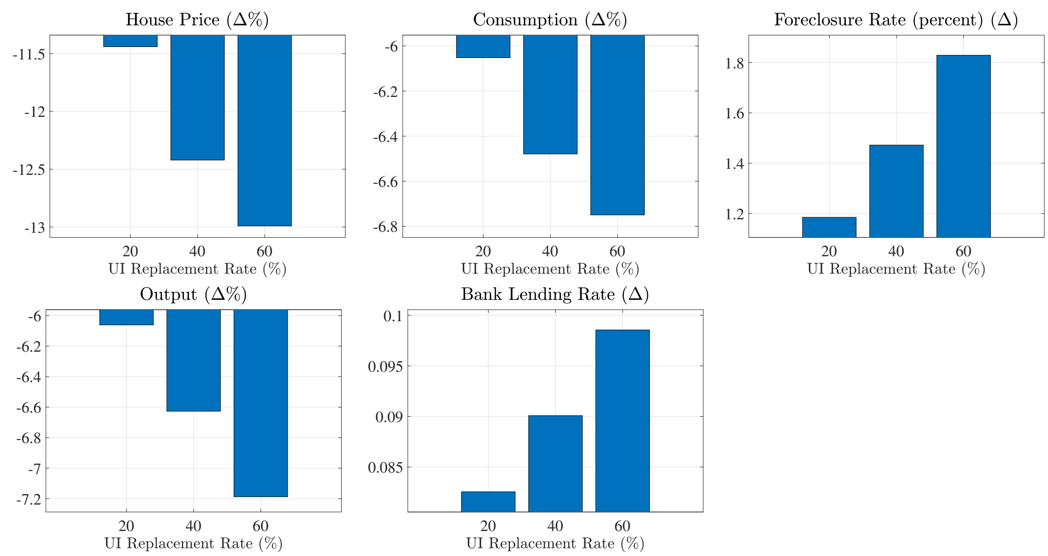
Online Appendix

D Further Quantitative Analysis

D.1 Boom-bust Dynamics under Alternative Aggregate Shocks

In this section, first, we solve the boom-bust dynamics without the unemployment shock during the bust. In fact, without the unemployment shock the destabilizing effects of UI become even stronger (Figure D.3). The main reason for the more amplified results is that when the unemployment rate does not increase during the bust, one channel that UI can stabilize gets closed. Therefore, the balance sheets channels become relatively stronger, amplifying the busts more.

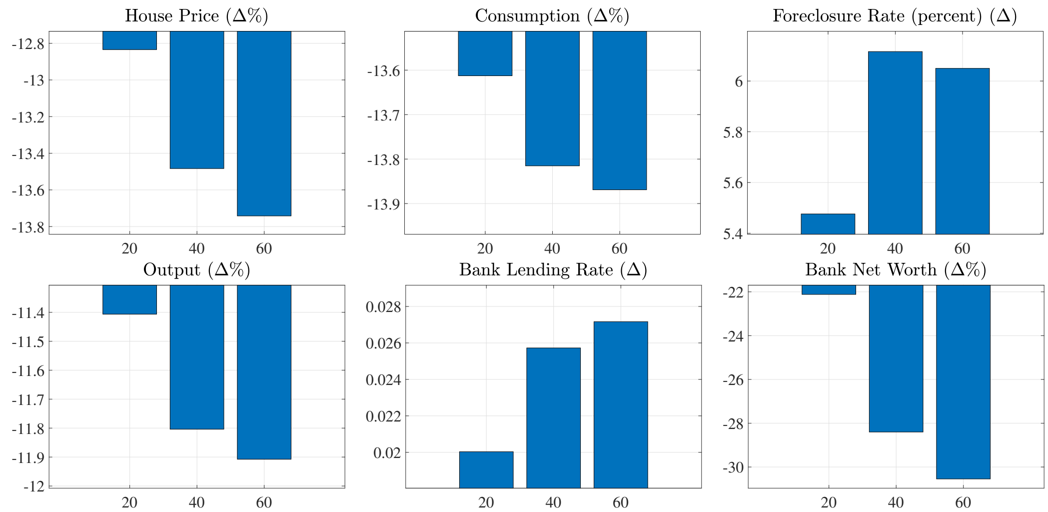
FIGURE D.3 – Destabilizing Effects of UI without the Unemployment Shock during the Bust



Notes: The graph plots the dynamics of key variables during the bust episode. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state. The difference from our benchmark is that and in the benchmark the unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Here, we do not give that shock. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

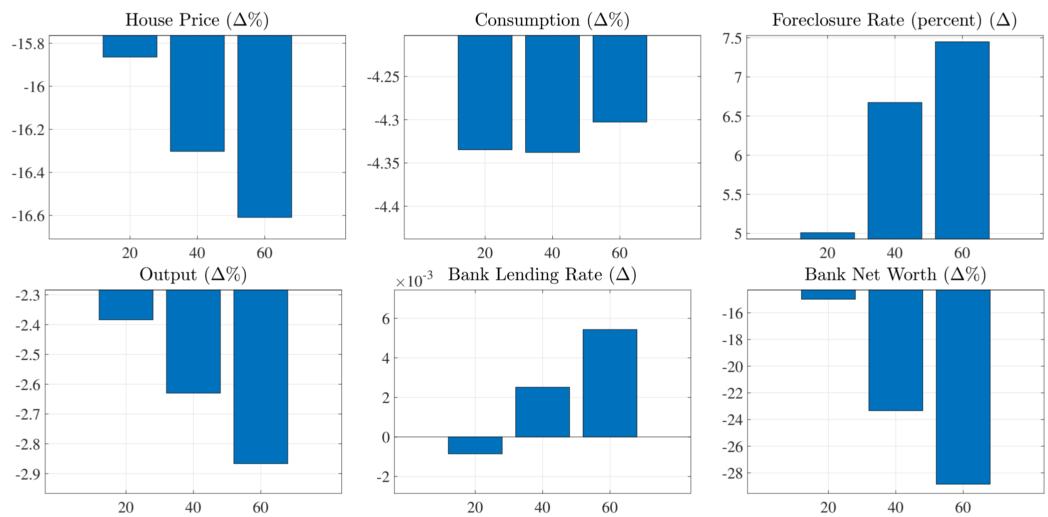
Next, we solve the dynamics of the model with productivity and house price expectation shocks. Our results suggest that main conclusions mostly do not change with these alternative shocks. In both cases we choose the size of the shocks so that we have a similar-sized boom in house prices with the benchmark. With the productivity shock, model dynamics are very similar to the dynamics with our benchmark. And more generous UI destabilizes the economies. With the expectation shock, the only difference is that consumption becomes more stable as UI generosity increases. The reason is that during the bust, the decline in house price expectations lower credit demand. As a result, bank lending rate barely increases. Therefore, the bank balance sheet mechanism ceases to exist. As we showed in Section 3.2.3 consumption becomes more stable without the bank balance sheet mechanism.

Figure D.4 – Destabilizing Effects of UI with Aggregate Productivity Shocks



Notes: The graph plots the dynamics of key variables during the bust episode. The shock during the boom is a gradual increase in productivity. During the bust, productivity reverses to the initial steady-state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

Figure D.5 – Destabilizing Effects of UI with House Price Expectation Shocks



Notes: The graph plots the dynamics of key variables during the bust episode. The shock during the boom is an expectation shock: everyone in the economy expects that house prices will increase by about 19 percent. During the bust, expectation reverses to the initial steady-state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

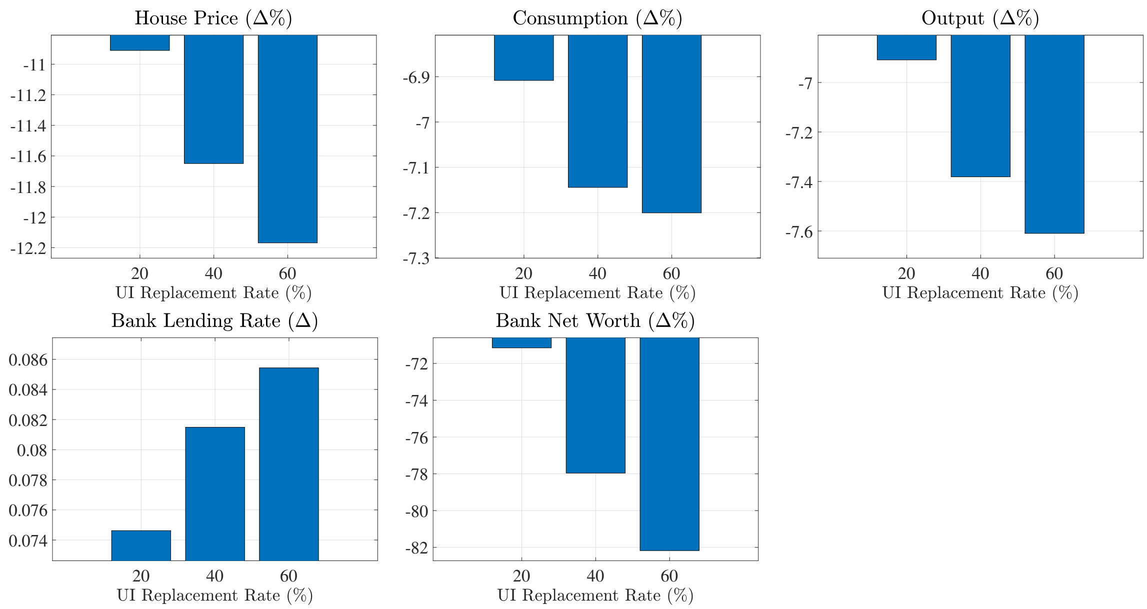
D.2 The Role of Foreclosures

The literature on mortgage default presents varied perspectives on its key determinants, with ongoing debates regarding the relative importance of strategic default driven purely by negative equity versus defaults triggered by liquidity constraints and adverse income shocks (the "double-trigger" hypothesis). To ensure that our core findings regarding the destabilizing effects of UI are not contingent on the specific modeling of the default decision, we conduct a robustness exercise where the possibility of mortgage default is entirely eliminated. This counterfactual scenario allows us to isolate the impact of the ex-ante balance sheet vulnerabilities induced by UI, abstracting from the direct losses banks incur due to foreclosures during the bust.

Figure D.6 shows that the destabilizing effects of UI are robust even in the absence of the foreclosure channel. Economies with more generous UI still experience deeper contractions during the bust, characterized by larger declines in house prices, consumption, output, and bank net worth, as well as a sharper increase in the bank lending rate.

This occurs because the fundamental vulnerabilities remain. Closing the default risk mutes the “banks offering looser mortgage terms” in higher UI economies channel that we mentioned earlier. However, still, as UI become more generous, households save less, and borrow more as their income risk declines. As a result, in this case as well, households and banks in high-UI economies enter the recession with higher leverage and lower precautionary savings, amplifying the negative wealth effects when house prices fall. Furthermore, while banks do not incur foreclosure losses in this scenario, they are exposed to significant valuation risk. Since banks in high-UI economies hold a greater proportion of long-term mortgage assets, the increase in the equilibrium lending rate during the bust leads to a more significant decline in the market value of these assets. This valuation loss erodes bank net worth more severely than in low-UI economies, leading to a larger contraction in credit supply and exacerbating the downturn.

Figure D.6 – Destabilizing Effects of UI without the Foreclosure Channel



Notes: The graph plots the dynamics of key variables during the bust episode. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years.. Here, we close the foreclosures so that foreclosures do not increase. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

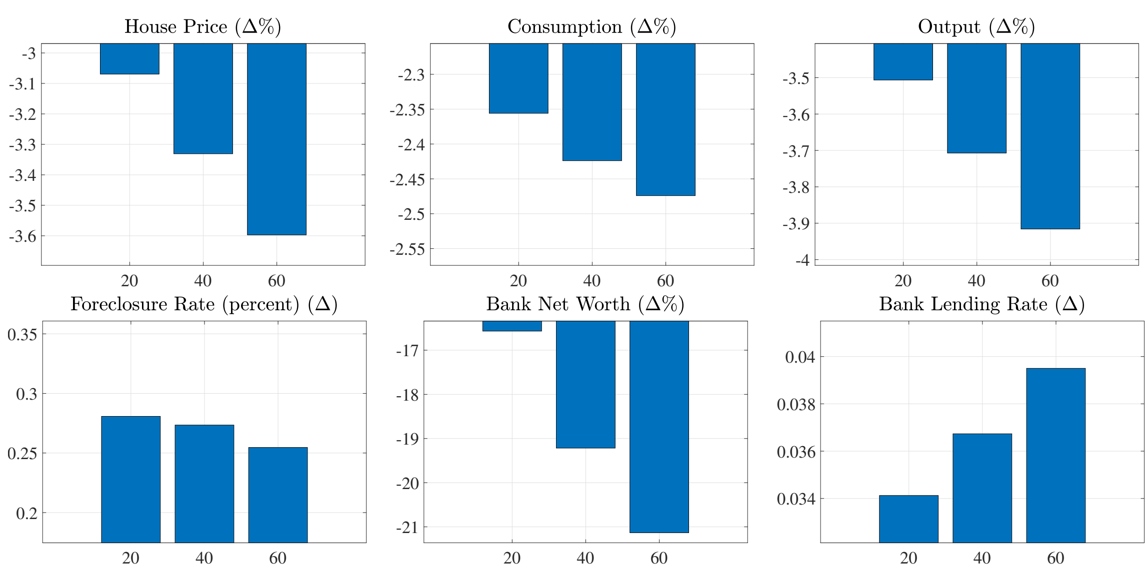
D.3 Model Dynamics with Temporary Shocks

The benchmark analysis utilizes unexpected shocks to the bank borrowing rate that are perceived by agents as permanent. To verify that the destabilizing effects of UI are not contingent on the permanence of the shock, we examine the model's dynamics under temporary aggregate shocks. In this experiment, we subject the economies to an unexpected 200 basis point increase in the bank borrowing rate that follows an AR(1) process with a persistence of 0.6. We also incorporate a corresponding temporary rise in the unemployment rate, calibrated to increase by approximately half the magnitude of the decline in output.

Figure D.7 confirms that our main conclusions are robust to the persistence of the shock. Economies characterized by permanently higher UI generosity experience greater vulnerability and experience more severe recessions, even when the downturn is temporary. The declines in house prices, consumption, and output are all amplified as the UI replacement rate increases from 20 to 60 percent. For example, output declines by nearly 3.9 percent in the 60-percent UI economy, compared to approximately 3.5 percent in the 20-percent UI economy. These amplified effects are driven by the balance sheet mechanisms highlighted in the benchmark: greater ex-ante leverage leads to a more substantial decline in bank net worth (21 percent vs. 16.5 percent) and a sharper increase in the bank lending rate in the high-UI economy, exacerbating the downturn.

Interestingly, the foreclosure rate displays a slight non-monotonicity, increasing less in the 60-percent UI economy compared to the 40-percent UI economy. This pattern suggests that the insurance channel of UI may be relatively more effective in preventing defaults when households anticipate the downturn to be short-lived and the decline in house prices is smaller.

FIGURE D.7 – Destabilizing Effects of UI with Temporary Shocks



Notes: The shock is temporary rise in interest rates with 0.6 persistence. Unemployment rate increases by about half of the decline in output. Once the shocks are realized there is perfect foresight.

E Robustness with Respect to Model Parameters

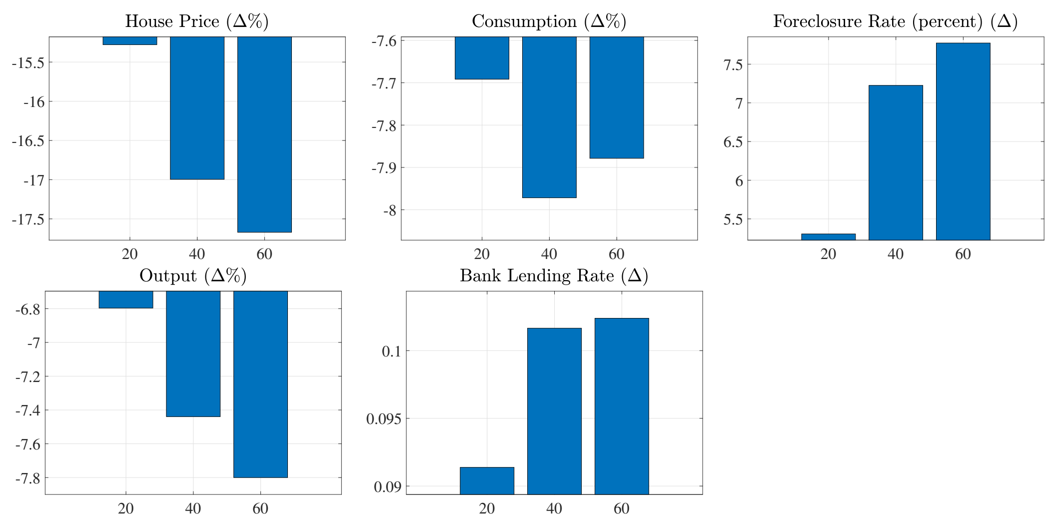
To ensure the robustness of our quantitative findings, we conduct several sensitivity analyses by recalibrating the model with alternative values for key parameters. This appendix presents the results of these exercises, focusing on parameters that govern household preferences (elasticity of intertemporal substitution and risk aversion), and the responsiveness of labor income to financial conditions (wage curvature). We examine how the economy responds to the benchmark boom-bust shocks under these alternative parameterizations, comparing outcomes across different levels of UI generosity.

The results, presented in below figures, confirm that our central conclusion is qualitatively robust across a wide range of plausible parameter values. In all scenarios examined, economies with permanently higher UI generosity experience greater balance sheet vulnerabilities ex-ante and consequently experience deeper contractions during the bust. Specifically, higher UI consistently leads to larger declines in output, consumption, and house prices, accompanied by a more significant tightening of financial conditions, as evidenced by the larger increase in the bank lending rate.

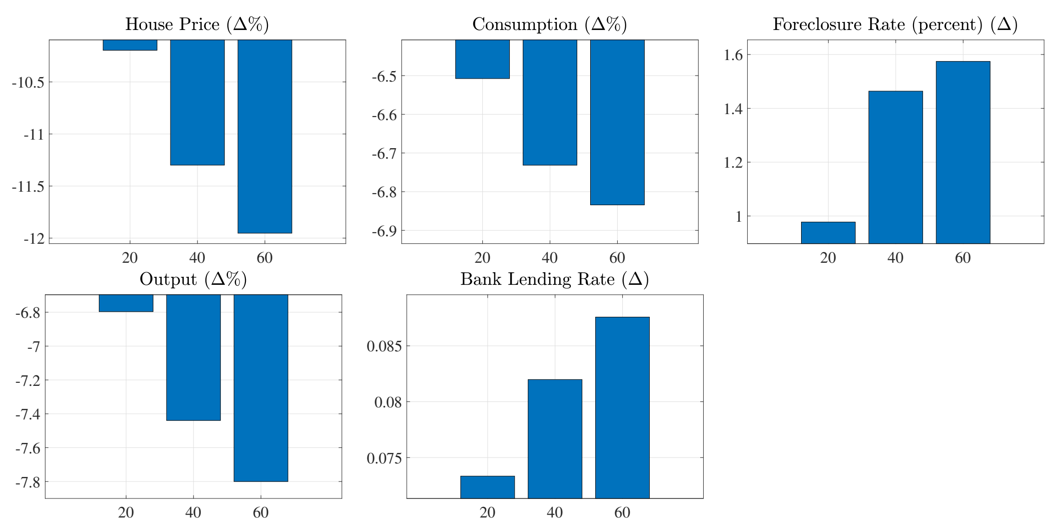
E.1 Alternative Preference Parameters

Figure E.8 – Destabilizing Effects of UI with Alternative EIS Parameters

Panel A: Low EIS ($\epsilon = 1$)



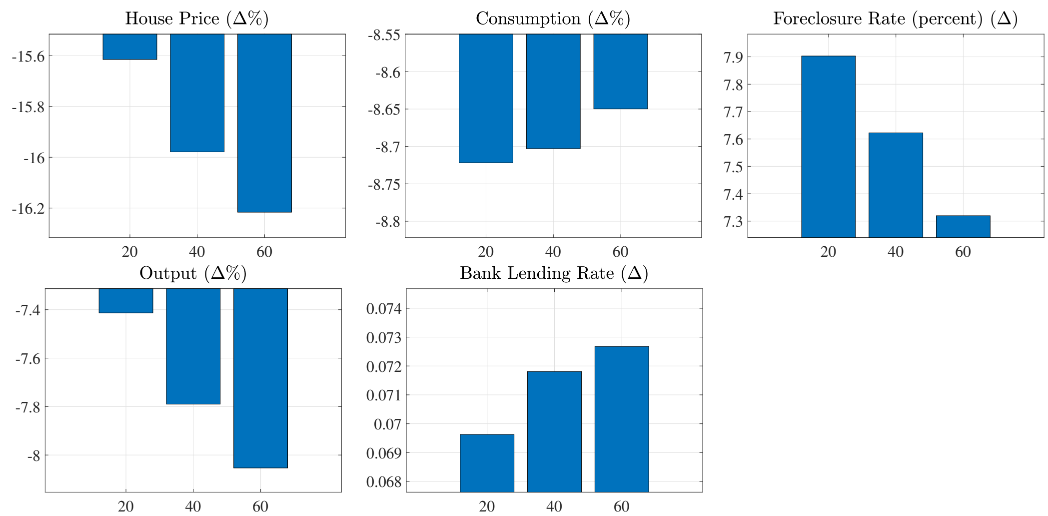
Panel B: High EIS ($\epsilon = 0.5$)



Notes: The graph plots the dynamics of key variables during the bust episode for different levels of elasticity of substitution between consumption and housing services. The benchmark value for this parameter is 0.8. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

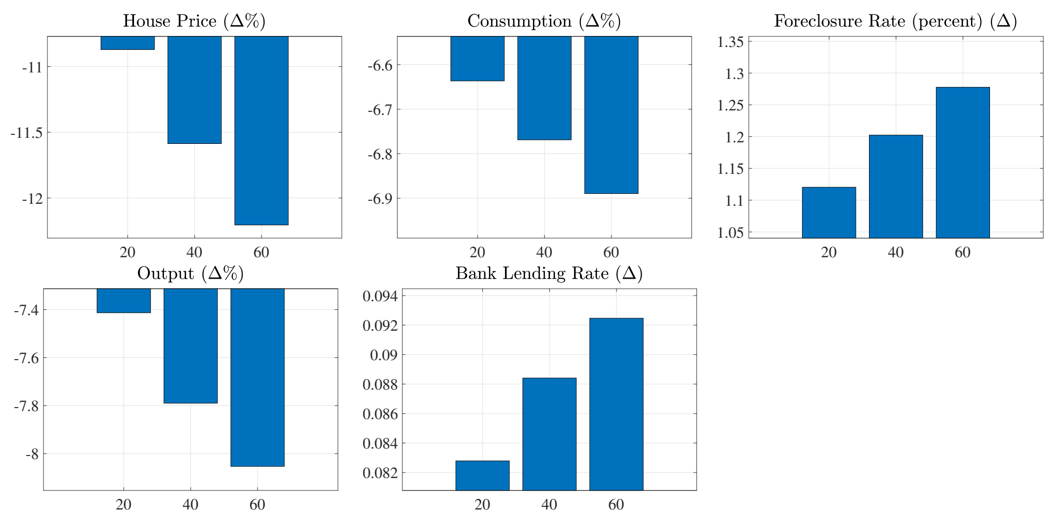
Figure E.9 – Destabilizing Effects of UI with Alternative Risk Aversion Parameters

Panel A: Low Sigma ($\sigma = 2$)



Panel B: High Sigma ($\sigma = 8$)

percent

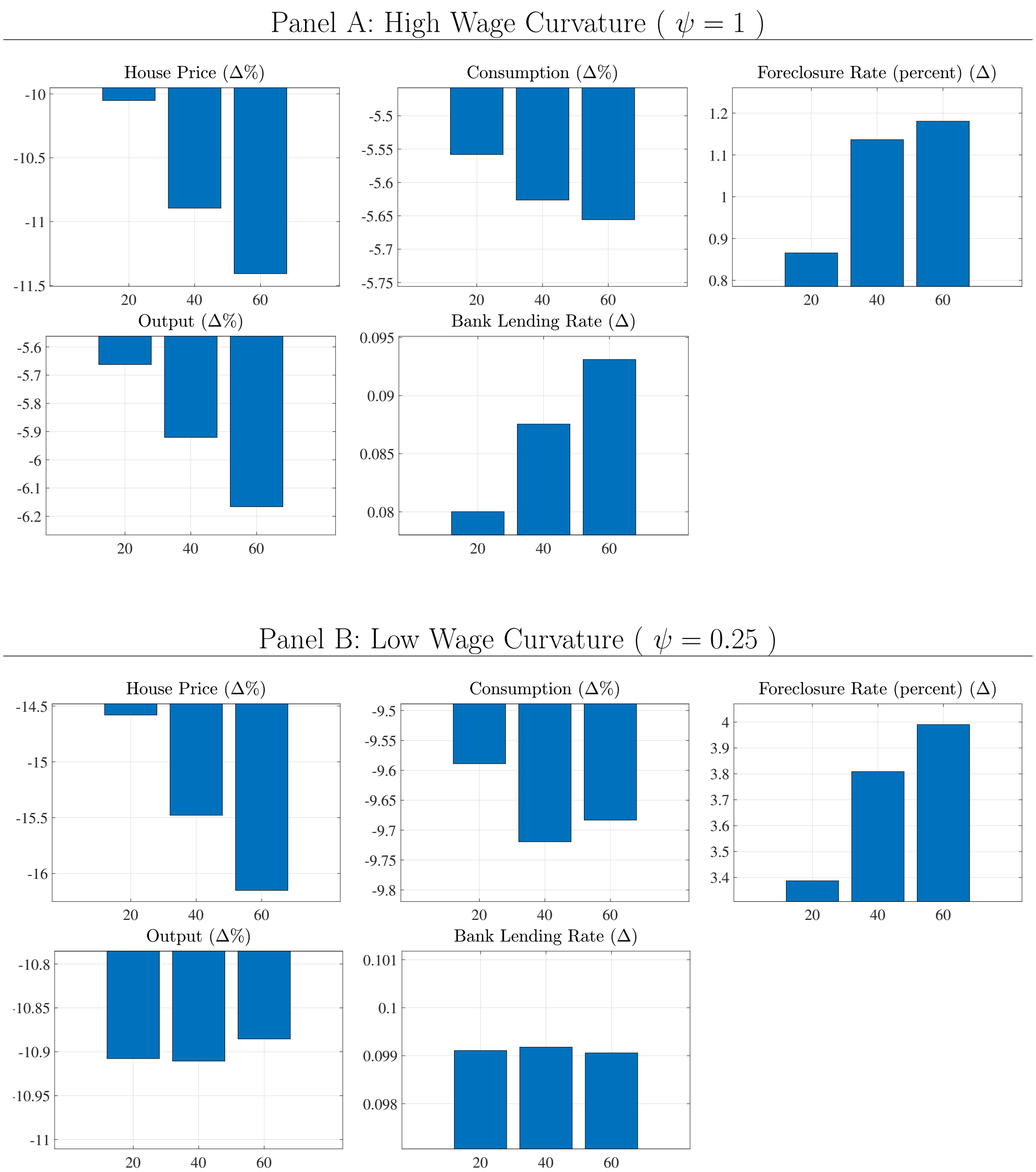


Notes: The graph plots the dynamics of key variables during the bust episode for different levels of risk aversion in household preferences. The benchmark value for this parameter is 4. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.0.078

0.36

E.2 Alternative Wage Curvature Parameters

FIGURE E.10 – Destabilizing Effects of UI with Alternative Wage Curvature Parameters



Notes: The graph plots the dynamics of key variables during the bust episode for different levels of curvature in the wage function in firm's problem. The benchmark value for this parameter is 0.5. The shock during the boom is a gradual decline in interest rates from 3 to 2 percent. During the bust, interest rates reverse to the initial steady state and unemployment rate increases to 9.5 percent and declines back to 5.5 percent linearly in 6 years.. Both the boom and bust shocks are unexpected. But, once realized there is perfect foresight.

F Further Empirical Analysis

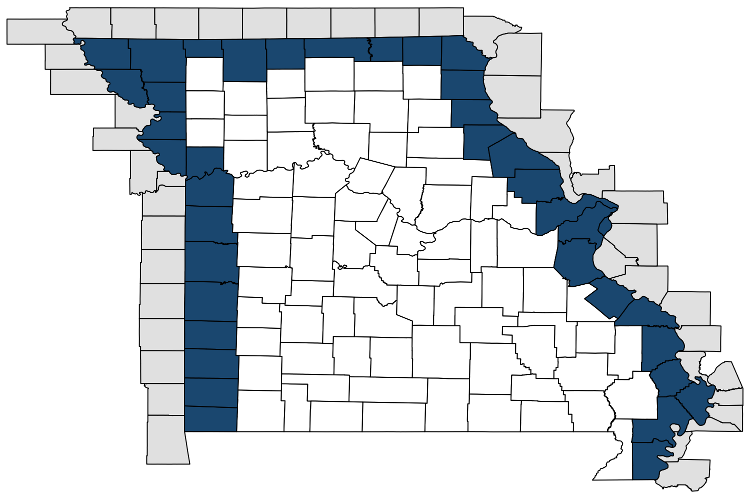
Table F.2 – Loan-to-Income Ratio and UI Generosity

	Loan-to-Income Ratio						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log(UI)	0.387***	1.084***	0.689***	0.408***	0.363***	0.427***	0.386***
	(0.057)	(0.055)	(0.108)	(0.093)	(0.089)	(0.093)	(0.081)
Controls & Fixed Eff:							
Controls					✓	✓	✓
State FE		✓					
County FE			✓	✓	✓	✓	✓
Year FE				✓	✓	✓	✓
Bank FE						✓	
Bank × Year FE							✓
Observations	115,716,494	115,716,494	115,716,494	115,716,494	115,716,494	115,716,494	115,716,494
R^2	0.042	0.102	0.120	0.125	0.126	0.183	0.208
Mean(Dep. var.)	4.933						

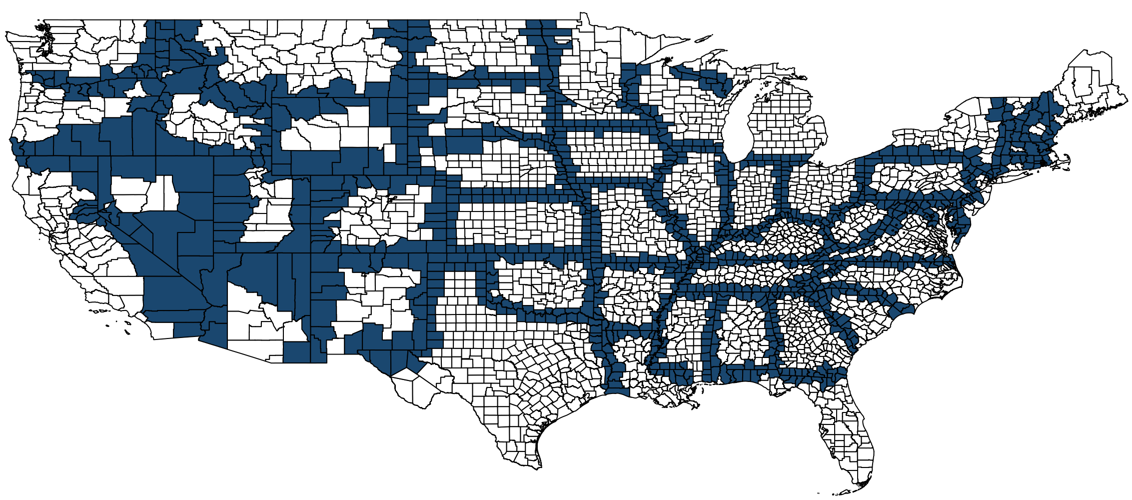
Notes: This table reports the regression results on the relationship between UI generosity and loan-to-income ratios of mortgages. The dependent variable is the loan level Loan-to-Income Ratio from HMDA data. The main independent variable is UI generosity, which is the log of UI generosity. Control variables and fixed effects are indicated at the bottom of each column. Control variables are county-level log average income, log labor force size, HHI for industry and deposit market concentration, state-level union coverage, and logs of minimum wage, health insurance payments, and non-UI transfer payments. Standard errors are clustered at the state-year level and reported in parentheses. * $p<0.10$, * $p<0.05$, ** $p<0.01$.

Figure F.11 – County samples

Panel A: Missouri's Border Counties

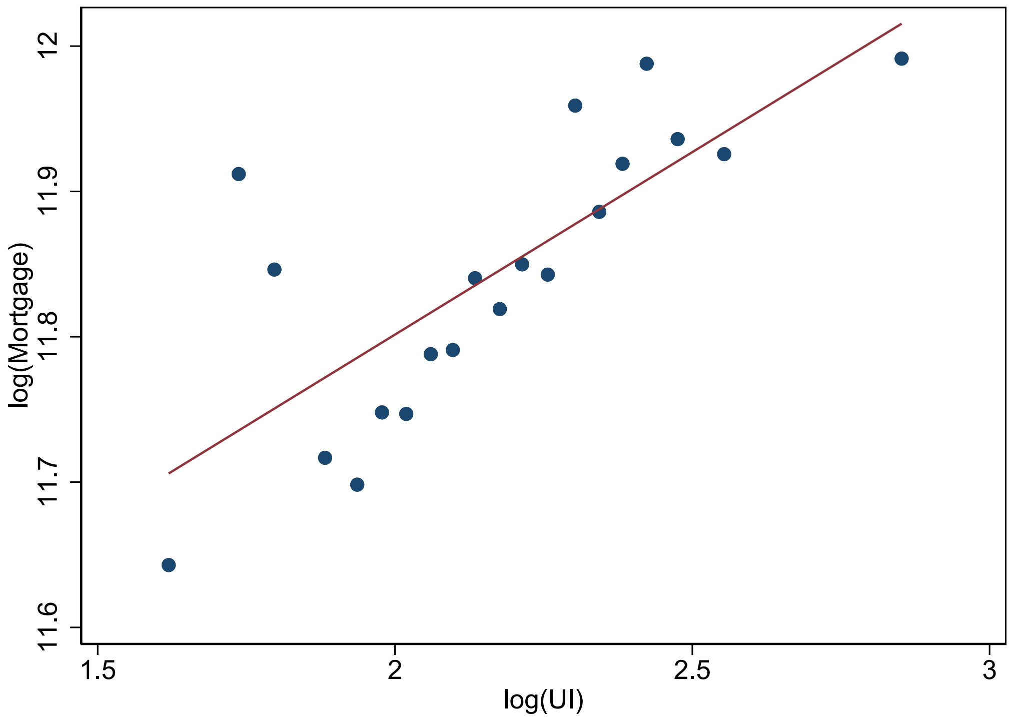


Panel B: Border Counties in the USA



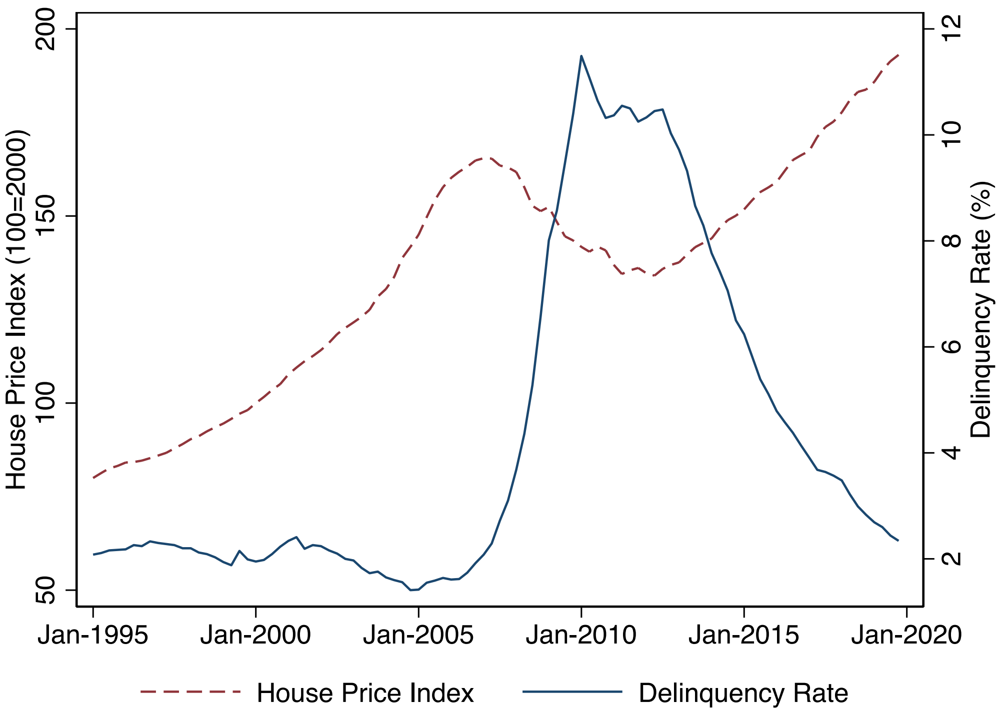
Notes: This figure presents the counties used in our analyses. Panel A illustrates the counties used in the Missouri's 2011 UI duration cut analysis. Panel B illustrates the counties used in stability analysis.

Figure F.12 – Mortgage amounts and UI Generosity



Notes: This figure plots a binned scatter of the log mortgage amounts against the log of UI generosity (i.e., weekly benefit cap x maximum duration) using HMDA data. Each dot represents the mean of 6,286,280 loans after residualising the variables for county income. The solid line shows the linear fit.

Figure F.13 – Delinquency Rates and House Price Index



Notes: This figure shows the delinquency rates and house price index in the US. The house price index: U.S. Federal Housing Finance Agency, All-Transactions House Price Index for the United States [USSTHPI], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/USSTHPI. Delinquency rates: Board of Governors of the Federal Reserve System (US), Delinquency Rate on Single-Family Residential Mortgages, Booked in Domestic Offices, All Commercial Banks [DRSFRMACBS], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/DRSFRMACBS.

Table F.3 – UI and the Aftermath of the Global Financial Crisis

	ΔForeclosure			Decline in Mortgages			Decline in House Prices		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\log(\text{UI})_{94-99}$	0.004**	0.006**	0.006**	0.107*	0.123**	0.117**	0.145*	0.147**	0.144**
	(0.002)	(0.002)	(0.002)	(0.056)	(0.050)	(0.050)	(0.081)	(0.071)	(0.071)
County-Pair FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other state policies		✓	✓		✓	✓		✓	✓
County controls			✓			✓			✓
Obs.	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958	1,958
R^2	0.652	0.662	0.666	0.678	0.681	0.683	0.682	0.685	0.687
Mean(Dep. var.)	0.009			0.468			0.655		

Notes: This table shows that the counties that have more generous UI before the GFC experience larger increase in foreclosure rates and larger declines in mortgage amounts and house prices. Columns (1)-(3) use changes in foreclosure rates, Columns (4)-(6) use the decline in mortgage amounts, and Columns (7)-(9) use the decline in house prices as dependent variables. ΔForeclosure is defined as the difference in average foreclosure rates between two periods, 2005 and 2007, and 2008 and 2010. *Decline in Mortgages* and *Decline in House Prices* are defined as the difference between the maximum value of the variable between 2005 and 2007 and the minimum value of the variable between 2008 and 2010. The main independent variable is $\log(\text{UI})_{94-99}$, which is the log of the average UI benefits a person can get between 1994 and 1999. Control variables and fixed effects are indicated at the bottom of each column. Other state policies are state-level logs of minimum wage, health insurance payments, non-UI transfer payments, and union coverage. County controls are the log of county-level average income, the log of the size of the labor force, county-level HHI of industry composition, and deposit markets. Standard errors are two-way clustered at the state and border segment level and reported in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table F.4 – UI and the Aftermath of the Global Financial Crisis

	ΔForeclosure			Decline in Mortgages			Decline in House Prices		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\log(\text{UI})_{99-02}$	0.005*	0.007**	0.007**	0.093*	0.117**	0.109**	0.165**	0.183**	0.185**
	(0.003)	(0.003)	(0.003)	(0.053)	(0.049)	(0.048)	(0.077)	(0.074)	(0.074)
County-Pair FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other state policies		✓	✓		✓	✓		✓	✓
County controls			✓			✓			✓
Obs.	1,970	1,970	1,970	1,970	1,970	1,970	1,970	1,970	1,970
R^2	0.663	0.667	0.674	0.682	0.684	0.687	0.686	0.688	0.691
Mean(Dep. var.)	0.012			0.498			0.684		

Notes: This table shows that the counties that have more generous UI before the GFC experience larger increase in foreclosure rates and larger declines in mortgage amounts and house prices. Columns (1)-(3) use changes in foreclosure rates, Columns (4)-(6) use the decline in mortgage amounts, and Columns (7)-(9) use the decline in house prices as dependent variables. ΔForeclosure is defined as the difference in average foreclosure rates between two periods, 2005 and 2007, and 2008 and 2013. *Decline in Mortgages* and *Decline in House Prices* are defined as the difference between the maximum value of the variable between 2005 and 2007 and the minimum value of the variable between 2008 and 2011. The main independent variable is $\log(\text{UI})_{99-02}$, which is the log of the average UI benefits a person can get between 1999 and 2002. Control variables and fixed effects are indicated at the bottom of each column. Other state policies are state-level logs of minimum wage, health insurance payments, non-UI transfer payments, and union coverage. County controls are the log of county-level average income, the log of the size of the labor force, county-level HHI of industry composition, and deposit markets. Standard errors are two-way clustered at the state and border segment level and reported in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.