NORTHWESTERN UNIVERSITY

Kellogg
School of Management

Guthrie Center for Real Estate Research

Positive Externalities of Social Insurance: Unemployment Insurance and Consumer Credit

Joanne W. Hsu, David A. Matsa, and Brian T. Melzer

September 23, 2014

10002

Positive Externalities of Social Insurance: Unemployment Insurance and Consumer Credit[*]

Joanne W. Hsu, David A. Matsa, and Brian T. Melzer

September 23, 2014

ABSTRACT

This paper studies the impact of unemployment insurance (UI) on consumer credit markets. Exploiting heterogeneity in UI generosity across U.S. states and over time, we find that UI helps the unemployed avoid defaulting on their mortgage debt. We estimate that UI expansions during the Great Recession prevented about 1.4 million foreclosures. Lenders respond to this decline in default risk by expanding credit access and reducing interest rates for low-income households at risk of being laid off. Our findings call attention to two benefits of unemployment insurance not previously highlighted: reducing deadweight losses from loan default and expanding access to credit.

[*] Hsu: Federal Reserve Board of Governors, 20th Street and Constitution Avenue N.W., Washington, D.C. 20551 (e-mail: joanne.w.hsu@frb.gov); Matsa: Kellogg School of Management, Northwestern University, and NBER, 2001 Sheridan Road, Evanston, IL 60208 (e-mail: dmatsa@kellogg.northwestern.edu); Melzer: Kellogg School of Management, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208 (e-mail: b-melzer@ kellogg.northwestern.edu). We thank Northwestern University's Guthrie Center for Real Estate Research for financial support and Jesse Davis, Naveen Gohndi, Eric Kennedy, Jake Krimmel, and Paolina Medina-Palma for research assistance. For helpful comments and suggestions, we are grateful to Gene Amromin, Marieke Bos, Tal Gross, Jeanne Lafortune, Andreas Mueller, Matthew Notowidigdo, Jonathan Parker, Janneke Ratcliffe, Amit Seru, Roine Vestman and seminar participants at the Consumer Financial Protection Bureau, DePaul-Chicago Fed, Massachusetts Institute of Technology, New York University, Northwestern University, Sveriges Riksbank, University of Arizona, University of California–Berkeley, University of California–Los Angeles, University of California–San Diego, University of Illinois–Chicago, University of Indiana, University of Mannheim, University of North Carolina, Boulder Summer Conference on Consumer Financial Decision Making, Federal Reserve Bank of Cleveland Policy Summit, Federal Reserve Bank of Philadelphia Credit and Payments Conference, Finance UC Conference at Pontificia Universidad Catolica de Chile, IBEFA Summer Meeting, NBER Conference on Poverty, Social Policy, and Inequality, NBER Summer Institute (Economics of Real Estate & Local Public Finance), and Norges Bank Workshop on Household Finance. The analysis and conclusions set forth in this paper are those of the authors and do not indicate concurrence by other members of the Federal Reserve research staff or the Board of Governors.

I. INTRODUCTION

Throughout the Great Recession, as home values declined and foreclosures proliferated, housing policy was forefront in debates on economic policy. A key motivation for policy intervention was to avoid deadweight costs of foreclosure borne by borrowers, lenders, and even those in the surrounding community (Posner and Zingales 2009; Federal Reserve Board of Governors 2012). Despite general agreement on the motives to intervene, policymakers struggled to design and implement effective policies. Debate centered on whether foreclosures were caused by job loss, payment shocks or underwater borrowers' incentive to "strategically default," and accordingly whether programs should focus on improving borrowers' ability or incentive to repay. In this paper, we explore the role of unemployment benefits in consumer credit markets, and show that unemployment insurance, which improves borrowers' ability to repay their debt, is effective in reducing mortgage delinquency and improving access to credit.

In theory, the effect of unemployment insurance on borrower default risk is ambiguous. Although increasing UI generosity improves households' *ability* to make loan payments, various forms of moral hazard might lead borrowers to default more often. First, weaker incentives to search for new work slows reemployment (Moffitt 1985; Meyer 1990) and increases long-term unemployment risk (Schmeider et al. 2012), reducing the resources available to meet credit obligations over time.[1] Second, more complete social insurance might embolden households to take greater risk (Gormley, Liu and Zhou 2010), including borrowing more. Third, if the number of unemployed individuals grows with UI generosity (Topel 1983), then aggregate loan delinquency might rise as well.

We evaluate the net impact of unemployment insurance on loan default by exploiting variation in UI generosity across states and over time. States differ substantially in benefit

[1] Households' incentive to avoid default mitigates this effect (Chetty and Szeidl 2007; Chetty 2008).

generosity, both in the cross-section and in how they adjust regular benefits over time.[2] During the recent recession, additional differences emerged across states as unemployed workers became eligible for supplemental benefits though the Extended Benefits (EB) and Emergency Unemployment Compensation (EUC) programs.

Our analysis begins by examining time-series variation in regular UI benefits (excluding the supplemental EB and EUC programs) between 1991 and 2011. We use household data on mortgage delinquency from the Survey of Income and Program Participation (SIPP) in a repeated cross-sectional research design, and identify the effect of UI generosity by comparing trends in loan delinquencies among employed and unemployed households to state-level changes in maximum UI benefits. We show that increases in UI generosity alleviate mortgage delinquency, specifically for unemployed homeowners. To gauge the magnitude, consider the effect of a $3,600 increase in a state's maximum regular UI benefits, which was the cross-state standard deviation of maximum benefits in 2010. We find that a $3,600 increase in benefits reduces the likelihood of mortgage delinquency among displaced workers by 90 basis points, thereby preventing 15% of the average layoff-related rise in delinquency. State benefit caps bind for only about half of UI recipients in our sample. Consistent with this fact, the sensitivity of mortgage delinquency to UI benefits roughly doubles when the maximum benefit is measured at the individual level, conditional on workers' past earnings: an additional $3,600 in maximum benefits reduces delinquency by 170 basis points. As a falsification test, we confirm that delinquency is unrelated to a state's UI generosity among homeowners who are not laid off and therefore do not receive UI benefits.

The effect appears to be long term, as UI benefits not only mitigate loan delinquency, but also reduce homeowner relocations and evictions. We find that an additional $3,600 in a state's

[2] In 2011, for example, a laid-off worker could collect up to about $28,000 in regular benefits in Massachusetts but only about $6,000 in Mississippi. Similarly, between 1991 and 2011, maximum UI benefits grew by only 22% in Florida but by 174% in New Mexico.

maximum UI benefits reduces mortgage default among unemployed homeowners by 9 to 45 basis points. These effects are sizeable: the increase in evictions, a subset of defaults, associated with being laid off is cut almost in half.

The key identifying assumption underlying our analysis is that changes in UI benefits are independent of factors that might otherwise affect loan defaults among the unemployed. A potential concern is that states may be more likely to increase UI benefits during an economic boom, when states are flush with cash, loan defaults are already low, and credit supply is already high. Direct evidence finds little support for this concern, as we find that states' maximum UI benefit is not significantly related to state unemployment rates, average wages, GDP growth, or home price growth. Although we can only examine *observable* variables directly, *unobservable* state-specific factors also do not appear to explain our results, as controlling for state-by-year fixed effects has little effect on our results.[3] Furthermore, when we examine the household-level benefit measure, we can control more flexibly with state-by-year-by-layoff status fixed effects and obtain similar estimates. All of our estimates also control for household characteristics, including mortgage indebtedness, education, employment, income, and net worth. Finally, consistent with UI generosity mitigating loan delinquency, we find that the effects are strongest among unemployed households with limited liquid assets. Based on this variety of tests, we conclude that the estimated effect of UI generosity is causal.

We also study the effects of federal extensions of UI benefits during the Great Recession. The EB and EUC programs, which increased the duration of benefits especially in states with high unemployment, resulted in dramatic differences in UI generosity across states.[4] Exploiting this variation and controlling for differences in unemployment rates, we find that these

[3] In these analyses, trends among employed residents of states provide counterfactuals for trends among unemployed residents when UI benefit levels change.

[4] In 2009, for example, a laid-off worker could collect an additional 53 weeks of benefits (totaling $30,950 of extended benefits) in New Jersey, but only 20 weeks (totaling $5,960) in South Dakota.

incremental UI payments reduce mortgage delinquency. The magnitude of the reduction is similar as for regular benefits: a $3,600 increase in maximum extended UI benefits is associated with a decline in the likelihood of mortgage delinquency of 90 to 110 basis points among those that are laid off, which is about 10 to 15% of the layoff-related increase in delinquency in that period.

This finding implies that unemployment insurance played an important role in preventing mortgage default during the Great Recession, despite neither being targeted at mortgage borrowers nor being promoted as a housing policy. Extrapolating from our analysis of the UI extensions, we estimate that expanding UI helped prevent about 1.4 million foreclosures between 2008 and 2012, which compares favorably to the estimated 800,000 foreclosures prevented by the largest public policy targeting mortgage modification, the Home Affordable Modification Program (Agarwal et al. 2013). We find that unemployment insurance even reduced delinquency among homeowners with loan-to-value ratios above 120%, which implies that foreclosure reduction policies targeting loan affordability can be effective even when homeowners are deeply underwater and have an incentive to strategically default.

Given these effects on delinquency and default, it is natural to ask whether lenders account for these repayment patterns when determining credit supply for at-risk populations. If the lending market is competitive and lenders anticipate that UI payments will reduce default risk, then we would expect lenders to offer better terms—lower interest rates or higher credit limits—when UI benefits are more generous. To assess changes in credit supply, we analyze purchase mortgages, home equity lines of credit (HELOCs), and credit card loans. For mortgages, we examine state-level data from the Federal Housing Finance Agency on the average interest rate for purchase mortgage loans. For HELOCs and credit cards, we analyze household-level data on credit offers collected by Mintel Comperemedia. These data, which are compiled from credit offers by mail, offer a deeper view of credit supply, as they include both

interest rates and credit limits.

We find that borrower improvement in credit worthiness appears to expand credit access for low-income households, even while they are employed. Applying a similar state-panel fixed effects approach as in our analysis of delinquency, we find that mortgage interest rates decline as regular UI benefits increase. For a $3,600 increase in maximum UI benefits, we estimate that interest rates for first-lien mortgage loans decline by about 10 basis points (a 5% decline relative to the 182 basis point average spread over treasuries) and interest rates for HELOC offers decline by 32 basis points. Likewise, credit card lenders offer households better credit terms when UI is more generous. Credit limits rise by $1,700 (about 11%) and interest rates decline by 23 basis points (about 1.4%) for a $3,600 increase in maximum UI benefits. As one would expect, the changes are larger among low-income households, who tend to have less savings to insulate them from an income shock. Among households with annual income less than $35,000, we find that credit card borrowing limits increase by $3,680 and credit card interest rates decrease by 43 basis points.

Our findings provide a novel contribution to the literature on optimal unemployment insurance, dating back to Baily (1978). Research on the costs and benefits of UI has emphasized the trade-off between costly distortions to labor supply (Moffitt 1985; Meyer 1990) and precautionary savings (Engen and Gruber 2001; Feldstein 2005), and social benefits from facilitating consumption smoothing for the unemployed (Gruber 1997; Browning and Crossley 2001; Bloemen and Stancanelli 2005), enabling productive job search by liquidity constrained households (Chetty 2008), and stimulating aggregate consumption (Auerbach and Feenberg 2000). Our results point to additional benefits. First, UI payments prevent deadweight losses associated with mortgage default, which include the value destroyed from undermaintenance and looting before and during foreclosure, and the negative externalities imposed on nearby properties. Second, UI payments facilitate credit access for at-risk households even before they

become unemployed: borrowers benefit from paying lower interest rates, and *may* also benefit from receiving additional credit.[5]

Our findings suggest that UI extensions during the Great Recession created a substantial welfare gain, especially in light of evidence that the extensions created minimal distortions to job search (Rothstein 2011; Farber and Valetta 2013).[6] Although the benefit from expanding credit access is difficult to quantify, the benefit from avoiding deadweight loss is easier to measure. Assuming a deadweight loss per foreclosure of about $50,000 (U.S. Department of Housing and Urban Development 2010), our results imply that the $250 billion of federally funded benefit payments between 2008 and 2012 saved $70 billion in social costs. Furthermore, preventing foreclosures reduced the fiscal cost of extending UI, a key consideration in the policy debate. We estimate that federally funded benefit payments during the Great Recession mitigated $46 billion of losses to the government-sponsored mortgage companies (e.g., Fannie Mae), which suggests that the net cost of these UI payments was actually about a fifth less than $250 billion paid out.

The rest of the paper proceeds as follows. Section II describes key features of the unemployment insurance system and characterizes the variation in UI benefits that we exploit in our analysis. Sections III presents the results on mortgage delinquency, and Section IV discusses various implications for housing policy. Section V presents the results on credit terms, and Section VI concludes.

II. Unemployment Insurance

A. Regular Benefits

The unemployment insurance system of the United States provides temporary income to

[5] Although empirical work documents a revealed preference for increasing debt as credit limits rise (Gross and Souleles 2002), it is not clear whether this increase in borrowing represents a welfare improvement. On one hand, credit access facilitates consumption smoothing and benefits households that face income uncertainty (Carroll 1997 and Chatterjee et al. 2007), but on the other hand, credit access can reduce welfare for households with self-control problems (Laibson 1997).

[6] Although they do not study the Great Recession, Kroft and Notowidigdo (2014) also find that the moral hazard costs of UI decrease at times of high unemployment.

eligible workers who become involuntarily unemployed. The joint federal-state system, created by Congress in 1935, provides insurance under a common basic framework nationwide, but each state has the autonomy to set the program's parameters, such as the amount of benefits paid to unemployed workers. Eligible claimants receive a weekly benefit payment for a specified number of weeks. To determine an individual's benefit level upon becoming unemployed, UI programs apply a benefit schedule that is increasing in the individual's prior wages, but is capped at the state's maximum weekly benefit ("*Max Weekly Benefit*").[7] In addition to this cap on the weekly payment, each state also limits the duration of benefits ("*Max Regular Duration*").

We obtain information on each state's benefit schedule from the U.S. Department of Labor's publication "Significant Provisions of State UI Laws." We measure the generosity of each state's UI benefits annually between 1991 and 2011 using the product of the maximum weekly benefit amount and the maximum duration (Agrawal and Matsa, 2013). Although we focus on this measure ("*Max Benefit*") throughout much of our analysis, the results are robust to a wide range of other measures of benefit generosity, as described in Section III.B.

Max Benefit provides a proxy for the total benefits that a UI claimant can receive in a given year (US Congress, US House of Representatives, 2004). Unadjusted for inflation, the average of *Max Benefit* is $8,600 per year. Significant variation also exists across states. In 2011, for example, the maximum total benefit over an unemployment spell varies from about $6,000 in Mississippi to more than $28,000 in Massachusetts. Figure 1 shows the geographic distribution, by quintile, of state benefit changes between 1991 and 2011, which is the period of our data on delinquency. The benefit increases over this period have no clear geographic pattern. The smallest increase in *Max Benefit* over the period was $624 in Washington, DC, followed by $1,300 in Florida, and the largest increase was $14,790 in Massachusetts. Other states with large

[7] For a given individual, the weekly benefit is the lesser of: (i) the product of their actual weekly wages in a base period and the state-specified wage replacement rate (which is typically around 50%); and (ii) the state-specified maximum weekly benefit.

increases include Rhode Island, Minnesota, New Mexico, Connecticut, New Jersey, Washington, Pennsylvania, and Montana.

As we would expect for a measure of UI generosity, *Max Benefit* affects the aggregate realized value of UI benefits paid by states. Using annual data on state UI payments from 1991 through 2011 from the US Bureau of Economic Analysis (BEA) "Regional Economic Accounts," we regress the natural log of total UI payments on the benefit criteria and state and year fixed effects. The results, reported in Appendix Table A-I, indicate that a $1,000 increase in *Max Benefit* is associated with a 4-log-point increase in UI payments (column 1). In a log-log specification, we find the elasticity of maximum total benefits to actual compensation payments is approximately 1.0 (column 2). These patterns are not explained by state-level macroeconomic conditions (columns 3 and 4), specifically the unemployment rate (Bureau of Labor Statistics), real gross domestic product (GDP) growth rate (Bureau of Economic Analysis), house price index growth (Case-Shiller), and employed workers' average annual wage (Bureau of Economic Analysis).

A number of factors lead to variation in unemployment insurance benefits across states and over time (Blaustein 1993). Underlying economic conditions play a critical role. For example, the degree of a state's industrial urbanization, underlying trends in local unemployment rates, and higher average wage levels are thought to be associated with benefit increases. Changes in UI benefits are also affected by politics and other noneconomic factors, including incumbent officials' reelection concerns, haggling and logrolling within legislative bodies, political party preferences, and lobbying efforts of various constituencies.

One concern for our analysis is that UI benefit laws might be correlated with other determinants of borrowers' credit quality, which could confound our estimates. To evaluate the determinants of state UI benefits, we estimate the correlation between benefit levels and various state macroeconomic variables, conditional on state and year fixed effects. The results, which are

reported in columns 1 through 4 of Appendix Table A-II, show no evidence of a relation. The estimated correlations are small in magnitude and not statistically significant.[8] We also explore the connection between a state's UI generosity and its UI trust fund balance, which provides a measure of the fiscal condition of the state's unemployment insurance system. The patterns are too noisy to draw definitive conclusions but are consistent with a nonlinear relation. Whereas the correlation between *Max Benefit* and trust fund reserves is trivial in magnitude and statistically insignificant (a one standard deviation increase in trust fund reserves is associated with only $40 in additional maximum benefits; column 5), states with negative trust fund balances offer, on average, $500 less in maximum benefits (column 6). This pattern, albeit noisy, is consistent with a negative trust fund balance making states less likely to increase UI generosity.[9] All of the results reported below are robust to either including or excluding these measures as controls.

As a falsification test, we also explore the relation between UI benefit levels and other transfer benefit payments. In contrast to the elasticity of UI payments to *Max Benefit*, which is 0.875 after including state macroeconomic controls ($p < 0.01$; column 4 of Appendix Table A-I), the elasticity of transfer payments to *Max Benefit* is –0.042 (column 5) and the elasticity of health insurance payments to *Max Benefit* is –0.031 (column 6), and neither is statistically significant. These findings help to rule out two potential omitted variable hypotheses. First, the changes in UI benefit levels do not appear to be correlated with changes in other government benefits. Second, governments do not appear to be raising UI generosity at times when other transfer programs reveal unusually high or low levels of need.

B. Extended Benefits

In addition to the "regular" UI payments discussed above, states also provide

[8] The largest point estimate (0.061 on average wages) implies that a standard deviation increase in average annual wages ($11,200) is associated with about a fifth of a standard deviation increase in maximum UI benefits ($690).

[9] The pattern is also consistent with more generous UI benefits depleting trust fund balances.

unemployed workers with further assistance during times of high unemployment. During such times, unemployment payments are extended: unemployed workers who exhaust their regular UI benefits are eligible to collect their weekly benefit for an additional period. We study the impact of extensions under two federal programs: Extended Benefits and Emergency Unemployment Compensation.

The Extended Benefits (EB) program, which was mandated by federal legislation adopted in 1970, provides an additional 13 weeks of benefits when the state's insured unemployment rate rises above 5% and is at least 20% higher than its average over the prior two years. Prior to 2009, 11 states also participated in a voluntary component of the EB program that activates the first 13 weeks of additional benefits when the total unemployment rate rises above 6.5% and an additional 7 weeks of benefits when the state's total unemployment rate rises above 8%, thereby providing up to 20 weeks of total extended benefits.[10] Extended benefits payments are typically funded in equal shares by the state and the federal government. However, the American Recovery and Reinvestment Act (ARRA), adopted in February 2009, temporarily established full federal funding for the EB program, leading 26 additional states to adopt the total unemployment rate triggers and 7 weeks of expanded coverage by mid-2009.

The Emergency Unemployment Compensation (EUC) program was enacted in June 2008 and modified several times thereafter. This federally funded program extended benefits for individuals who had exhausted their regular benefits but remained unemployed.[11] At its peak between 2010 and 2012, EUC provided up to 53 weeks of additional benefits. Similar to the EB program, EUC provided longer extensions in areas with greater unemployment, based on total unemployment rate triggers in the range of 6% to 9%. As of May 2009 (the time period of the

[10] To trigger each tier of extension, the total unemployment rate must also be at least 10% above its level in either of the prior two years.

[11] In most states, EUC payments were paid immediately following the exhaustion of regular benefits, and EB payments began only after EUC benefits were exhausted.

household data we analyze below), the EUC program authorized 20 weeks of benefit extensions in all states and an additional 13 weeks (i.e., 33 weeks in total) in states with total unemployment rates above 6.5%.

Due to both the EB and EUC programs, there is considerable variation in the duration of benefit extensions as of May 2009. As shown in Table I, the average state offered up to 40 total weeks of extensions with a standard deviation of 13.1. The number of maximum weeks in each state is displayed in Figure 2. The length of possible extensions varies from 20 weeks (the minimum from EUC) to 53 weeks (the maximum from both programs). The duration of benefits extensions is somewhat clustered regionally across the country, as would be expected given that they are in part triggered by economic conditions, an identification challenge that we discuss below. Nevertheless, note that the geographic pattern of possible benefit extensions, shown in Figure 2, is unrelated to the geographic pattern of regular benefit increases, shown in Figure 1. Although our analyses of the two programs exploit very different geographic variation in benefit generosity, they will find remarkably similar estimates for the impact of benefit generosity on mortgage delinquency and default.

To measure differences in extended benefit generosity in dollar terms, we use trigger notices for UI extensions from the U.S. Department of Labor to calculate *Max EB EUC*, the product of the state's maximum weekly benefit and the number of weeks of extended UI authorized (*beyond* the regular benefit period). As of May 2009, the average state offered $17,700 of maximum additional benefits with a standard deviation of $8,400.

III. UI Benefits, Mortgage Delinquency, and Default

We assess whether UI benefits affect mortgage delinquency and default using the Survey of Income and Program Participation (SIPP), a longitudinal survey conducted by the U.S. Census Bureau. The SIPP is well suited to our study because it tracks mortgage delinquency and employment status for a sizeable sample of households. The data also include rich information

on relevant control variables—such as income, assets, and mortgage leverage—and provide state identifiers to link the survey responses with measures of UI program generosity.[12]

The SIPP gathers information on households in a series of panel data. In each panel, the SIPP follows a national sample of up to 43,500 households for four years, collecting information on monthly employment, income, and program participation through interviews that recur every four months. In supplemental interviews conducted annually, the survey also gathers information on households' assets and liabilities, from which we observe mortgage leverage and savings. Finally, the SIPP assesses mortgage delinquency once for each panel of households as part of the Adult Well-being topical module.

Our study examines data from seven SIPP panels, covering the period 1991–2010, with Adult Well-being interviews at roughly three-year intervals during that period.[13] Because mortgage delinquency is assessed only once for each panel of households, our study exploits a repeated cross-sectional research design. Throughout the analysis, we restrict the sample to homeowners with mortgage loans. In total, the sample includes 64,922 households. Summary statistics for the full sample are reported in Panel B of Table I.

We code mortgage delinquency based on respondents' answer to the question "Did you fail to pay the full amount of the rent or mortgage over the prior twelve months?" Over the full sample period, 5.4% of households report a mortgage delinquency. For comparison, the 30-plus day delinquency estimate from the Mortgage Banker's Association's National Delinquency Survey was 5.3% over the same period. The two measures are also highly correlated within the cross-section of states; in 2010, for example, the correlation is 0.73 across all states with at least

[12] In SIPP panels before 2004, the state of residence is suppressed for households in the least populous states. This data issue affects only 1.5% of SIPP observations in our sample.

[13] We examine data from the SIPP panels beginning in 1991, 1992, 1993, 1996, 2001, 2004 and 2008. Within these panels, delinquency is measured in various years between 1991 (the timing of the Adult Well-Being interview for the 1991 Panel) and 2010 (the timing of the Adult Well-Being interview for the 2008 Panel). SIPP panels prior to 1991 do not include information on mortgage delinquency.

200 SIPP observations.

Using respondents' employment history, we code *Layoff*, an indicator for whether anyone in the household has been without a job and looking for work in the year-long period for which mortgage delinquency is assessed.[14] As shown in Table 1, 14.7% of sample households experience such a spell of unemployment. This figure is higher than the unemployment rate, because (i) it refers to households rather than individuals and (ii) it is measured over a year rather than at a single point in time. Similar to previous studies (e.g., Topel 1983; Gruber 1997), we use benefit *eligibility* rather than benefit *receipt* to evaluate the impact of UI, because it is likely to be reported more accurately. Indeed, studies find that households' self-reported information on employment closely matches those reported by businesses (Bowler and Morisi 2006), but their self-reported information on UI payments is 30% to 40% lower than administrative records suggest (Meyer et al. 2009).

Based on the debt balances and estimated home values reported by homeowners, the average mortgage loan-to-home value in the sample is 59.2% and the proportion of respondents reporting negative home equity is 5.4%. Among respondents reporting mortgage payment information (mortgage payments were not collected in the 1991 or 1992 panels) and unadjusted for inflation, the median required payment is $795 per month, or $183 per week. Measured relative to UI benefits, the median respondent's mortgage payment is about half of the maximum weekly UI benefit.

A. Regular UI Benefits

We begin by examining variation in maximum benefits under states' regular UI programs. Figure 3 plots the relationship between changes in UI generosity and changes in mortgage delinquency, as measured in the SIPP, from 1991 to 2011. This relationship is plotted

[14] More specifically, we analyze the SIPP's employment status variable (RMESR), coding *Layoff* to be 1 if anyone in the household reports their employment status as "No job all month, on layoff or looking for work all weeks."

separately for households that experience a layoff (Panel A) and those that do not (Panel B). Among households experiencing a layoff, mortgage delinquency decreases more in states with larger increases in UI generosity. A $1,000 increase in *Max Benefit* is associated with a 62 basis point decrease in delinquency (Panel A). Consistent with measuring a causal effect, we find no relationship between UI generosity and delinquency among households that remain employed and are thus ineligible to collect unemployment benefits (Panel B).

These relationships are revealing, but the simple correlations compare changes across only two points in time and do not control for other state or household characteristics. To account for such factors, we estimate the following linear probability model:

$$Delinquent_{ist} = \alpha + \beta Max\ Benefit_{st} + \gamma Max\ Benefit_{st} \times Layoff_{it} + \delta Layoff_{it} + \boldsymbol{\zeta}\mathbf{X}_{it} + \boldsymbol{\eta}\mathbf{Z}_{st} + \lambda_s + \mu_t + \varepsilon_{ist}, \quad (1)$$

where $Delinquent$ is an indicator for mortgage delinquency, $\mathbf{X}$ is a vector of household characteristics, $\mathbf{Z}$ is a vector of state characteristics, λ and μ are state and year fixed effects, and ε is an idiosyncratic error. *Max Benefit* is demeaned (with respect to the mean for the entire sample) before it is interacted with *Layoff*, so δ represents the relation between delinquency and being laid off in a state with average UI generosity. The vector $\mathbf{X}$ includes the following household characteristics, each of which is predictive of mortgage delinquency: the mortgage loan-to-value ratio, an indicator for negative home equity, *Layoff* interacted with the indicator for negative home equity, household earnings, household net worth, and fixed effects for educational attainment.[15] The vector $\mathbf{Z}$ includes the following state-level economic and fiscal conditions: the state unemployment rate, real GDP growth, home price growth, average wages, the UI trust fund

[15] The loan-to-value ratio is Winsorized at the 1 percent tails and the negative equity indicator is demeaned (with respect to the mean for the entire sample). Household earnings is the total household earnings in the quarter prior to the year-long period in which we assess delinquency and employment status. We code household educational attainment based on the most educated member of the household across the following five categories: less than a high school diploma, high school diploma only, some college, college degree, some graduate studies.

reserve ratio, and an indicator for a negative UI trust fund balance. The main results reported below are ordinary least squares estimates of the linear probability model; similar results are obtained from Probit and Logit specifications.

We begin by estimating a version of equation (1) that excludes the $Max\ Benefit \times Layoff$ interaction. In this specification, which is reported in column (1) of Table II, the coefficient on *Max Benefit* measures the average association between UI generosity and mortgage delinquency for all residents of a state. The estimate is negative but not statistically significant. This average effect, however, obscures UI's impact on the relevant subpopulation. Indeed, we would only expect UI generosity to affect mortgage delinquency for people who have been laid off and are eligible to collect UI benefits. The results also find laid-off workers to be at greater risk of mortgage default, with 6.51 percentage point higher delinquency rates ($p < 0.01$).

Allowing the coefficient on *Max Benefit* to vary by layoff status, we find that increases in UI benefits significantly reduce delinquencies for people who are out of work. The estimates are reported in column (2) of Table II. The $Max\ Benefit \times Layoff$ interaction coefficient is −0.23 ($p < 0.01$), suggesting that, for a $1,000 increase in the maximum UI benefit, delinquencies decline by 23 basis points more among laid off workers than among others.[16] This coefficient implies that a one standard deviation increase in *Max Benefit* ($3,600) reduces the likelihood of delinquency by 83 basis points, or about 13% of the layoff-related increase.

Omitted variables are unlikely to explain this result. Equation (1) includes a rich set of controls for household characteristics and time-varying macroeconomic conditions.[17] Furthermore, UI benefit generosity has no discernible association with mortgage delinquency for

[16] Similar estimates are obtained from probit and logit specifications of this model. The probit and logit structural coefficients are reported in Appendix Table A-III. To estimate the marginal effect of a $1,000 increase in the maximum UI benefit, we compute the difference in the predicted probability of default for a $1,000 increase in benefits for both laid-off homeowners and employed homeowners. Comparing across these two groups, we estimate a marginal effect of −0.191 under a probit model (column 4) and −0.193 under a logit model (column 5).

[17] Coefficient estimates for these control variables are reported in column (1) of Appendix Table A-III.

homeowners who remain employed; the coefficient on the *Max Benefit* main effect is small and statistically insignificant. This lack of an association provides another falsification test, in addition to those explored in Appendix Tables A-I and A-II, in that we would not expect UI generosity to affect delinquency among workers who remain employed and thus do not collect benefits. In a final specification, we control even more flexibly for state economic conditions by including a full set of state-by-year fixed effects. The result, reported in column (3) of Table II, is very similar: the estimated interaction coefficient is −0.25 ($p < 0.01$). We include the full set of state-by-year fixed effects throughout the remainder of our analysis on delinquency and default.

B. Robustness

The relationship that we find between changes in regular UI benefits and mortgage delinquency is quite robust. The relationship is not simply an artifact of the Great Recession: we obtain a similar estimate if we limit the sample to observations before 2008 (see Appendix Table A-III, column 2). As detailed in Appendix A1 and in Appendix Table A-IV, our findings are also robust to using alternative measures of UI generosity, including defining *Max Benefit* in real terms, in logs, or adjusted for wage differences across states.

Thus far, we have focused on measuring UI generosity at the state level and gauging the average effect of UI generosity on delinquency within the state. In the next analysis, we measure UI generosity at the household level and assess how much $1,000 of available UI for a given household changes their probability of delinquency. For each individual in the household, we estimate the weekly benefit available if he or she were laid off by applying the relevant state benefit schedule to the individual's actual wages in the prior quarter. After selecting the highest benefit available between the household reference person and spouse, we multiply this weekly amount by the maximum duration of benefits available in the state to calculate *Max Benefit HH*—a household-level analog of *Max Benefit*. Comparing these two measures, we find that *Max*

Benefit HH increases by \$0.47, on average, for every \$1 increase in *Max Benefit*.[18] In other words, about half of individuals' base period wages are too low to benefit from increases in the state's maximum weekly benefit.

Appendix Table A-IV reports results from regressions of delinquency on the household-level measure of benefits generosity. We estimate a *Max Benefit HH* $\times$ *Layoff* interaction coefficient of −0.47 when including the full set of controls, along with state-year fixed effects ($p < 0.01$; column 4). This sensitivity is almost twice the corresponding estimate for the state-level measure of benefits (−0.25; see Table II, column 3), consistent with the statutory maximum benefit binding for only about a half of households, as reported above. Because *Max Benefit HH* varies within-states, we are also able to take our analysis one step further. In analysis reported in column (5) of Appendix Table A-IV, we include complete sets of state-year fixed effects separately by layoff status. These additional fixed effects account for any state-level unobservables that vary between households that are employed and those that are not. Even with this flexible specification, we estimate a similar coefficient of −0.42 ($p < 0.01$), which suggests that state-level, employment-status-specific unobservables do not play an important role in our estimation.

In the final model reported in Appendix Table A-IV, we decompose *Max Benefit* into two components, the maximum weekly benefit (in dollars) and the maximum duration of benefits (in weeks), and examine variation in those components separately. We find that the maximum weekly benefit has a strong and statistically significant relationship with delinquency, of similar sign and magnitude to the main findings: the interaction coefficient of −5.83 implies that a one standard deviation change in the maximum weekly benefit (\$0.1 thousand) reduces delinquency by 66 basis points. We also find that delinquency declines as the maximum duration of benefits

[18] Krueger and Mueller (2010) find a similar relationship when instrumenting for average weekly benefits with maximum weekly benefits.

becomes more generous: the interaction coefficient of −0.35 implies that a one standard deviation change in the maximum benefit duration (0.8 weeks) reduces delinquency by 27 basis points. However, this estimate is not statistically significant, which is not surprising given the limited statistical power (there is little variation in the duration of regular benefits across states or over time). We next analyze the EB and EUC programs, which provide greater variation in benefit duration.

C. Extended UI Benefits

Our analysis of UI benefit extensions during the Great Recession takes advantage of substantial cross-state variation in the maximum duration of benefits as of mid-2009, when the SIPP panel that began in 2008 measures mortgage delinquency. Figure 4 plots the cross-sectional relation between the UI benefit extensions and mortgage delinquency, separately for households that experience a layoff (Panel A) and those that do not (Panel B). Homeowners experiencing a layoff were less likely to fall behind in their mortgage in states that extended UI benefits, despite the fact that these states also suffered greater economic dislocation. Similar to the pattern for regular benefits revealed in Figure 3, a $1,000 increase in *Max EB EUC* is associated with a 26 basis point decrease in delinquency (Panel A). Again, consistent with measuring a causal effect, we find no relationship between UI generosity and delinquency among households that remain employed and are thus not directly affected by UI generosity (Panel B).

To control for state economic conditions and household characteristics, we estimate the following cross-sectional regression:

$$Delinquent_{is} = \alpha + \beta Max\ EB\ EUC_s \times Layoff_i + \delta Layoff_i + \boldsymbol{\zeta}\mathbf{X_i} + \lambda_s + \varepsilon_{is}, \qquad (2)$$

where *Max EB EUC* is the product of the state's maximum weekly benefit and the maximum number of weeks of extended UI available in the state (see Section II for more details). As in our analysis of regular UI benefits, we control for layoff status and for household-level characteristics, **X**. We also include state fixed effects, λ, to control flexibly for variation in state-

level economic conditions, which is important in this analysis because the duration of extended benefits is triggered by the severity of unemployment in the state. The state fixed effects absorb the main effect of *Max EB EUC*. *Max EB EUC* is demeaned (with respect to the mean for the entire sample) before it is interacted with *Layoff*, so δ represents the relation between delinquency and being laid off in a state with average UI generosity. The coefficient of interest, β, measures the differential effect of an additional $1,000 of maximum extended benefits on delinquency among households that experience a layoff compared to those that remain employed.

The regression results, which are reported in Table III, show that laid off homeowners are less likely to be delinquent on their mortgage payments in states where extended benefits are more generous. The estimates, reported in column (1), suggest that the likelihood of mortgage delinquency declines by 25 basis points for every $1,000 of extended benefits authorized ($p < 0.01$). This estimate is identical in magnitude to the earlier estimate for regular UI benefits, though slightly smaller if considered in proportion to the mean delinquency rate of 7.6% in this period (compared to 5.4% in the full sample).

Given the explicit link between extended benefits and state unemployment rates, it is important to control flexibly for unemployment rates in order to get an unbiased measure of the effect of extended benefits. One concern with the estimate obtained from equation (2) is that state employment conditions may affect the probability of delinquency differently for laid off and non-laid off households because, for example, it is more difficult to find a new job amid high unemployment. Thus, the most likely concern is that an omitted variable might bias upward the estimate for β, i.e., closer to zero. To address this concern, we augment equation (2) by interacting the layoff indicator with a flexible function of the state unemployment rate. Following Rothstein (2011) and Farber and Valetta (2013), who examine the effect of extended benefits on unemployment durations, we control for a cubic polynomial in the state

unemployment rate, separately by layoff status:

$$Delinquent_{is} = \alpha + \beta Max\ EB\ EUC_s \times Layoff_i + \delta Layoff_i + \boldsymbol{\zeta}\mathbf{X_i} + \lambda_s + \mu_1 Unemployment_s \times Layoff_i + \mu_2 Unemployment_s^2 \times Layoff_i + \mu_3 Unemployment_s^3 \times Layoff_i + \varepsilon_{is}, \quad (3)$$

where $Unemployment_s$ is the state's total unemployment rate over the prior 3 months, collected from EB and EUC trigger notices published by the U.S. Department of Labor.[19] As expected, the interacted unemployment rate-layoff controls increase the estimated magnitude of β, suggesting that laid off households' likelihood of mortgage delinquency declines by 31 basis points for every $1,000 of maximum extended benefits ($p < 0.01$; column 2)

Thus far, we have measured differences in benefit generosity under the EB and EUC programs in dollars, by multiplying the number of additional weeks authorized by the states' maximum weekly UI benefit. In a final specification, reported in column (3), we isolate differences in benefit duration alone by replacing *Max EB EUC* (measured in dollars) with *Max EB EUC Duration* (measured in weeks). This model reveals the same relationship: mortgage delinquency is lower where benefits are more generous. Using the same controls as in equation (3), we find that each additional week of extended benefits reduces the laid off households' probability of delinquency by 34 basis points ($p < 0.01$).

D. Heterogeneity by Savings

Extending the main analysis, we explore whether the effects of UI on mortgage delinquency vary with household savings. Given the ability to smooth expenditures by drawing down savings, one might expect households with higher levels of savings to be less sensitive to UI generosity. Households that lack savings, on the other hand, are likely to be particularly dependent on the cash transfers from UI.

[19] *Max EB EUC* and *Unemployment* are demeaned (with respect to their mean for the entire sample) before they are interacted with *Layoff*, so δ represents the relation between delinquency and being laid off in a state with average unemployment and UI generosity.

In an initial test, we interact the amount of savings with benefit generosity and layoff status to test whether UI's impact on displaced workers varies with savings. We measure liquid savings as the sum of financial assets held outside of retirement accounts. The results are reported in Table IV, column (1). For both regular and extended benefits, we find that increases in UI generosity reduce delinquency more for households that lack savings.

Further analysis reveals that these differences in UI sensitivity emerge in the bottom tail of the savings distribution. We next exclude the savings interaction and instead split the sample into two groups: households in the bottom quartile of asset holdings, who report savings of $500 or less (results reported in column 2 of Table IV), and households in the upper three quartiles (results reported in column 3). Among households in the bottom quartile of assets, we estimate a *Max Benefit* × *Layoff* interaction coefficient of −0.53 ($p < 0.10$), twice as large as in the full sample, and substantially larger than the comparable estimate of −0.02 among households in the upper three quartiles of savings. Similarly, for the extended benefits analysis, we estimate a *Max EB EUC* × *Layoff* interaction coefficient of −0.66 among low-savings households ($p < 0.05$) and −0.11 among higher-savings households ($p < 0.10$).

IV. Implications for Housing Policy

Next, we explore the implications of our results for housing policy. First, we exploit our empirical setting to shed light on the role of strategic default. Second, we examine whether UI payments postpone delinquency or also prevent default and foreclosure. Finally, we estimate the aggregate impact of UI expansions during the Great Recession, quantifying both the number foreclosures avoided and the associated savings to the GSEs and to society.

A. Heterogeneity by Mortgage Leverage

During the recent housing crisis, economists and policymakers debated whether foreclosures were caused by borrowers' inability to pay, e.g., due to job loss or payment

increases on adjustable rate loans, or by borrowers' strong financial incentive to default and thereby avoid paying mortgage balances far in excess of the value of their homes (Ellul et al. 2010; Foote et al. 2010; Federal Reserve Board of Governors 2012; Tracy and Wright 2012; Gerardi et al. 2013; and Guiso et al. 2013). The answer to this question could help guide foreclosure reduction policy. If ability to pay determines mortgage delinquency, then interventions that replace lost income or reduce mortgage payments through loan modifications would be effective. On the other hand, if strategic default is prevalent and homeowners default even when they are able to pay, then income replacement would be ineffective and mortgage principal must be reduced to avoid foreclosures.

Our main results imply that policies that make mortgages more affordable, such as by replacing lost income through UI payments, can be effective in reducing mortgage delinquency. An interesting follow-on question is whether UI payments are also effective among households who have substantial negative equity and therefore a strong financial incentive to default.

To address this question, we divide the regression sample by the degree of home equity and repeat our main analyses of regular and extended UI benefits. We consider three subsamples: positive equity, negative equity, and deep negative equity (viz., loan-to-value of 120% or more). The results, which are reported in Table V, show that UI payments reduce delinquency in all three categories. In the analysis of regular UI benefits, we estimate *Max Benefit* × *Layoff* interaction coefficients of −0.22 ($p < 0.01$), −0.88 ($p < 0.05$) and −1.27 ($p < 0.05$) across the positive, negative and deep negative equity subsamples, respectively. We find similar UI benefit-layoff interaction coefficients in the analysis of extended benefits: −0.23 ($p < 0.05$), −0.81 ($p < 0.01$) and −0.99 ($p < 0.01$). These estimates imply a quantitatively similar proportional effect in each subsample, as the increase in the coefficients across the three groups parallels the increasing prevalence of delinquency among displaced workers.

We conclude that policies improving borrowers' ability to pay can be effective in

reducing delinquency risk, even among those with incentive to strategically default. This conclusion is consistent with Fuster and Willen's (2012) finding that lower mortgage payments reduce delinquency, even for deeply underwater borrowers.

B. Long Term Effects: Eviction and Moving

To interpret the effects of UI generosity on mortgage delinquency, it is important to understand whether UI payments merely postpone delinquency or whether they also prevent default and foreclosure. To examine this issue, we code three indicator variables: *Eviction*, *Move Within 1 Year*, and *Move Within 3 Years*. *Eviction* reflects respondents' answer to the question: "Were you evicted from your home or apartment for not paying the rent or mortgage?" This question is asked of all respondents that indicate delinquency on their rent or mortgage in the Adult Well-Being survey. (As before, we restrict the sample to homeowners with mortgage loans.) Although mortgage default can result in foreclosure and eventually eviction, default often forces homeowners from their homes through other procedures, such as short sales or deeds in lieu of foreclosure. To capture these events, we also code *Move Within 1 Year*, an indicator variable for whether the household moved residences during the past twelve months. Finally, to assess the permanence of any effect on moving, we extend the horizon by two years and analyze *Move Within 3 Years*, another indicator variable.

As with mortgage delinquency, we examine the impact of UI benefit generosity under both the regular and extended benefits programs. The results, reported in Table VI, suggest that more generous UI reduces both eviction and relocation after a layoff. The coefficient estimates are similar for analysis examining the regular and extended benefits programs; however the regular benefits estimates are more precise, consistent with the larger sample size and the ability to exploit within-state variation.[20]

[20] Because we can measure relocation for some individuals who did not respond to the Adult Well-being survey, the sample size for relocation is slightly larger than for eviction.

Examining the impact of regular benefits on evictions, reported in column (1), the estimated coefficient on the $Max\,Benefit \times Layoff$ interaction is −0.025 ($p < 0.10$). This coefficient implies that a one standard deviation increase in *Max Benefit* ($3,600 in 2010) decreases the likelihood of eviction by 9 basis points, a roughly 50% reduction of the increase associated with being laid off (18.4 basis points). Analysis exploiting variation in extended benefits obtains a similar, but less precisely estimated, point estimate: a $3,600 increase in EB and EUC payments is associated with a 7 basis point decline in the likelihood of eviction after being laid off (column 2).

Homeowners who are laid off are also less likely to relocate when UI is more generous. As reported in column (3), the estimated coefficient on the $Max\,Benefit \times Layoff$ interaction is −9.2 basis points ($p = 0.102$). Thus, a $3,600 increase in the maximum regular UI benefit is associated with a 33 basis point ($p = 0.102$) differential decline in laid-off homeowners' likelihood of moving within a year of being laid off, which corresponds to about a quarter of the layoff-related increase in the probability of moving (1.4%). That UI has a larger effect on moving (33 basis points) than on eviction (9 basis points) is consistent with UI preventing not only evictions but also other forced moves related to mortgage default, such as agreeing to a short sale or providing a deed in lieu of foreclosure. Analysis exploiting variation in extended benefits, which is reported in column (4) and is again estimated less precisely, finds nearly the same effect of UI generosity: the interaction coefficient is −10.8 basis points ($p = 0.118$).

Finally, analysis of moving over the three-year horizon suggests that UI payments prevent relocation rather than merely postponing it. That is, the estimated effect of UI on moving does not decline when extending the moving horizon from one year to three years following job displacement. Because only the 1992 and 2008 panels track households long enough after the Adult Well-being survey, extending the relocation horizon reduces the sample for the regular benefits analysis by 75%. Although the estimates are less precise, the point estimate reported in

column (5) indicates that moves by displaced workers decrease by 45 basis points for a $3,600 increase in maximum benefits (30% of the layoff-related increase), which is slightly more than the 33 basis point effect for moving within one year (23% of the layoff-related increase). During the Great Recession, layoffs appear to have a delayed effect on moving, with the probability of moving increasing by more over the three-year horizon (2.46 percentage points) than over the one-year horizon (1.12 percentage points). Nevertheless, extending UI has a similar proportional effect at both horizons: a $3,600 increase in extended benefits mitigates 35% of layoff-related moves over one year (i.e., $-0.108 \times 3.6/1.12$) and 33% of moves over three years (i.e., $-0.229 \times 3.6/2.46$).

In sum, we find that UI helps not only to postpone delinquency but also to keep laid off homeowners in their homes.

C. Delinquencies and Foreclosures Avoided by Extending UI during the Great Recession

Next, we use our regression estimates to approximate the number of mortgage delinquencies and foreclosures prevented by federal expansions of unemployment insurance during the Great Recession. Federal policy expanded UI in three main ways. First and foremost, Congress authorized and funded additional weeks of benefits under the EUC program. Second, Congress authorized full federal funding for the existing EB program, leading 26 states to increase extended benefit generosity. Third, Congress raised the weekly benefit payment by $25 for all UI recipients between February 2009 and December 2010 through the Federal Additional Compensation (FAC) program. In all, EUC accounted for 81% of the benefit expansions, increases to EB accounted for 15%, and FAC accounted for 4%. We exclude from this calculation extended benefits that would have been available under the EB program in the absence of full federal funding.

For each year *t*, we calculate the proportional change in the mortgage delinquency rate

implied by our estimates using the following equation, where *UI* denotes the additional benefits authorized (in thousands of dollars) under the EB, EUC, and FAC programs:

$$\%\Delta D_t = \frac{(\Delta \Pr(Delinquency)\, per\ UI|Layoff) * (Mean\ of\ UI)_t * \Pr(Layoff)_t}{\Pr(Delinquency)} \qquad (4)$$

The numerator gives the change in the probability of delinquency across all households, assuming zero effect of UI payments on households that do not experience a layoff. To be more specific, we multiply the change in delinquency for each $1,000 in maximum extended benefits for those that are laid off (−0.31, from column 2 of Table III) by the amount of maximum extended benefits, averaged across states, and the probability of a layoff in that year. Dividing through by the average delinquency rate, we are left with an estimate of the proportional change in delinquencies attributable to the UI expansions.[21]

In Table VII, we report the inputs to this calculation in each year. For the year 2009, we find that extended benefits reduced the delinquency rate by 1.09 percentage points, or 14.2%, relative to the average delinquency rate of 7.65%. To convert this proportional change into the number of delinquencies avoided, we multiply by 4.1 million, the average number of delinquent mortgages (30+ days late) in the year 2009 according to the National Delinquency Survey from the Mortgage Banker's Association. By this calculation, the UI extensions helped avoid 584,800 delinquencies in 2009 and 2.7 million delinquencies in total between 2008 and 2012.

To convert our estimate of delinquencies avoided into foreclosures avoided, we need an estimate for how the delinquency-to-foreclosure transition probability compares between the pool of all delinquent loans and the pool of loans for which extended benefits prevent delinquency. To this end, we examine loan servicing data from Lender Processing Services (LPS) and test whether the delinquency-to-foreclosure transition rate in a state varies with

[21] An implicit assumption in this calculation is that the average and marginal effects of $1,000 of UI expansions are similar. We believe that this assumption is reasonable, given our quantitatively similar findings for the effects of maximum regular and extended UI benefits.

extended benefits. The details of this analysis are described in Appendix A2 and in Appendix Table A-V. Using a specification similar to equation (3), we find no detectable difference in the proportion of delinquent loans that enter foreclosure within 24 months: an additional $1,000 in maximum benefits is associated with 6 basis points lower foreclosure transition rates (standard error 11 basis points), which is almost 3 orders of magnitude smaller than the national average foreclosure transition rate of 38.9 percent.[22]

This finding—that UI generosity does not substantively change the foreclosure transition rate—implies that extending UI benefits causes the same proportional change in foreclosures as it does for delinquencies. In the year 2009, for which we found a 14.2% reduction in delinquencies, we estimate that UI avoided 332,000 foreclosures (14.2% of the 2,320,000 foreclosure starts in 2009). Summing the estimated foreclosures avoided between July 2008 and December 2012, we find that the expanding UI helped prevent about 1.4 million foreclosures.

This reduction compares favorably to the estimated 800,000 foreclosures prevented by the largest public policy targeting mortgage modification, the Home Affordable Modification Program (Agarwal et al. 2013). The HAMP program fell short of its goals at least in part because it relied on the participation of mortgage servicers. After struggling to secure full participation by servicers, the program succeeded in disbursing less than a quarter of the funds allocated (CBO 2012). The Home Affordable Refinance Program (HARP) also underperformed its goals, likely due to features of its design, including requirements that the mortgagor be current with their payments and document sufficient income to repay the new loan, which prevented the participation of many unemployed borrowers (Remy, Lucas, and Moore 2011). Expanding UI may have prevented more foreclosures than these programs because it did not require cooperation from loan originators, investor pools, or subordinated lien holders, and was able to

[22] Furthermore, if the UI extensions prevented delinquencies that were less likely to transition to foreclosure, then we would expect the point estimate to be positive, not negative.

deliver assistance to unemployed borrowers, who were at a heightened risk of default.

D. Estimated Savings from Avoiding Foreclosures

By preventing foreclosures, the federal expansions of unemployment insurance during the Great Recession prevented deadweight loss and subsidized both government-sponsored enterprises (GSEs) and the overall U.S. financial system. In this section, we build on estimates from the U.S. government to quantify these savings and subsidies.

The U.S. Department of Housing and Urban Development (HUD 2010) estimates the deadweight loss of a typical foreclosure during the Great Recession to be about $51,061, including depreciation in the property's structural value ($13,455), decline in neighboring home values ($14,531), and transaction costs paid by the lender ($12,775) and the household ($10,300).[23] Aggregating over 1.4 million foreclosures avoided, we estimate that the federal UI expansions prevented more than $70 billion in deadweight loss.

Preventing foreclosures also subsidized mortgage lenders, insurers, local governments, and the overall financial system by averting losses incurred on foreclosed properties. Building on HUD's (2010) calculations, we report estimates of the magnitude of these subsidies in Appendix Table A-VI. Based on the median property value in 2007, an original loan-to-value ratio of 80%, an unpaid loan balance of 104%, and a loss rate of 42.3%, HUD (2010) estimates that first lien mortgage lenders lost roughly $76,687 per foreclosed property during the Great Recession. Deadweight costs borne by lenders accounted for roughly one third of this loss, while the other two thirds were transfers of value to the borrower and others.[24] Many properties were also

[23] Reductions in maintenance and investment spending by homeowners at risk of default (Harding et al. 2000; Melzer 2013) contribute to depreciation in the foreclosed property's value. Following a foreclosure, neighboring properties also lose value (Immergluck and Smith 2006; Harding et al. 2009; Campbell et al. 2011; Mian, Sufi, and Trebbi 2011; Gerardi et al. 2012) and neighborhood crime increases (Ellen et al. 2013).

[24] The transfer to borrowers is the amount of principal and unpaid interest in excess of the property's fair value. The discount to fair value that lenders receive when selling the foreclosed property is transferred to the purchaser of the property.

financed by second lien loans, for which the outstanding balance was about one-eighth that of first lien loans (Lee, Mayer, and Tracy 2012), or on average about 10% of the original property value. Applying the same calculation as for first lien loans and recognizing that the typical second lien holder recovered nothing in foreclosure, we estimate an average loss of $18,129 per foreclosed property for second lien holders. HUD (2010) also estimates that local governments lost $6,200 per foreclosure in reduced property tax revenue and greater costs from policing, building inspections, social services, and—in the most extreme cases—demolition.

Aggregating over the 1.4 million avoided foreclosures and accounting for the proportion of federally owned or insured loans (Congressional Budget Office 2010), we estimate that UI expansions during the Great Recession provided a $46 billion subsidy to the GSEs, an $84 billion subsidy to private mortgage investors, and an almost $9 billion subsidy to local governments. Given the federal government's implicit guarantee of the GSEs, this estimate implies that the net cost of the UI expansions to the federal government was actually about a fifth less than $250 billion paid out. These saving are particularly notable because the fiscal cost of extending UI was a key consideration in the public policy debate. The subsidy to private investors, many of which were struggling financial institutions, also represented a sizable capital injection into the financial system at a critical time; at $84 billion, this subsidy equates to more than 30% of the capital invested in banks under the Troubled Asset Relief Program (TARP), which Veronesi and Zingales (2010) estimate created substantial social value.

V. UI BENEFITS AND CREDIT SUPPLY

Having established the effect of UI generosity on delinquency and default, we next examine whether lenders respond by adjusting credit terms in response to UI generosity. In this analysis we focus on variation in regular UI benefits, because the emergency and extended benefits programs were temporary and therefore less likely to affect the default risk of a loan

applicant that is currently employed.

A. Mortgage interest rates

To evaluate the impact of UI generosity on mortgage terms, we examine state-level data on mortgage interest rates published by the Federal Housing Finance Agency (FHFA), which regulates Fannie Mae and Freddie Mac. On a monthly basis, the FHFA surveys a sample of mortgage lenders (including mortgage companies, banks, and savings associations) on the terms and conditions of all purchase mortgage loans closed during the last five days of the month. At annual frequency for 1978 to 2011, the FHFA published the average mortgage interest rate at the state level, based on the borrower's location. For the analysis that follows, we extend the data on UI generosity and state economic conditions back to 1978.

We regress the state-level average mortgage interest rate, measured in logs and levels, on UI generosity, controls for state-level economic conditions ($\boldsymbol{Z}$), the average loan-to-value ratio (LTV), the average loan term (Term), state fixed effects (λ), and year fixed effects (μ):

$$Rate_{st} = \alpha + \beta Max\ Benefit_{st} + \boldsymbol{\eta}\mathbf{Z}_{st} + LTV_{st} + Term_{st} + \lambda_s + \mu_t + \varepsilon_{st}. \qquad (4)$$

The results are reported in the first two columns of Table VIII. We find that as *Max Benefit* increases, mortgage interest rates decline. For every $1,000 increase in maximum unemployment benefits, the state-wide average interest rate decreases by 2.5 basis points ($p < 0.02$; column 1) or 0.3 log points ($p < 0.01$; column 2).

To gauge the economic magnitude of these estimates, consider the observed variation in *Max Benefit* across states in 2010. A one standard deviation increase in the maximum UI benefit ($3,600) corresponds to about a 5% decline in the 1.82% average mortgage credit spread over treasury bonds during this period. Furthermore, note that these estimates correspond to the average savings across mortgage borrowers in a state and thus likely belie substantial heterogeneity in savings across borrowers. We would expect higher risk borrowers—particularly

those perceived to be at greater risk of unemployment—to realize substantially higher savings.

B. UI generosity and HELOC offers

Next, we examine offers for home equity lines of credit (HELOC), which are revolving lines of credit that are secured by home equity. HELOCs are an important component of household borrowing: over the last decade, HELOC borrowing averaged $570 billion, which constituted 5% of total household debt, just behind credit cards (7%) and auto loans (7%) in its share of household debt (Federal Reserve Bank of New York 2014).

We obtained data on HELOC offers from Mintel Comperemedia, a leading market research firm that tracks direct marketing and other advertising in the United States. Each month, Mintel invites households to participate in a survey in which they answer background questions on their household demographics and forward all of their mail that contains credit offers and solicitations. Mintel collects a sample of roughly 2,000 households each month, with repeated cross-sections covering a sample period from January 2000 to December 2011. Summary statistics for the Mintel sample, adjusted for sampling weights, are reported in Panel C of Table I. The median household in this sample has $55,000 in annual income. The average head of household is 48 years old, and about a third have a college degree.

Using the Mintel data, we analyze the HELOC offers that homeowners receive. As reported in Table I, the average quoted interest rate is 5.3%. To test whether UI generosity affects credit offers, we estimate the following regression model using weighted least squares and sampling weights:

$$Rate_{ist} = \alpha + \beta Max\ Benefit_{st} + \boldsymbol{\zeta}\mathbf{X}_{it} + \boldsymbol{\eta}\mathbf{Z}_{st} + \lambda_s + \mu_t + \varepsilon_{ist}, \quad (5)$$

where $Rate_{ist}$ is the HELOC interest rate. The independent variable of interest remains *Max Benefit*. We include flexible household-level controls for education, income, and age ($\mathbf{X}_{it}$) in

addition to state-level economic conditions ($\mathbf{Z}_{st}$) and state and year fixed effects.[25] The results are reported in columns (3) and (4) of Table VIII.

We find that homeowners are offered lower interest rates on HELOCs when they are eligible for more generous UI benefits. The average interest rate declines by 9.0 basis points ($p < 0.05$; column 3) or 1.9 log points ($p < 0.05$; column 4) for every $1,000 increase in maximum benefits. A one standard deviation increase in the maximum UI benefit ($3,600) is thus associated with a 32 basis point or 6.8% decline in the HELOC rate. This estimate implies that HELOC interest rates are considerably more responsive to UI generosity than first lien mortgage interest rates, as one would expect. Because HELOCs are junior to first lien mortgages and more susceptible to losses, HELOC credit losses (and interest rates) should be more responsive to marginal changes in borrowers' ability to pay. In a robustness exercise, we confirm that HELOC terms improve with UI generosity even prior to the Great Recession; indeed, we estimate slightly larger effects for sample observations prior to 2009 (see Appendix Table A-VII, columns 1 and 2).

A marginal change in UI benefits has a greater impact on low-income households relative to high-income households, who are more likely to have accumulated savings available to weather a job loss. We therefore split our sample into three income groups (cut at $35,000 and $70,000) and re-run our analysis. The results are presented in Panel A of Table IX. Perhaps unsurprisingly, there are relatively few observations for the lowest income group, reducing the precision of that estimate. Nevertheless, increased generosity of UI benefits appears to decrease the HELOC interest rate for each income group. The point estimate is about 10 to 20 percent larger for the lowest income group, consistent with the marginal impact of UI benefits on creditworthiness being greatest for those with the least income, but the estimates' imprecision

[25] The household-level controls are: indicators for each of 5 education categories (based on education of the head of household), indicators for 18 categories of household income, and indicators for 10 categories of age of the head of household. All regressions are weighted using survey weights.

also cannot reject a homogenous negative effect across the income categories. A log specification obtains similar results.

C. UI Generosity and Credit Card Terms

The credit market effects of UI go beyond mortgages and home equity lines of credit. UI generosity also influences the market for credit cards, which are used widely to finance consumption. About three quarters of American households use credit cards (Henriques and Hsu, forthcoming), and card balances averaged $740 billion over the last decade (Federal Reserve Bank of New York 2014). By providing revolving credit, credit cards enable individuals to increase their borrowing and smooth spending in the face of shocks. Sullivan (2008) documents that households with limited assets do exactly that during unemployment spells, using credit in addition to publicly provided unemployment benefits to finance consumption. Our analysis takes a different perspective by examining whether public insurance, through its effect on credit risk, affects the *availability* rather than the *use* of revolving credit.

We examine direct mail credit card offers using data from Mintel. Given the prevalence of direct mail as a channel for originating credit card loans, the Mintel data provide an important measure of households' access to credit cards. A typical credit card offer will include information about interest rates, credit limits, annual fees, and rewards. Among the offers' terms, we focus on the annual percentage rate charged for regular purchases and the maximum borrowing limit advertised in the offer.[26] For households that receive multiple offers, we compute the average interest rate and the average credit limit across all offers. To ensure

[26] The data on maximum borrowing limits is concentrated in the first three-quarters of the sample period, from 2000 to 2008. Early in our sample period, issuers commonly advertised the maximum amount of credit available, but this practice changed over time and, after 2008, they rarely included this information in card offers. We suspect that regulatory changes instituted by the Credit Card Accountability, Responsibility, and Disclosure Act ("CARD Act") of 2009 contributed to this change in industry practice. The CARD Act includes a provision requiring issuers to consider borrowers' ability-to-pay, including the amount of debt relative to income, before extending credit. Without knowing the borrower's income, lenders may be reluctant to advertise the maximum credit limit in light of this ability-to-pay requirement.

comparability, we limit the analysis to offers for credit cards with zero annual fees and no rewards; we place no restrictions on the homeownership status of the household. Across households, the mean interest rate is 11.9 percent and the mean credit limit is about $36,000 (see Table I). Results from regression analysis, using the same model as in the HELOC analysis, are reported in the last four columns of Table VIII.

More generous unemployment insurance seems to lead lenders to offer borrowers more favorable credit terms. Controlling for income, education, and state-level economic conditions, households in states with more generous UI benefits receive credit card offers with lower interest rates and higher credit limits. We find that increasing *Max Benefit* by $1,000 reduces the interest rate by 6.3 basis points ($p < 0.01$; column 5) or 0.4 log points ($p < 0.01$; column 6), which implies that a one standard deviation increase in *Max Benefit* ($3,600) reduces credit card interest rates by about 23 basis points or 1.4%.[27]

The estimated effect on credit limits is more substantial. We find that increasing *Max Benefit* by $1,000 increases the offered credit limit by $474 ($p < 0.01$; column 7) or 3.0 log points ($p < 0.01$; column 8), which implies that a one standard deviation increase in *Max Benefit* ($3,600) raises the offered credit limit by about $1,700 or 11%.

We also investigate how these effects of UI generosity vary with household income. The results are reported in Panels B and C of Table IX. The effect of *Max Benefit* is largest in the lowest income group, those with income below $35,000. In this group, for which regression results are reported in column (1), a $1,000 increase in *Max Benefit* corresponds to an 11.8 basis point decline in the interest rate ($p < 0.01$; Panel B) and a $1,023 increase the credit limit ($p < 0.01$; Panel C).[28] In contrast, the estimated effects of *Max Benefit* are smaller and statistically

[27] As with HELOC offers, the estimated effect of UI on credit card interest rates is robust to dropping observations during the Great Recession, i.e. post-2008 (see Appendix Table A-VII, columns 3 and 4).
[28] Recall that the sample is restricted to offers for credit cards with zero annual fee. The least creditworthy households and those with less savings are less likely to receive such offers. Among those households, the

insignificant for households with higher incomes (columns 2 and 3). A log specification obtains similar results.

All in all, the results for the various types of consumer credit suggest that lenders respond to the decrease in default risk by increasing credit supply to low-income households when they are eligible for greater unemployment insurance.

VI. Conclusion

The United States and other developed countries have robust social safety nets that provide households with assistance in the case of job loss, a workplace accident, disability, or health or other problems. The benefits of such programs are typically evaluated by measuring the welfare improvement of recipients when payments are received. But consumer credit markets can amplify the effects of social insurance in two ways. First, when there are social costs of loan default as in mortgage markets, the benefits of social insurance can spread beyond the direct recipients. Second, when changes to social insurance affect borrowers' credit risk and access to credit, the gains from expanding insurance spread to at-risk populations even before they draw on social insurance.

This paper focuses specifically on unemployment insurance, the largest government transfer program outside of social security and government-sponsored health care. Exploiting differences in the generosity of UI across US states and over time, we find that mortgage delinquency and default decline as benefits become more generous. The impact of benefit payments during the Great Recession was substantial: we estimate that Federal expansions of UI helped to avert about 1.4 million foreclosures and $70 billion of housing-related deadweight losses between 2008 and 2012. Furthermore, we find that greater benefit generosity improves credit access for the poor, even while they are employed. In that way, unemployment insurance

---

sensitivity of credit supply to UI generosity is likely even greater than the estimates reported here.

confers social benefits not previously highlighted by academic research.

Even if not by design, unemployment insurance stemmed foreclosures in a period when more targeted housing programs, such as the Home Affordable Refinance Program (HARP) and the Home Affordable Modification Program (HAMP), underperformed their goals. UI achieved the goal of those programs—making loan payments more affordable—while avoiding key challenges of loan refinancing and modification, such as the need for lenders' and loan servicers' cooperation in screening borrowers and modifying loan contracts. UI bypassed lenders and loan services by transferring money to homeowners directly. By linking assistance to an observable shock beyond a household's control (i.e., job displacement), UI also distorted *ex ante* choices less than assistance conditioned on indebtedness or payment delinquency.

Although expanding UI reduced foreclosures during the crisis, it is a blunt policy that entails additional costs that should not be ignored. Increasing benefit generosity has the potential to distort all recipients' job search, even though it reduces foreclosure risk only among the roughly half of recipients who are mortgagors. Policymakers preferring more targeted policies could direct additional cash assistance to unemployed mortgagors, by expanding the Hardest Hit Fund or adopting similar programs proposed by housing economists (Davis, Malpezzi, and Ortalo-Magne 2009; Foote et al. 2009). Our results suggest that such programs could help to stabilize the housing market during times of crisis.

REFERENCES

Agarwal, Sumit, Gene Amromin, Itzhak Ben-David, Souphala Chomsisengphet, Tomasz Piskorski, and Amit Seru. 2012. Policy Intervention in Debt Renegotiation: Evidence from the Home Affordable Modification Program. Working paper.

Agarwal, Sumit, Gene Amromin, Itzhak Ben-David and Serdar Dinc. 2013. The Legislative Process and Foreclosures. Working paper.

Agrawal, Ashwini K. and David A. Matsa. 2013. Labor Unemployment Risk and Corporate Financing Decisions. *Journal of Financial Economics*, 108(2): 449–470.

Auerbach, Alan J. and Daniel Feenberg. 2000. The Significance of Federal Taxes as Automatic Stabilizers. *Journal of Economic Perspectives*, 14(3): 37–56.

Baily, Martin N. 1978. Some Aspects of Optimal Unemployment Insurance. *Journal of Public Economics*, 10: 379–402.

Blaustein, Saul J., 1993. Unemployment insurance in the United States: the first half century. With Wilbur J. Cohen and William Haber. W. E. Upjohn Institute for Employment Research, Kalamazoo, MI.

Browning, Martin, and Thomas F. Crossley. 2001. Unemployment Insurance Levels and Consumption Changes. *Journal of Public Economics*, 80(1):1–23.

Bloemen, Hans G., and Elena G. F. Stancanelli. 2005. Financial Wealth, Consumption Smoothing and Income Shocks Arising from Job Loss. *Economica*, 72: 431–452.

Bowler, Mary, and Teresa L. Morisi. 2006. Understanding the Employment Measures from the CPS and CES Survey. *Monthly Labor Review* (February 2006): 23–38.

Campbell, John Y., Stefano Giglio, and Parag Pathak. 2011. Forced Sales and House Prices. *American Economic Review*, 101(5): 2108–2131.

Carroll, Christopher D. 1997. Buffer-stock saving and the life cycle/permanent income hypothesis. *Quarterly Journal of Economics*, 112(1): 1–55.

Congressional Budget Office (CBO). 2012. Report on the Troubled Asset Relief Program – March 2012. Retrieved from http://www.cbo.gov/sites/default/files/cbofiles/attachments/03-28-2012TARP.pdf

Chatterjee, Satyajit, Dean Corbae, Makoto Nakajima and Jose-Victor Rios-Rull. 2007. A Quantitative Theory of Unsecured Credit with Risk of Default. *Econometrica*, 75(6): 1525–1589.

Chetty, Raj and Adam Szeidl. 2007. Consumption Commitments and Risk Preferences. *Quarterly Journal of Economics*, 122(2): 831–877.

Chetty, Raj. 2008. Moral Hazard vs. Liquidity and Optimal Unemployment Insurance. *Journal of Political Economy*, 116(2): 173–234.

Davis, Morris A., Stephan Malpezzi, and Francois Ortalo-Magne. 2009. The Wisconsin Foreclosure and Unemployment Relief Plan. http://bus.wisc.edu/centers/james-a-graaskamp-center-for-real-estate/publications/wi-fur.

Ellen, Ingrid Gould, Johanna Lacoe, and Claudia Ayanna Sharygin. 2013. "Do Foreclosures Cause Crime?" *Journal of Urban Economics*, 74: 59–70.

Ellul, Ronel, Nicholas S. Souleles, Souphala Chomsisengphet, Dennis Glennon, and Robert Hunt. 2010. What "Triggers" Mortgage Default? *American Economic Review, Papers & Proceedings* 100: 490–494.

Engen, Eric and Jonathan Gruber. 2001. Unemployment Insurance and Precautionary Savings. *Journal of Monetary Economics*, 47: 545–579.

Farber, Henry S., and Robert G. Valetta. 2013. Do Extended Unemployment Benefits Lengthen Unemployment Spells? Evidence from Recent Cycles in the U.S. Labor Market. NBER Working Paper No. 19048.

Federal Reserve Bank of New York. 2014. Quarterly Report on Household Debt and Credit. Retrieved from http://www.newyorkfed.org/householdcredit/2013-Q4/HHDC_2013Q4.pdf

Federal Reserve Board of Governors. 2012. The U.S. Housing Market: Current Conditions and Policy Considerations. Retrieved from http://www.federalreserve.gov/publications/other-reports/files/housing-white-paper-20120104.pdf

Feldstein, Martin. 2005. Rethinking Social Insurance. *American Economic Review*, 95(1): 1–24.

Foote, Chris, Jeff Fuhrer, Eileen Mauskopf and Paul Willen. 2009. A Proposal to Help Distressed Homeowners: A Government Payment-Sharing Plan. Federal Reserve Bank of Boston Public Policy Briefs No. 09-1.

Foote, Christopher, Kristopher Gerardi, Lorenz Goette and Paul Willen. 2010. Reducing Foreclosures: No Easy Answers. *NBER Macroeconomics Annual 2009*, Volume 24: 89–138.

Fuster, Andreas and Paul S. Willen. 2012. Payment Size, Negative Equity, and Default. Federal Reserve Bank of New York, Staff Report Number 582.

Gerardi, Kristopher, Eric Rosenblatt, Paul Willen and Vincent Yao. 2012. Foreclosure Externalities: Some New Evidence. NBER Working Papers, Number 18353.

Gerardi, Kristopher, Kyle F. Herkenhoff, Lee E. Ohanian and Paul S. Willen. 2013. Unemployment, Negative Equity and Strategic Default. Working paper.

Gormley, Todd A., Hong Liu and Guofu Zhou. 2010. Limited Participation and Consumption-Saving Puzzles: A Simple Explanation and the Role of Insurance. *Journal of Financial Economics*, 96(2): 331–344.

Gross, David B. and Nicholas S. Souleles. 2002. Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data. *Quarterly Journal of Economics*, 117(1): 149–185.

Gruber, Jonathan. 1997. The Consumption Smoothing Benefits of Unemployment Insurance. *American Economic Review*, 87(1): 192–205.

Guiso, Luigi, Paola Sapienza and Luigi Zingales. 2013. The Determinants of Attitudes towards Strategic Default on Mortgages. *Journal of Finance*, 68(4): 1473–1515.

Harding, John, Thomas Miceli and C.F. Sirmans. 2000. Do Owners Take Better Care of Their Housing Than Renters? *Real Estate Economics*, 28 (4): 663–681.

Harding, John, Eric Rosenblatt and Vincent Yao. 2009. The Contagion Effect of Foreclosed Properties. *Journal of Urban Economics*, 66(3): 164–78.

Henriques, Alice M., and Joanne W. Hsu. Forthcoming. Analysis of Wealth Using Micro and Macro Data: A Comparison of the Survey of Consumer Finances and Flow of Funds Accounts. In *Measuring Economic Sustainability and Progress*, Dale W. Jorgenson, J. Steven Landefeld, and Paul Schreyer, editors. NBER Book Series Studies in Income and Wealth. University of Chicago Press, Chicago, IL.

Immergluck, Dan and Geoff G. Smith. 2006. The External Costs of Foreclosure: The Impact of Single-Family Mortgage Foreclosures on Property Values. *Housing Policy Debate*, 17(1): 57–80.

Kroft, Kory and Matthew J. Notowidigdo. 2014. Should Unemployment Insurance Vary with the Unemployment Rate? Theory and Evidence. Working paper.

Krueger, Alan B. and Andreas Mueller. 2010. Job Search and Unemployment Insurance: New Evidence from Time Use Data. *Journal of Public Economics*, 94(3-4): 298–307.

Laibson, David. 1997. Golden Eggs and Hyperbolic Discounting. *Quarterly Journal of Economics*, 112(2): 443–477.

Melzer, Brian T. 2013. Mortgage Debt Overhang: Reduced Investment by Homeowners with Negative Equity. Working Paper.

Meyer, Bruce D. 1990. Unemployment Insurance and Unemployment Spells. *Econometrica*, 58(4): 757–782.

Meyer, Bruce D., Wallace K. C. Mok, and James X. Sullivan. 2009. The Under-Reporting of Transfers in Household Surveys: Its Nature and Consequences. NBER Working Paper No. 15181.

Mian, Atif, Amir Sufi, and Francesco Trebbi. 2011. Foreclosures, House Prices, and the Real Economy. NBER Working Paper No. 16685.

Moffitt, Robert. 1985. Unemployment Insurance and the Distribution of Unemployment Spells. *Journal of Econometrics*, 28(1): 85–101.

Posner, Eric A., and Luigi Zingales. 2009. A Loan Modification Approach to the Housing Crisis. *American Law and Economics Review*, 11(2): 575–607.

Remy, Mitchell, Deborah Lucas, and Damien Moore. 2011. An Evaluation of Large-Scale Mortgage Refinancing Programs. Working paper.

Rothstein, Jesse. 2011. Unemployment Insurance and Job Search in the Great Recession. *Brookings Papers on Economic Activity*, Fall 2011: 143–210.

Schmeider, Johannes F., Till von Wachter and Stefan Bender. 2012. The Longterm Effects of UI Extensions on Employment. *American Economic Review: Papers and Proceedings*, forthcoming.

Sullivan, James X. 2008. Borrowing During Unemployment: Unsecured Debt as a Safety Net. *Journal of Human Resources*, 43(2): 383–412.

Topel, Robert H. 1983. On Layoffs and Unemployment Insurance. *American Economic Review*, 73(4): 541–559.

Tracy, Joseph, and Joshua Wright. 2012. Payment Changes and Default Risk: The Impact of Refinancing on Expected Credit Losses. Federal Reserve Bank of New York, Staff Report Number 562.

U.S. Congress, U.S. House of Representatives, 2004. *2004 Green Book, Background Material and Data on Programs within the Jurisdiction of the Committee on Ways and Means*. 108th Congress, 2nd session, WMCP: 108-6. US Government Printing Office, Washington, DC.

U.S. Department of Housing and Urban Development (HUD). 2010. Economic Impact Analysis of the FHA Refinance Program for Borrowers in Negative Equity Positions. Retrieved from http://www.hud.gov/offices/adm/hudclips/ia/ia-refinancenegativeequity.pdf

Veronesi, Pietro, and Luigi Zingales. 2010. Paulson's Gift. *Journal of Financial Economics*, 97(3): 339–368.

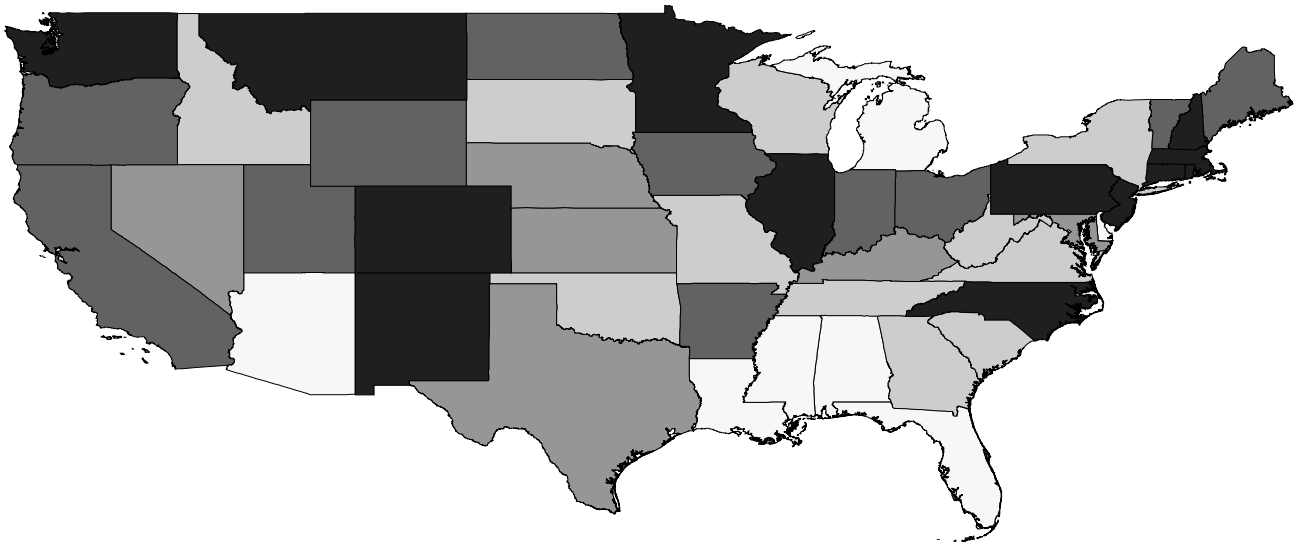

Figure 1. Geographic distribution of regular state unemployment insurance benefit increases between 1991 and 2011, by quintile.

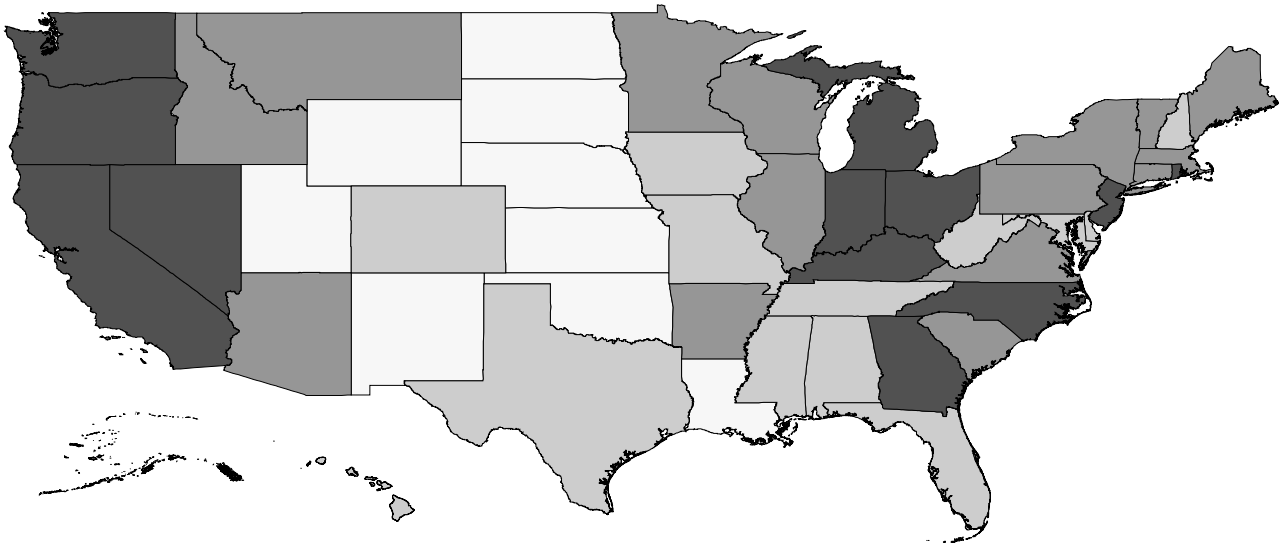

Figure 2. Weeks of extended benefits available to eligible unemployment insurance recipients under the Extended Benefits and Emergency Unemployment Compensation programs, May 2009.

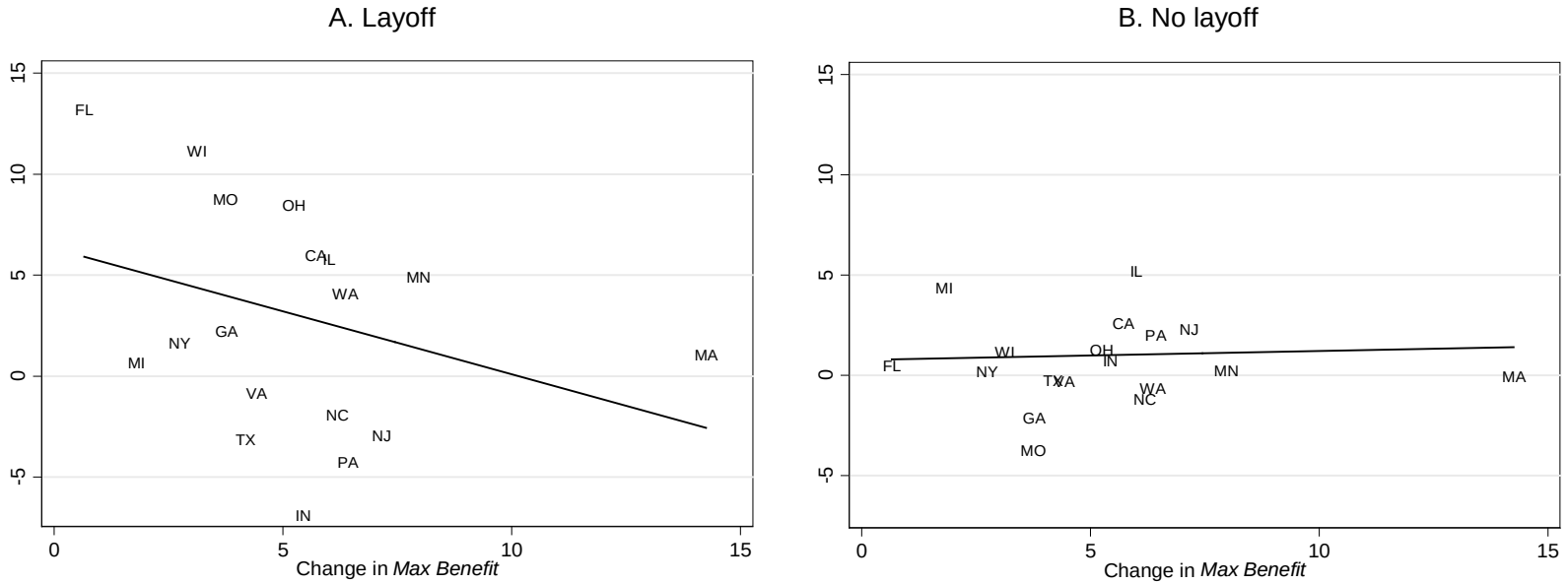

Figure 3. Changes in mortgage delinquency and maximum regular state unemployment insurance benefits (in thousands of dollars) between 1992 and 2011, by state. Only states with at least 50 observations in each period are displayed.

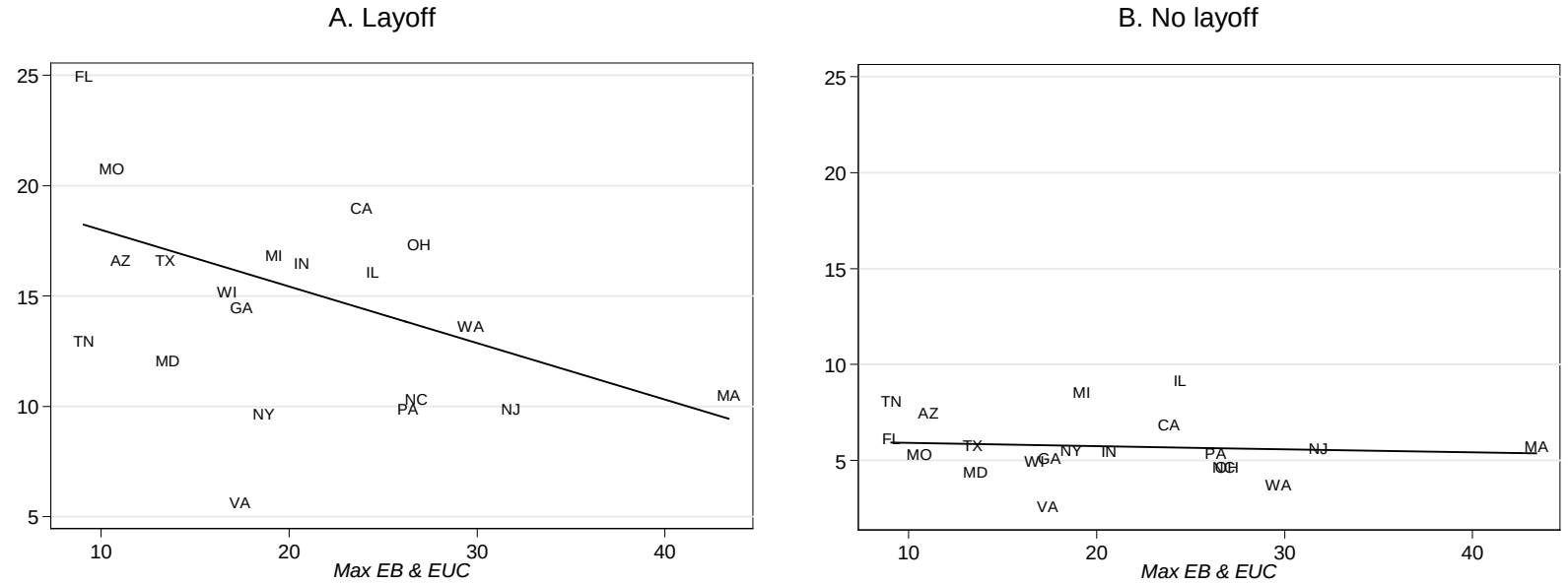

Figure 4. Mortgage delinquency and extended benefits available to eligible unemployment insurance recipients under the Extended Benefits and Emergency Unemployment Compensation programs (in thousands of dollars) in May 2009, by state. Only states with at least 50 observations are displayed.

Table I: Summary Statistics

	Mean	Median	Standard Deviation
Panel A: State Characteristics (1991-2011, N = 1,071)			
Unemployment Insurance			
Max Benefit ($ thousands)	8.6	8.0	3.2
Max Weekly Benefit ($ thousands)	0.3	0.3	0.1
Max Regular Duration (weeks)	26.2	26.0	0.8
Real Max Benefit (2011 $ thousands)	10.8	10.2	3.3
Log of Max Benefit	9.0	9.0	0.3
Max Benefit/Wages (% of semi-annual wages)	46.1	45.7	11.1
Max Benefit HH ($ thousands)	6.7	6.9	3.9
UI Trust Fund Reserves (% of covered annual wages)	1.5	1.4	1.2
UI Trust Fund Reserve Ratio < 0? (%)	7.3	0	26.0
Max EB EUC ($ thousands, 2009, N = 51)	17.7	17.4	8.4
Max EB EUC Duration (weeks, 2009, N = 51)	40.0	46.0	12.0
Economic Variables			
Unemployment rate (%)	5.6	5.3	1.9
Real GDP growth (%)	2.6	2.5	2.9
Home price growth (%)	3.3	3.5	6.6
Average annual wages ($ thousands)	39.0	37.7	11.2
Mortgage Variables			
Interest rate (%, 1978–2011, N = 1,733)	8.4	7.7	2.6
Panel B: Household Characteristics, Delinquency Analysis (1991-2011, N = 64,922)			
Mortgage and Housing			
Delinquent prior 12 months? (%)	5.4	0	22.6
Evicted prior 12 months? (%)	0.2	0	3.9
Moved prior 12 months? (%)	8.0	0	27.2
Moved prior 36 months? (%, N = 17,096)	14.2	0	34.9
Loan-to-value (%)	59.2	59.8	31.6
Negative Equity (%)	5.4	0	22.6
Mortgage payment ($ per month, N = 52,738)	926.7	794.5	589.7
Mortgage payment per week/max weekly benefit (%)	61.7	52.2	39.5
Panel B: Household Characteristics, Delinquency Analysis (continued)			
Employment, Income, and Assets			
Layoff within household in prior 12 months? (%)	14.7	0	35.4
Household annual earnings ($ thousands)	52.8	42.6	55.1
Liquid financial assets ($ thousands)	43.8	3.6	945.7
Net worth ($ thousands)	195.8	88.4	997.3
Education (maximum within household)			
No high school diploma (%)	5.5	0	22.7
High school diploma only (%)	20.3	0	40.2
Some college studies (%)	33.0	0	47.0
College degree (%)	22.8	0	42.0
Some graduate studies (%)	18.4	0	38.8
Panel C: Household Characteristics, Credit Terms Analysis (2000-2011, N = 148,327)			
Credit Offers			
HELOC interest rate (%, N = 14,643)	5.3	4.75	1.6
Interest rate, credit card (%, N = 143,364)	11.9	10.6	4.1
Credit limit, credit card ($ thousands, N = 96,935)	36.3	30.0	32.2
Income			
Household annual income ($ thousands)	63.1	55.0	46.1
Education			
No high school diploma (%)	8.8	0	28.3
High school diploma only (%)	32.8	0	47.0
Some college studies (%)	22.4	0	41.7
College degree (%)	23.6	0	42.5
Some graduate studies (%)	12.4	0	32.9
Other			
Age	48.3	47.0	13.5

Notes: This table describes the main samples analyzed in this paper. The state characteristics are assembled from various sources: unemployment insurance (UI) benefit criteria and Trust Fund reserves are from the U.S. Department of Labor's "Significant Provisions of State UI Laws," trigger notices, and "Unemployment Insurance Financial Data Handbook"; average wages and GDP are from the U.S. Bureau of Economic Analysis; the unemployment rate is from the U.S. Bureau of Labor Statistics; the home price growth rate is calculated from the Case-Shiller Home Price Index; and purchase mortgage loan interest rates are from the Federal Housing Finance Agency. The sample for the delinquency analysis is all homeowners with mortgage loans in the Survey of Income and Program Participation (SIPP) panels beginning in 1991, 1992, 1993, 1996, 2001, 2004 and 2008. The sample for the household-level credit terms analysis is all households that receive a credit offer in the Mintel Comperemedia survey.

Table II: Unemployment Insurance Generosity and Mortgage Delinquency
(SIPP, 1991-2011)

	Dependent variable: Mortgage Delinquency		
	(1)	(2)	(3)
Max Benefit	-0.08	-0.03	
	(0.12)	(0.13)	
Max Benefit*Layoff		-0.23***	-0.25***
		(0.07)	(0.08)
Layoff	6.51***	6.55***	6.55***
	(0.38)	(0.34)	(0.35)
Observations	64,922	64,922	64,922
R^2	0.05	0.05	0.05
Household-level controls?	Y	Y	Y
State-year controls?	Y	Y	-
State and year FEs?	Y	Y	-
State-year FEs?	N	N	Y

Notes: This table summarizes the results from linear probability regressions of mortgage delinquency on *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system), a layoff indicator, their interaction, and a set of controls. When uninteracted, the *Layoff* coefficient measures the effect in a state with average *Max Benefit*. Controls in all regressions include the household's earnings, net worth, education (indicators for each of five categories), mortgage loan-to-value, and indicators for negative home equity and its interaction with *Layoff*, and the states' unemployment rate, average wage, GDP growth rate, home price growth rate, Unemployment Insurance (UI) Trust Fund reserve ratio, an indicator for a negative UI Trust Fund reserve ratio, and state and year fixed effects. In column (3), controls also include state-by-year fixed effects, which absorbs the estimate of the *Max Benefit* main effect. Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table III: Unemployment Insurance Extensions and Mortgage Delinquency (SIPP, 2010)

	Dependent variable: Mortgage Delinquency		
	(1)	(2)	(3)
Max EB EUC*Layoff	-0.25***	-0.31***	
	(0.08)	(0.09)	
Max EB EUC Duration*Layoff			-0.34***
			(0.11)
Layoff	8.13***	8.83***	8.80***
	(0.71)	(0.86)	(0.85)
Observations	12,602	12,602	12,602
R^2	0.07	0.07	0.07
Household-level controls?	Y	Y	Y
State-year FEs?	Y	Y	Y
Layoff X cubic in unemployment rate	N	Y	Y

Notes: This table summarizes the results from linear probability regressions of mortgage delinquency on measures of the generosity of extended benefits paid under states' unemployment insurance system in May 2009, a layoff indicator, their interaction, and a set of controls. *Max EB EUC Duration* is the maximum number of weeks of benefits paid under the Extended Benefits (EB) and Emergency Unemployment Compensation (EUC) programs, and *Max EB EUC* is the maximum total potential dollars paid. When uninteracted, the *Layoff* coefficient measures the effect in a state with average *Max EB EUC* (in columns 1 and 2) and average *Max EB EUC Duration* (in column 3). Controls in all regressions include state fixed effects and the household's earnings, net worth, education, mortgage loan-to-value and an indicator for negative home equity (alone and interacted with *Layoff*). In columns (2) and (3), controls also include different cubic functions of the state's unemployment rate for laid off and nonlaid off households. Standard errors, adjusted for clustering at the state level, are reported in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table IV: Unemployment Insurance and Mortgage Delinquency, by Household Savings

	Dependent variable: Mortgage Delinquency		
Sample:	All Households	Liquid Assets, Bottom Quartile (< $500)	Liquid Assets, Upper 3 Quartiles (≥ $500)
	(1)	(2)	(3)
Panel A: Regular UI Program			
Max Benefit*Layoff	-0.29***	-0.53*	-0.02
	(0.09)	(0.27)	(0.09)
Max Benefit*Layoff*Liquid Assets	0.19***		
	(0.04)		
Household-level controls?	Y	Y	Y
State-year FEs?	Y	Y	Y
Observations	64,922	15,624	49,298
R^2	0.05	0.07	0.04
Panel B: EB and EUC Programs			
Max EB EUC*Layoff	-0.36***	-0.66**	-0.11*
	(0.09)	(0.30)	(0.06)
Max EB EUC*Layoff*Liquid Assets	0.16***		
	(0.03)		
Household-level controls?	Y	Y	Y
State-year FEs?	Y	Y	Y
Layoff X cubic in unemployment rate	Y	Y	Y
Observations	12,602	3,384	9,218
R^2	0.07	0.08	0.06

Notes: This table summarizes the results from linear probability regressions of mortgage delinquency on measures of the generosity of state unemployment insurance benefits, a layoff indicator, their interaction, and a set of controls. Controls in Panel A are the same as in the specification reported in Table II, column (3), and controls in Panel B are the same as in the specification reported in Table III, column (2). The regressions reported in column (1) also include an additional interaction with the household's liquid assets (measured in $100,000s) and controls for all pairwise combinations of benefit generosity, layoff status, and liquid assets. The regressions reported in columns (2) and (3) are for different subsamples, divided based on the quartile of household's liquid assets. Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table V: Unemployment Insurance and Mortgage Delinquency, by Home Equity

	Dependent variable: Mortgage Delinquency		
Sample:	Positive Home Equity	Negative Home Equity	Deep Negative Home Equity (LTV > 120%)
Mean Dependent Variable:	[4.94%]	[13.6%]	[14.7%]
	(1)	(2)	(3)
Panel A: Regular UI Program			
Max Benefit*Layoff	-0.22***	-0.88**	-1.27**
	(0.08)	(0.38)	(0.59)
Layoff	6.19***	13.10***	15.64***
	(0.36)	(1.520)	(2.42)
Observations	61,407	3,515	2,102
R^2	0.04	0.11	0.15
Household-level controls?	Y	Y	Y
State-year FEs?	Y	Y	Y
Panel B: EB and EUC Programs			
Max EB EUC*Layoff	-0.23**	-0.81***	-0.99***
	(0.10)	(0.22)	(0.30)
Layoff	7.48***	17.10***	18.92***
	(0.98)	(2.68)	(4.04)
Observations	10,963	1,639	987
R^2	0.05	0.09	0.13
Household-level controls?	Y	Y	Y
State-year FEs?	Y	Y	Y
Layoff X cubic in unemployment rate	Y	Y	Y

Notes: This table summarizes the results from linear probability regressions of mortgage delinquency on measures of the generosity of state unemployment insurance benefits, a layoff indicator, their interaction, and a set of controls. The specification reported in Panel A is the same as in Table II, column (3), and the specification reported in Panel B is the same as in Table III, column (2). The regression reported in each column is for a different subsample, divided based on households' perceived amount of home equity. Standard errors, adjusted for clustering at the state level, are reported in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table VI: Unemployment Insurance, Eviction, and Moving

Dependent variable:	Eviction		Move Within 1 Year		Move Within 3 Years	
	(1)	(2)	(3)	(4)	(5)	(6)
Max Benefit*Layoff	-0.025*		-0.092		-0.124	
	(0.013)		(0.055)		(0.225)	
Max EB EUC*Layoff		-0.019		-0.108		-0.229**
		(0.016)		(0.068)		(0.104)
Layoff	0.184**	0.076	1.423***	0.603	1.471**	2.116**
	(0.073)	(0.178)	(0.354)	(0.771)	(0.679)	(0.939)
Observations	64,888	12,600	68,622	13,328	17,096	10,882
R^2	0.01	0.01	0.02	0.02	0.03	0.02
Household-level controls?	Y	Y	Y	Y	Y	Y
State-year FEs?	Y	Y	Y	Y	Y	Y
Layoff X cubic in unemployment rate	N	Y	N	Y	N	Y

Notes: This table summarizes the results from linear probability regressions of eviction or relocation on measures of the generosity of state unemployment insurance benefits, a layoff indicator, their interaction, and a set of controls. Except for the dependent variable, the specification reported in odd-numbered columns is the same as in Table II, column (3), and the specification reported in even-numbered columns is the same as in Table III, column (2). The dependent variables are indicated in the column headings. Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table VII: Delinquencies and Foreclosures Avoided by Unemployment Insurance Expansions (2008-2012)

Year	Pr(Layoff)	UI-Layoff Coefficient	EB, EUC & FAC	Pr(Delinq.)	Delinquent Loans (D)	Foreclosure Starts (F)	ΔD	ΔF
2008	0.174	-0.31	5,452	7.65%	3,315,069	951,090	-127,432	-36,560
2009	0.186	-0.31	18,988	7.65%	4,112,037	2,320,315	-588,494	-332,072
2010	0.176	-0.31	30,135	7.65%	4,031,198	2,132,809	-866,412	-458,398
2011	0.163	-0.31	28,281	7.65%	3,465,668	1,780,284	-647,403	-332,565
2012	0.163	-0.31	22,528	7.65%	3,058,442	1,475,146	-455,107	-219,507
						TOTAL	-2,684,848	-1,379,102

Notes: This table presents estimates of the numbers of delinquencies and foreclosures avoided by federal expansions of unemployment insurance (UI) benefits between July 2008 and December 2012. The estimates are based on the following inputs: our regression estimate for the impact of additional UI benefits on mortgage delinquency (from Table III, column 2); the proportion of households with a layoff and the delinquency rate (from the SIPP); the maximum incremental benefit available due to federal expansions of UI, including benefits paid under the Emergency Unemployment Compensation (EUC), Extended Benefits (EB), and Federal Additional Compensation (FAC) programs; and the numbers of delinquent mortgages (30+ days late) and foreclosure starts from the National Delinquency Survey from the Mortgage Banker's Association. See Section IV.C. for more detail on the calculation of these estimates.

Table VIII: Unemployment Insurance and Loan Terms

Loan type:	First Lien Mortgages		HELOC Offers		Credit Card Offers			
Dependent variable:	Interest Rate	Log Interest Rate	Interest Rate	Log Interest Rate	Interest Rate	Log Interest Rate	Credit Limit	Log Credit Limit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Max Benefit	-0.026**	-0.003***	-0.090**	-0.019**	-0.064***	-0.004***	474***	0.030***
	(0.013)	(0.001)	(0.033)	(0.006)	(0.016)	(0.001)	(106)	(0.004)
Observations	1,733	1,733	14,643	14,643	143,364	143,364	96,935	96,935
R^2	0.99	0.99	0.60	0.60	0.19	0.23	0.16	0.15
State and Year FEs?	Y	Y	Y	Y	Y	Y	Y	Y
State-year Controls?	Y	Y	Y	Y	Y	Y	Y	Y
Average LTV and term?	Y	Y	N	N	N	N	N	N
Borrower Characteristics?	N	N	Y	Y	Y	Y	Y	Y

Notes: This table summarizes the results from regressions of loan terms on *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) and a set of controls. The dependent variables are indicated in the column headings. Columns (1) and (2) report analysis of states' average mortgage interest rates annually between 1980 and 2010 from the Monthly Interest Rate Survey. Controls in these regressions include state-level economic conditions (unemployment rate, average wage, GDP growth rate, home price growth rate, Unemployment Insurance (UI) Trust Fund reserve ratio and an indicator for negative UI Trust Fund reserve ratio), the average mortgage loan-to-value ratio, the average mortgage loan duration, and state and year fixed effects. Columns (3) through (8) report analysis of individual households' HELOC and credit card offers between 2000 and 2011 from Mintel. Controls in these regressions include the same state-level economic conditions, households' education (indicators for each of five categories), annual income (indicators for each of 18 categories), and age (indicators for each of 10 categories), and state and year fixed effects. Standard errors, adjusted for clustering at the state level, are reported in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table IX: Unemployment Insurance and Loan Terms, by Income Range

Sample:	Income < $35,000 (1)	Income $35,000–$70,000 (2)	Income > $70,000 (3)
Panel A: Mortgage HELOC Interest Rate			
Max Benefit	-0.100	-0.083*	-0.090**
	(0.072)	(0.036)	(0.030)
Observations	2,303	4,377	7,963
R^2	0.60	0.61	0.59
Panel B: Credit Card Interest Rate			
Max Benefit	-0.120***	-0.027	-0.056
	(0.033)	(0.027)	(0.031)
Observations	41,145	45,175	57,044
R^2	0.18	0.18	0.20
Panel C: Credit Card Limit			
Max Benefit	1,023***	97	296
	(218)	(285)	(187)
Observations	26,760	30,929	39,246
R^2	0.15	0.17	0.14
State and Year FEs?	Y	Y	Y
State-year Controls?	Y	Y	Y
Borrower Characteristics?	Y	Y	Y

Notes: This table summarizes the results from regressions of loan terms on *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) and a set of controls. The specifications and sample periods are the same as in Table VIII but for different subsamples based on household income. The dependent variables are indicated in the panel titles. Standard errors, adjusted for clustering at the state level, are reported in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX

A1. Alternative measures of UI generosity

Our estimates are robust to using alternative measures of UI generosity. Appendix Table A-IV reports results from models that use different measures of UI generosity but are otherwise identical to the final specification in Table II. These regressions include the full set of household-level controls and state-by-year fixed effects. The various alternative generosity measures help both to establish the robustness of the relationship with UI generosity and to interpret its source and magnitude.

We explore three different adjustments to the *Max Benefit* measure. First, we convert *Max Benefit* into 2011 dollars using the national Consumer Price Index. Whereas the earlier models control for inflation using year or state-by-year fixed effects, this model also treats a given nominal change in benefits as a larger real increase in earlier years than in later years, which adjusts the identifying variation in UI generosity. The resulting estimate for the interaction coefficient, reported in column (1) of Appendix Table A-IV, is slightly larger (−0.31) and statistically significant ($p < 0.01$). Second, we examine *Max Benefit* in logs, which roughly speaking treats proportional changes in UI generosity equally. The estimated magnitude of the effect, reported in column (2), is almost identical to estimate obtained from the analysis in levels: a one standard deviation change in *Ln(Max Benefit)* (0.3 log points) reduces the likelihood of delinquency by 73 basis points ($p < 0.05$). Third, we adjust UI generosity for wage differences across states by normalizing *Max Benefit* by the prior year's average semi-annual wage. We again find a negative coefficient on the interaction between UI generosity and *Layoff*. The magnitude of the interaction coefficient is slightly smaller than before: a one standard deviation increase in this measure of benefit generosity (0.111 points) reduces the likelihood of delinquency by 65 basis points. The remaining tests reported in Appendix Table A-IV are described in Section III.B of the paper.

A2. The effect of extended benefits on the probability that delinquent loans transition to foreclosure

To convert our estimate of delinquencies avoided into foreclosures avoided, we need an estimate for how the delinquency-to-foreclosure transition probability compares between the pool of all delinquent loans and the pool of loans for which extended benefits prevent delinquency. To this end, we examine loan servicing data from Lender Processing Services (LPS) to calculate delinquency-to-foreclosure transition rates by state. Over all loans that became 90-days delinquent in the year 2009, we measure the proportion that enter foreclosure within 24 months. To test whether this proportion varies with the generosity of extended benefits, we regress states' transition rates on *Max Benefit EB EUC* and controls for states' economic and fiscal conditions: real GDP growth, home price growth, average wages, the UI trust fund reserve ratio, an indicator for a negative UI trust fund balance, and a cubic polynomial in the states' unemployment rates (similar to equation 3).

We find no detectable difference in the transition rates. Estimates from regression analysis with various combinations of control variables are reported in Appendix Table A-V. The most demanding specification, reported in column (4), finds that an additional $1,000 in maximum benefits is associated with 6 basis points lower transition rates (standard error 11 basis points). The negative point estimate suggests that expanding UI might have reduced the foreclosure rate even more than it reduced the delinquency rate. Regardless, the point estimate is small. For comparison, the national average transition rate is 38.9 percent, which is almost 3 orders of magnitude greater than the point estimate.

Appendix Table A-I: Social Insurance Payments and Unemployment Insurance Generosity (1991-2011)

Dependent variable:	Log of UI Payments (1)	Log of UI Payments (2)	Log of UI Payments (3)	Log of UI Payments (4)	Log of non-UI transfer payments (5)	Log of Health Insurance Payments (Medicaid and CHIP) (6)
Max Benefit	0.040*		0.041**			
	(0.021)		(0.015)			
Log of Max Benefit		0.966***		0.875***	-0.042	-0.031
		(0.168)		(0.133)	(0.099)	(0.188)
Unemployment rate			0.055***	0.060***	0.022**	0.006
			(0.014)	(0.011)	(0.009)	(0.014)
Real GDP growth			-0.026***	-0.023***	-0.004**	-0.002
			(0.004)	(0.004)	(0.002)	(0.004)
House price growth			-0.008***	-0.007***	-0.001	-0.002
			(0.002)	(0.002)	(0.001)	(0.001)
Average wage			-0.008	-0.002	-0.014***	-0.005
			(0.005)	(0.005)	(0.004)	(0.005)
Observations	1,071	1,071	1,071	1,071	1,071	1,071
R^2	0.98	0.98	0.99	0.99	1.00	0.99
State and year FEs?	Y	Y	Y	Y	Y	Y

Notes: This table summarizes the results from state-panel regressions of various measures of social insurance payments on the generosity of state unemployment insurance (UI) benefit criteria and a set of controls. The dependent variable is indicated in each column's heading, and UI generosity is measured by *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) in columns (1) and (3) and by the natural log of *Max Benefit* in the other columns. Controls in all regressions include state and year fixed effects. Where shown, controls also include the state's unemployment rate, average wage, and growth rates of gross domestic product (GDP) and house prices. Standard errors, adjusted for clustering at the state level, are reported in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A-II: Unemployment Insurance Generosity and Economic Conditions (1991-2011)

	Dependent variable: Max Benefit					
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate	-0.057					
	(0.079)					
Real GDP growth		-0.018				
		(0.024)				
House price growth			-0.005			
			(0.008)			
Average wage				0.061		
				(0.104)		
UI Trust Fund Reserves					0.033	
					(0.188)	
UI Trust Fund Reserve < 0?						-0.506
						(0.480)
Observations	1,071	1,071	1,071	1,071	1,071	1,071
R^2	0.92	0.92	0.92	0.92	0.92	0.92
State and year FEs?	Y	Y	Y	Y	Y	Y

Notes: This table summarizes the results from state-panel regressions of *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) on a measure of economic conditions and state and year fixed effects. Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A-III: Unemployment Insurance and Mortgage Delinquency, Robustness

Dependent variable:	Mortgage Delinquency	Mortgage Delinquency	Mortgage Delinquency	Mortgage Delinquency	Mortgage Delinquency
Sample:	All	Pre-2008	Post-2008	All	All
Estimation method:	OLS	OLS	OLS	Probit	Logit
	(1)	(2)	(3)	(4)	(5)
Max Benefit				0.00	0.01
				(0.01)	(0.03)
Max Benefit*Layoff	-0.25***	-0.33***	-0.21**	-0.01**	-0.03**
	(0.08)	(0.12)	(0.10)	(0.01)	(0.01)
Max EB EUC Duration*Layoff			-0.29**		
			(0.11)		
Layoff	6.55***	6.02***	8.87***	0.54***	1.09***
	(0.35)	(0.37)	(0.82)	(0.05)	(0.10)
Loan-to-value	5.13***	4.79***	6.65***	0.41***	0.73***
	(0.30)	(0.32)	(1.06)	(0.04)	(0.09)
Negative Equity	1.63***	1.29*	1.69	0.03	-0.03
	(0.56)	(0.71)	(1.18)	(0.05)	(0.10)
Negative Equity*Layoff	7.75***	2.36	9.69***	0.04	0.07
	(1.52)	(2.03)	(2.39)	(0.04)	(0.08)
Earnings	-0.03***	-0.03***	-0.02***	-0.01***	-0.01***
	(0.002)	(0.002)	(0.003)	(0.0004)	(0.001)
Net worth ($ 1,000,000s)	-0.19**	-0.16*	-0.26	-0.67***	-1.98***
	(0.08)	(0.09)	(0.17)	(0.15)	(0.34)
High school diploma only	-1.41*	-1.89**	1.26	-0.04	-0.05
	(0.83)	(0.91)	(1.47)	(0.05)	(0.10)
Some college	-1.30	-1.89**	1.50	0.00	0.07
	(0.79)	(0.91)	(1.24)	(0.05)	(0.10)
College degree	-4.60***	-5.02***	-2.38*	-0.29***	-0.53***
	(0.88)	(1.01)	(1.21)	(0.06)	(0.12)
Some graduate studies	-5.19***	-5.35***	-3.96***	-0.46***	-0.92***
	(0.82)	(0.94)	(1.15)	(0.06)	(0.13)
Observations	64,922	52,320	12,602	64,821	64,821
R^2	0.05	0.04	0.07	0.11	0.11
State-year controls?	-	-	-	Y	Y
State and year FEs?	-	-	-	Y	Y
State-year FEs?	Y	Y	Y	N	N
Layoff X cubic in unemployment rate	N	N	Y	N	N

Notes: This table summarizes the results from regressions of mortgage delinquency on measures of the generosity of state unemployment insurance benefits, a layoff indicator, their interaction, and a set of controls. Column (1) reports more coefficients from the linear probability regression reported in Table II, column (3). Columns (2) and (3) report estimates from the same specification for different sample periods, which are indicated in the column headings, and the specification reported in column (4) includes also the interaction of the layoff indicator and the maximum number of weeks of benefits paid under the Extended Benefits (EB) and Emergency Unemployment Compensation (EUC) programs. The final two columns report probit (column 5) and logit (column 6) coefficient estimates the specification reported in Table II, column (2). Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A-IV: Alternative Measures of Unemployment Insurance Generosity (SIPP, 1991-2011)

	Dependent variable: Mortgage Delinquency					
	(1)	(2)	(3)	(4)	(5)	(6)
Real Max Benefit*Layoff	-0.31***					
	(0.07)					
Ln(Max Benefit)*Layoff		-2.45**				
		(1.01)				
(Max Benefit/Wages)*Layoff			-6.16*			
			(3.53)			
Max Benefit HH*Layoff				-0.47***	-0.42***	
				(0.07)	(0.12)	
Max Weekly Benefit*Layoff						-5.83**
						(2.52)
Max Regular Duration*Layoff						-0.35
						(0.43)
Layoff	6.55***	6.54***	6.51***	6.40***		6.54***
	(0.34)	(0.35)	(0.38)	(0.34)		(0.35)
Observations	64,922	64,922	64,922	63,227	63,227	64,922
R^2	0.05	0.05	0.05	0.05	0.06	0.05
Household-level controls?	Y	Y	Y	Y	Y	Y
State-year FEs?	Y	Y	Y	Y	-	Y
State-year-layoff FEs?	N	N	N	N	Y	N

Notes: This table summarizes the results from linear probability regressions of mortgage delinquency on various measures of the generosity of state unemployment insurance benefits, a layoff indicator, their interaction, and a set of controls. To measure benefit generosity, the first three models use *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) measured in 2010 dollars, in logs, and as a proportion of the state's average semi-annual wage. The fourth and fifth models use the maximum total benefit available to the household based on the state's benefit schedule and the household's prior wages. The sixth model estimates separately the impact of differences in *Max Benefit* due to the state's maximum weekly benefit and the state's maximum duration of benefits. When uninteracted, the *Layoff* coefficient measures the effect in a state with average unemployment insurance benefits. Controls in all regressions are the same as in the specification reported in Table II, column (3), with the addition of separate state-by-year fixed effects for laid off and non-laid off households in column (5). Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A-V: Unemployment Insurance Extensions and Foreclosure Transition Rates (LPS, 2009)

	Dependent variable: Foreclosure Transition Rate (in basis points)			
	(1)	(2)	(3)	(4)
Max EB EUC	7.17	-5.45	-12.44	-6.20
	(12.60)	(10.37)	(15.54)	(11.40)
Observations	51	51	51	51
R^2	0.01	0.63	0.16	0.64
State-year controls?	N	Y	N	Y
Cubic in unemployment rate	N	N	Y	Y

Notes: This table summarizes the results from state-level OLS regressions of the foreclosure transition rate on measures of the generosity of extended benefits paid under states' unemployment insurance system in May 2009 and a set of controls. The foreclosure transition rate is the proportion of loans that became 90-days delinquent in 2009 that enter foreclosure within 24 months, based on loan servicing data from Lender Processing Services (LPS). *Max EB EUC* is the maximum total potential dollars paid under the Extended Benefits (EB) and Emergency Unemployment Compensation (EUC) programs. Controls in columns (2) and (4) include the states' unemployment rate, average wage, GDP growth rate, home price growth rate, Unemployment Insurance (UI) Trust Fund reserve ratio, and an indicator for a negative UI Trust Fund reserve ratio. Controls in columns (3) and (4) also include a cubic function of the state's unemployment rate. Robust standard errors are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A-VI: Estimated Savings from Foreclosures Avoided by Unemployment Insurance Expansions (2008-2012)

		Data source
A. First lien lender loss per foreclosure		
1. Original property valuation (median sale price in 2007)	217,900	U.S. Census Bureau (2012, Table 977)
2. Original mortgage amount (80% of 1.)	174,320	
3. Unpaid balance (104% of 2.)	181,293	U.S. Department of Housing and Urban Development (2010)
4. Loss in foreclosure (42.3% of 3.)	76,687	U.S. Department of Housing and Urban Development (2010)
B. Second lien lender loss per foreclosure		
5. Original mortgage amount (10% of 2.)	17,432	Lee, Mayer, and Tracy (2012)
6. Unpaid balance (104% of 5.)	18,129	U.S. Department of Housing and Urban Development (2010)
7. Current property value (medial sale price in 2010)	173,100	U.S. Census Bureau (2012, Table 977)
8. Distressed sale value (15% less than 7.)	147,135	U.S. Department of Housing and Urban Development (2010)
9. Loss in foreclosure (6. minus any residual value from sale)	18,129	
C. Aggregate savings due to foreclosures avoided		
10. Foreclosures avoided (2008-2012)	1,379,102	Table X
11. Total savings to mortgage investors (10. x (4. + 9.))	130,761,107,835	
11. Savings to GSEs (10. x 44% of 4.)	46,533,952,945	Congressional Budget Office (2010, p.10)
12. Savings to private investors (10. x (56% of 4. + 9.))	84,227,154,890	Congressional Budget Office (2010, p.10)
13. Subsidy to local governments (10. x $6,200)	8,550,431,566	U.S. Department of Housing and Urban Development (2010)

Notes: This table presents estimates of the estimated savings to Government-Sponsored Enterprises (GSEs), the overall financial system, and local governments from foreclosures avoided by federal unemployment insurance expansions between 2008 and 2012. See Section IV.D. for more detail on the calculation of these estimates.

Appendix Table A-VII: Unemployment Insurance and Loan Terms, Pre-2008

Loan type:	HELOC Offers			Credit Card Offers			
Dependent variable:	Interest Rate	Log Interest Rate		Interest Rate	Log Interest Rate	Credit Limit	Log Credit Limit
	(1)	(2)	#	(3)	(4)	(5)	(6)
Max Benefit	-0.123***	-0.024***		-0.062***	-0.004***	473***	0.028***
	(0.035)	(0.007)		(0.011)	(0.001)	(117)	(0.005)
Observations	13,941	13,941		127,805	127,805	96,214	96,214
R^2	0.59	0.60		0.16	0.19	0.15	0.13
State and Year FEs?	Y	Y		Y	Y	Y	Y
State-year Controls?	Y	Y		Y	Y	Y	Y
Borrower Characteristics?	Y	Y		Y	Y	Y	Y

Notes: This table summarizes the results from regressions of loan terms on *Max Benefit* (the maximum total potential benefit available under the state's unemployment insurance system) and a set of controls. The dependent variables are indicated in the column headings. The specifications are the same as in Table VIII but the sample period ends in 2008. Standard errors, adjusted for clustering at the state level, are reported in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%