Examining the Externality of Unemployment Insurance on Children's Educational Achievement

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Abstract

I exploit differences in the generosity of unemployment insurance (UI) benefits across states and over time in the U.S. to investigate the link between UI and children's academic achievement. Results show that a one percent increase in maximum UI benefits reduces the probability that a child repeats a grade by around 0.05 percentage points, which is approximately 2 percent. The effect is concentrated on children of less educated fathers, who are considered to be more responsive to UI benefits. The positive effect of UI on child education coincides with improved self-reported health outcome of laid-off fathers, suggesting that UI becomes a potential mediator to affect children's school performance by helping shield them from negative consequences of fathers' adverse health arising from a job loss. This paper's findings, which are the first in the literature to show evidence of a positive effect of UI on children's educational outcomes, help us to understand the role of UI in the human capital accumulation of children, and have implications for the design of an optimal level of UI.

JEL classification: I23, J24, J38, J65, J68
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I. Introduction

One of the well-documented empirical results derived from the analysis of unemployment insurance programs is that they lead to a moral hazard by providing disincentives for recipients to participate in the labor market. For example, past empirical research has established negative effects of unemployment insurance (UI) on job search, and on the duration of unemployment (e.g, Moffitt 1985, Meyer 1990, Katz and Meyer 1990, Regmi 2015). The primary objective of UI is to provide temporary financial assistance to mitigate the hardships experienced by the loss of a job. It is well understood that job loss produces a range of negative effects such as health problems, loss in earnings, and a higher likelihood of future unemployment, which extend to impede children's educational outcomes in school (e.g, Stevens and Schaller 2011, and Rege, Telle and Votruba 2011), and their college enrollment (Pan and Ost, 2014, and Hilger, 2016). However, less understood is the role of UI in mitigating such negative effects. This paper first investigates the role of UI benefits as a mediator to lessen the adverse effect of parental job loss on children's educational performance. Specifically, I analyze the effect of generosity of UI benefits on the likelihood of children's grade repetition, exploiting the variation in the benefits across states and over time.

To study the link between UI and children's grade repetition, I use data from the Survey of Income and Program Participation (SIPP), which consists of a continuous series of nationally representative short-panels lasting approximately four years. The SIPP collects information about respondents' income and labor force status, among others. Each SIPP panel consists of two types of questions: core questions which are repeatedly asked in every wave, and topical questions which are not repeated in each wave. Topical questions appear in topical modules (supplementary surveys) which are targeted at collecting information about a wide range of contemporary issues such as well-being and child care. In the 1996, 2001, 2004, and 2008 panels, a total of seven topical modules ask questions regarding children's education such as grade repetition and grade level. I exploit these seven waves from the

four panels to examine the link between UI and grade repetition. I use children aged 5 to 17 years.[1] In my research design, the treatment group includes children who experienced parental job loss. And, I use children whose both parents always remained employed as a comparison group.

My identification strategy rests on the variation of UI benefits across states and over time, which is considered to be plausibly exogenous (e.g., Gruber 1997). States set the parameters of UI benefits, including the maximum amount that an individual is eligible to receive. States also revise, usually upward, the amount periodically. I exploit UI laws, specifically the maximum UI benefits that an individual is eligible to receive. My choice is similar to Hsu, Matsa and Melzer (2014), who examine the effect of UI benefits on mortgage delinquency. I also examine if there is a systematic link between state economic factors and educational characteristics that could affect children's educational achievements and the generosity of UI benefits. I could not find any significant correlation between the maximum UI amount and the unemployment rate, the GDP growth rate, the growth rate in school expenditures, and pupil-teacher ratio.

I begin my estimation excluding the 2008 panel, with my sample period ranging from 1997 to 2006. My goal is to prevent my estimates from being diluted by other confounding factors created by the 2008-09 recession. My main results show that a one percent increase in maximum UI benefits reduces the likelihood that a child repeats grade by 0.050 percentage points. This represents approximately two percent. My estimates also suggest that the effect of UI benefits is concentrated on less educated families, a group supposed to be more responsive to UI benefits. To further check that my results are not an artifact of the underlying differences in state-level education policies and economic structures, I estimate the effect of UI on children of employed parents. If states with a higher level of UI are systematically different from the rest, we should expect the significant effect of UI on those children. But

[1] Children under five years of age are not in schools long enough to repeat a grade. 17 years is the oldest age observed in the sample.

my estimates show that the effect of UI on those children is not statistically different from zero. Additionally, my results pass several robustness tests. I exploit the unprecedentedly generous rollout of UI benefits during and aftermath of the Great Recession to measure the UI effect, and find some effect of the possible duration of benefits on grade repetition. I also go on to estimate the effect on high-school dropout status using the Current Population Survey data, and find a significant effect.

I also investigate the possible mechanisms through which UI mediates children's educational outcomes. My analysis suggests that the positive effect on children is not driven by an increase in time spent by parents on children. Using time diary data from the American Time Use Survey, I investigate the relationship between UI generosity and time spent on child care,including education, but the effect is not different from zero. This finding is consistent with most of empirical studies which do not find any effect of parental leave on children's cognitive development. Using supplementary surveys from the SIPP, I study the link between UI and parents' self-reported health outcomes. I do not find any effect on mothers' health, but find a positive effect on the health outcome of fathers under 51 years of age. This indicates that major pathway through which UI operates to affect children's education is an improvement in father's health. This is in line with Rege, Telle and Votruba (2011) who point out that father's health, particularly, mental stress is a major pathway for a layoff to disturb children's school performance.

To the best of my knowledge, this paper is the first to examine the link between UI generosity and children's educational outcomes. Having demonstrated that the effects of UI extend beyond labor supply, this article adds to a small amount of literature that studies the positive benefits of unemployment insurance. Tefft (2011) the association between UI and reduction in mental stress. Hsu, Matsa and Melzer (2014) show that UI benefits decrease mortgage delinquency. Barr and Turner (2015) find that extended UI benefits during the Great Recession increased youth's propensity to enroll in college, especially a

two-year college, by reducing the cost of attendance. Gruber (1997) studies the role of UI in smoothing consumption of job losers. Moreover, this paper contributes to the literature related to the design of optimal unemployment insurance (e.g., Baily 1978, and Chetty 2006). My paper's results imply that the optimal UI should be higher than that of current estimates in the existing literature which fail to account for the role of UI in child development.

This paper complements the literature studying the short-term effect of family income on child development. Duncan and Smith (1998) show the importance of family income in improving children's educational outcomes, especially in early age. Dahl and Lochner (2012) examine how family income affects children's math and reading ability in the United States and find a positive effect. Exploiting income transfer programs in Canada, Milligan and Stabile (2011) document that such programs improve children's test scores and mental health.

The rest of the paper is structured as follows. Section II presents a theoretical mechanism to describe how UI affects children's educational outcomes. Section III explain UI, and Section IV presents data and preliminary analysis. In Section V, I design my empirical strategy, and present results. Section VI presents additional robustness checks. In Section VII, I investigate possible mechanisms. Section VIII offers concluding remarks.

II. Theoretical Mechanism

In this section, I outline a simple theoretical mechanism to provide an insight into the existence of a causal link between UI benefits and children's academic success, thus motivating my subsequent empirical exercise. Four lines of theories could be used to examine the possibility that unemployment insurance (UI) becomes a mediating factor to minimize the negative effects of a layoff on children's education. First, UI could play a role in mitigating the negative consequences of a job loss such as mental stress and health condition, thus

helping shield children from these negative effects. The second pathway could be parental investment in children's education: UI benefits enable parents to spend money on children's education such as books and other extra curricular activities. Third, UI subsidizes home production, enabling parents to increase the quantity and quality of their time spent with children. Fourth, UI might lessen the need for residential mobility, which is found to negatively affect children's academic success.

First, a model of "family stress" from the literature in psychology is helpful to illustrate a theoretical linkage between job loss and children's educational outcome, and a possible mediating role of UI. The model elucidates how parental, especially father's, stress stemming from unemployment affects their behavior towards the child, impacting the child's educational success (Elder, Nguyen and Caspi 1985). Loss in earnings, and subsequent rise in financial stress are likely to alter the family structure and increase psychological stress of parents. These adversities make parents less caring and supportive to their children, producing punitive parental behavior and disposition (McLoyd 1989). Another indirect avenue is children's perception about their parents' emotional stress (Christoffersen 2000), which may affect children's self-esteem, aspiration, expectation, and emotion, undermining cognitive development. The literature in psychology suggests that social support mitigates negative psychological impacts of job loss. Unemployment insurance might be supportive to reduce emotional or mental stress of a father, partially offsetting the negative effects of a job loss on children.

Findings from recent research in the economics literature provide support to the theoretical insight of the psychology literature. Rege, Telle and Votruba (2011) explore a causal mechanism of parental job loss affecting children's academic achievements. Using Norwegian data, they find that parental job loss has a statistically significant and negative effect on grade point average (GPA) in the 10th grade. They argue that a major pathway of job loss to operate through to mediate children's educational outcome is the father's

mental stress. Another paper, Tefft (2011), provides evidence of a reduction in "depression" and "anxiety" because of a rise in unemployment insurance during the Great Recession. Linking these two lines of research offers an insight that a higher level of welfare benefits like unemployment insurance insulates parents from poor health, including mental stress stemming from a job loss, which in turn mitigates negative effects being spread to children's educational achievements.

Second, UI benefits help to ease income constraint, affecting parental investment in children. With the support from UI, parents can afford to offer learning opportunities outside of school. In a new study, Fletcher and Wolfe (2016) investigate the association of family income with children's non-cognitive skills in the United States, and find a positive effect. Likewise, Dahl and Lochner (2012) study the causal effect of family income on children's math and reading ability and find a positive effect.

Third, parental time with children is considered to be another component in education production function. UI subsidises home production, enabling parents to afford to spend more time with children. Time spent with children could be helpful to develop their cognitive skill. However, there is little evidence of the effect of parental time spending on children's education. Researchers who focus on both long-term and short-term effects of maternal or parental leave on educational attainment have mixed results.

Fourth, with support from UI, parents might not feel an immediate need to move to a new location to find a job. Likewise, generous UI benefits could help displaced parents to afford their current housing. Hence, they do not have to relocate to a poorer neighborhood detrimental to child's academic success. Studies find that residential mobility has serious implication for children's educational progress (Nan Marie Astone, 1994).

In summary, generous UI has a possibility to reduce negative effects of a job loss, partially preventing such effects from being extended to disrupt children's educational achievements. In the empirical analysis below, I explore this possibility by investigating how the

probability of a child living in a more generous UI regime repeating a grade differs from the probability of one living in a less generous UI regime.

III. Unemployment Insurance Background

A. Regular Benefits

Unemployment insurance (UI) is one of the largest public insurance programs in the United States. It aims to provide temporary financial assistance to workers losing jobs, and facilitate them in their job search efforts. It was established under the Social Security Act of 1935 as a joint federal-state program, and is funded by the federal and state taxes on employers.

States manage the provisions of the regular UI, determining the maximum and minimum amount of the benefits, the potential duration, and the eligibility criteria. To be eligible for UI, individuals must have been employed for a certain period and have made a certain amount of earnings before becoming unemployed through no fault of their own. Additionally, workers must be available and actively search for work. If workers quit a job, or are fired for misconduct, then they are not eligible for UI benefits.

In the latest unemployment insurance supplement to the CPS conducted in 2005, around 33.5 percent of unemployed women and 34.8 percent of unemployed men applied for UI benefits, and 23.6 percent of unemployed women and 23.9 of men actually received benefits (see Vroman 2009 for details).

The regular benefits are usually available for about 26 weeks. In 2012, the maximum amount ranged from $653 in Massachusetts ($979 if including dependence allowance) to $265 in Alabama. The average weekly benefit (ratio of the total benefits paid to the total number of weeks compensated) was $300. Figures A1 and A2 present information about the generosity of UI benefits by state and changes in generosity over time.

B. Extended Benefits

The U.S. government has historically been supplementing the regular UI benefits with Extended Benefits and other temporary compensation packages during periods of high levels of unemployment. Established in 1970 as a joint federal-state program, the EB offers additional benefits. This program is triggered automatically whenever a state's insured unemployment rate (IUR) exceeds 5 percent. BLS defined the IUR as the ratio of the insured unemployed (i.e., the unemployed receiving benefits) in the current quarter to the total number of employed workers. States also have an option to unveil EB on the basis of the total unemployment rate (TUR), with 13 weeks of benefits in states exceeding the TUR of 6.5 percent and 20 weeks in states with higher than 8 percent of the TUR. In total, the unemployed are eligible to receive up to 33 weeks of benefits under the EB. Typically, the federal government and states share 50 percent of the cost each. During the recent labor market downturn, some states did not choose to participate in the EB program at some point of time. Later, the federal government fully funded it under the American Recovery and Reinvestment Act 2009 (ARRA).

As a temporary measure, in July 2008, the government unveiled the Emergency Unemployment Compensation (EUC) program, which came into effect in November. It is fully funded by the federal government, but administered by states. The duration of compensation was based on the tier's structure. In the beginning, the maximum duration was 13 weeks, and it was available in all states. However, Congress successively revised it. As presented in Table A1, the unemployed were able to receive up to 53 weeks of benefits under it. Tiers I and II (except the fact that Tier II was available only for states with TUR greater than 6 percent until November 7, 2008) were available for all states irrespective of the unemployment rate. It is worth noting that the weekly dollar amounts for both EB and EUC were the same as the regular benefits.

IV. Data and Descriptive Analysis

A. Survey of Income and Program Participation

The Survey of Income and Program Participation (SIPP) contains a continuous series of panels from 1984 (the first panel) to 2008 (the latest panel). The sample size of the SIPP panels includes around 14,000 to 52,000 households interviewed over a period ranging from two and a half years to four years. Each SIPP panel contains core modules (regular surveys) and topical modules (supplementary surveys). Core modules collect monthly information about income, labor market status, expenditures, and other demographic characteristics. Individuals are interviewed once every four months. In every interview (wave), each member of the household is asked demographic and social characteristics such as age, education, labor market status, and income for each of the four months prior to the interview month. Core questions are repeated in each interview.

Topical modules include a variety of topics not included in core questions, such as child care, child support, program eligibility, health care, disability, and school enrollment. Of all the SIPP panels, the 1996, 2001, 2004, and 2008 panels have a total of 7 topical waves containing information related to child education, which includes grade repetition status, the current grade level and the highest grade attended.[2] These seven topical waves are wave 4 (from September 2009 to December 2009) and wave 10 (from September 2011 to December 2011) from the 2008 panel. Likewise, wave 3 (covering the period from October 2004 to January 2005) and wave 8 (covering the period from June 2006 to September 2006) from the 2004 panel have such information. The other three waves are wave 7 (from February 2003 to May 2003) from the 2001 panel, and waves 6 and 12 from the 1996 panel (which cover periods from December 1997 to March 1998, and December 1999 to March 2000, respectively).

[2]Specifically, households were asked whether or not a child has repeated a grade, and if so, which grade was repeated.

As the topical module contains information about the child's current grade and the grade that the child has repeated, I use these information and trace the academic year of grade repetition. I link children to their parents. I use children aged five years or above, as those under five years of age might not be in school long enough to repeat a grade. The oldest age observed in the sample is 17 years. My treatment group includes children experiencing parental layoff.[3] On the basis of the reference period of the interview, I document the date of the first parental job loss in the survey. Using the information about the first parental job loss and the academic year of grade repetition, I coded grade repetition as an indicator variable taking value one for a child if he/she experienced parental job loss before the end of the academic year in which the child repeated a grade. I dropped those children who repeated a grade before their parents were interviewed in the survey, because I could not ascertain whether parents were employed or unemployed at the time of the grade repetition. Likewise, I exclude children who repeated a grade after experiencing parental job loss. The indicator variable takes value zero if a child faced parental job loss before the end of the latest academic year in the survey, and did not repeat a grade. Furthermore, my comparison group includes children whose parents were always employed.[4]

I exclude those from Maine, Vermont, North Dakota, South Dakota, and Wyoming in the 1996 and 2001 panels, as these states were combined in two groups,[5] making it impossible to pinpoint the particular state of residency. I also drop if either parent is unemployed in the first interview in the survey as it is impossible to know when they first lost their job. The total number of observations came down to 54,720. Panel A of Table 1 reports descriptive statistics for the sample of my treatment group, i.e., those children who faced parental job loss, and Panel B contains the sample of children who never experienced parental job loss.

[3]Using the SIPP's monthly employment status variable RMESR, I code individuals to layoff if they report their employment status as "No job all month, on layoff or looking for work all weeks."

[4]Using the SIPP's monthly employment status variable RMESR, I code individuals as employed if they report their employment status as "With a job entire month, worked all weeks" or "With a job all month, absent from work without pay 1+ weeks."

[5]Maine and Vermont have the same state code, so do North Dakota, South Dakota, and Wyoming.

B. Other Data Sources

I also complement the SIPP data with variables related to school resources and state economic conditions. I collect information about school characteristics such as teacher-pupil ratio, school enrollment, and expenditure by state from different versions of the Digest of Education Statistics published by National Center for Education Statistics.[6]

Furthermore, I gather information regarding the maximum benefits of UI by state, using "Significant Provisions of State UI Laws: Benefit and Tax" published by the Bureau of Labor Statistics.[7] Likewise, I use trigger notices issued by the Bureau of Labor Statistics to calculate the duration of benefits. The trigger notice is issued each week. I choose the notice issued at the end of the month to calculate the duration available in that particular month. Data on population and state income are collected from the Census Bureau. I assemble the unemployment rate data from the Bureau of Labor Statistics. Summary statistics are presented in Table 2.

V. Identification Strategy and Results

To investigate the relation between unemployment insurance (UI) and children's educational outcome, I exploit the variation in the UI generosity across states. My assumption is that the generosity of benefits is plausibly exogenous, as in many empirical studies in the literature such as Gruber (1997) and Hsu, Matsa and Melzer (2014). Gruber (1997) uses the replacement rate, calculated on the basis of individual earnings. I use maximum UI benefits that workers are eligible to receive, basing my analysis only on state parameters. Using state-set maximum benefits level helps to eliminate the possibility that a benefits level calculated based on individual characteristics could be correlated with other unobserved factors, which

[6]The data are available at https://nces.ed.gov/programs/digest/.

[7]The data are available at http://www.workforcesecurity.doleta.gov/unemploy/statelaws.asp#sigprouilaws.

might lead to biased estimates. Furthermore, my choice of the maximum benefits over using actual benefits that individuals receive or the average benefits receipt by state is aimed at preventing my results being diluted by unobserved factors. For instance, those who are more likely to receive benefits might be less educated or low earning groups whose children might have a different home environment or resources than the average child, causing their children to have lower educational achievements. My choice of the maximum UI benefits that workers are eligible to receive is common in the literature (see Hsu, Matsa and Melzer, 2014; Krueger and Mueller, 2010).

Endogeneity of UI is inherently untestable. Nonetheless, I examine if observed state economic and educational factors that have the possibility to influence school education are associated with maximum UI benefits. I regress maximum UI benefits on the growth rate of GDP, the growth rate in state-level school expenditures, state-level enrollments, and pupil-teacher ratio. School expenditures and enrollments are adjusted for state population. Controlling for state-fixed effects and year-fixed effects, I do not find a correlation between maximum UI benefits and these characteristics. Table 3 contains the results. Results suggest that that those states which are experiencing a good economic growth or expanding their school resources do not appear to have more generous UI benefits. It is still possible that other unobserved state factors which affect educational outcomes might be correlated with maximum UI benefits. I attempt to control for this possibility by using state-fixed effects and year-fixed effects.

I use grade repetition as a measure of children's educational achievement, which has been used in the literature to estimate the effect of layoff (e.g., Stevens and Schaller, 2011). I begin my analysis limiting the sample prior to 2008 to ensure that the results below are not the artifact of the Great Recession and other confounding factors such as expansionary fiscal and monetary polices associated with the recession. Particularly, I use the 1996, 2001, and 2004 panels of the Survey of Income and Program Participation (SIPP), excluding the

2008 panel, and pool all observations into a single sample. My sample period ranges from 1997 to 2006. In a robustness check later, I extend my sample to include the 2008 panel, covering the period from 1997 to 2011. I use the version of the model below to analyze the effect of UI on grade repetition in school.

$$y_i = \alpha + \beta_1 MaxBenefits * Layoff + \beta_2 Layoff + \beta_3' X_i + f(ParentEduc) + + \kappa_1' Z_i + \phi_s + \delta_t + \epsilon_i, \tag{1}$$

where y_i is an indicator variable for grade repetition. The variable of interest is the interaction of log of maximum unemployment benefits across states and an indicator variable of layoff. X_i consists of children's characteristics such as age, age-squared, sex, and race. To control for home environment, which influences children's education, I use the father's and mother's education. Next I control for state-specific economic and school characteristics that could affect students' performance in school, as measured by the vector of z_i. The vector of variables representing school resources are teacher-pupil ratio, school enrollment, and school expenditure,[8] and representing economic conditions are the state-year median income and the polynomial function of the state-year unemployment rate. Rothestein (2011) argues the importance of such functional form to capture non-linear labor market conditions across states.[9] Overall, I attempt to control for three most important inputs of educational production function- individual characteristics, family resources, and state education policies.

Moreover, ϕ_s represents state-fixed effects that are intended to capture state-specific time-invariant factors which influence educational outcomes in school. The vector of year-fixed dummies δ_t controls for unobserved factors that influence academic achievement and are common across states; for example, efforts from the federal government to improve educational outcomes. I use the survey weight to generate the entire population distribution.

[8] I adjust school enrollment and school expenditure for state population.

[9] However, results do not change much even with a simple linear form of the unemployment rate.

As observations should be correlated within household, especially considering the fact that some individuals are observed in two waves, I cluster standard errors at the household level.

A. Main Results

In this subsection, I present my results. Table 4 contains results from the main sample. I begin estimating without any control variables, reported in the first column. Then, I add individual and state-specific characteristics. Finally, I use the exact version of equation 1, with state and year-fixed effects. *Layoff Max UI*, which is the interaction of layoff dummy and log of maximum UI benefits, is the variable of interest. It measures the effect of maximum unemployment insurance on grade repetition by children who faced parental layoff relative to children whose parents were always employed.

Results are qualitatively similar across the three models. Putting my estimates in perspective, a one percent increase in maximum benefits reduces the probability that a child repeats a grade by around 0.05 percentage points, which is about two percent. As expected, the indicator variable of layoff is positive and significant. This variable measures the effect of parental job loss on children's grade. My estimates shows that a layoff increases the probability that a child repeats a grade by around 0.306 percentage points. This is consistent with the existing literature documenting negative effects of parental layoff on child academic achievement. Job loss is associated with a number of negative effects such as income and health, which spread to impact children. My results demonstrate that a higher level of unemployment insurance is helpful to reduce the negative effects of a parental job loss. To gauge the magnitude of my estimates, if a family moves from the state with the lowest UI benefits to the state with the highest UI benefits, the likelihood that a child repeats a grade decreases by around eight percent.

B. Heterogeneity by Family Status

I attempt to study the effect of UI by socioeconomic status. I divide children by father's education: those without a bachelor's degree and those with at least a bachelor's degree. As income level is not observed for the unemployed, education provides a proxy estimate for income. The low-income fathers are expected to be more responsive to unemployment insurance as it can replace a considerable portion of their lost income. However, for high-income individuals, the amount of UI benefits could be too low to offset their income loss. Children of less educated fathers should benefit more from a higher level of UI than those of children of fathers having at least a bachelor's degree. I estimate the same model above separately for these two groups. Table 5 contains the results. The impact for children from less educated families is negative and statistically significant. In other words, a generous UI package helps to reduce the probability that these children repeat a grade. But I do not find any significant effect on children of more educated fathers. This suggests that my results are driven by children from low income households. These findings further provide credence to my earlier estimates. Putting my results into the existing literature, Rege, Telle and Votruba (2011), using administrative data from Norway, provide a suggestive evidence that it is the father's job loss, not the mother's, that affects education. The father's mental stress is the major pathway for job loss to affect children's education. UI appears to be more effective for shielding children of low-income fathers from the negative effects of a job loss.

C. Falsification Test

My results above are derived from the identification strategy of treating maximum unemployment insurance (UI) as plausibly exogenous. Because of the inherently untestable nature of identification strategy, a caveat of other confounding factors that affect education success in school merits further examination. To strengthen the validity of my strategy, I examine if maximum UI benefits have any effect on the children of the employed. As the employed

are not allowed to collect benefits, UI should not affect their children. If states which have better educational policies or put more efforts to improve school quality set generous UI, then we should expect UI benefits to affect these children. Table 6 contains the results. The magnitude of maximum UI benefits is positive, but not statistically different from zero. This evidence demonstrates that other unobserved heterogeneities are not driving my baseline results. In other words, this helps to eliminate concerns that states which differ in UI generosity have a trend of systematic differences in school performance because of differential unobserved education polices.

VI. Additional Robustness Checks

A. State-Specific Linear Time Trend

In this subsection, I re-estimate the main model, controlling for state-specific trends to capture the fact that states have grown differently in terms of their economic conditions or other social factors. The state-specific linear trend also captures time-changing school environments. For example, some states might have kept expanding the enforcement of accountability for school districts and teachers' training to improve performance. Using such a trend along with state-fixed and year-fixed effects has a downside too. It could raise a concern of over-controlling the model. Nonetheless, it provides an additional avenue to scrutinize earlier results. As presented in Table 7, the results are similar to those derived without a linear trend. Overall, the results strengthen the evidence of UI effect on children's educational outcomes.

B. Extended Sample

In this subsection, I extend the analysis by including the panel 2008, which I dropped in my analysis above due to concerns regarding other confounding factors brought about by the Great Recession. Now, my sample ranges from 1997 to 2011. As presented in Table 8, the effect does not change. This finding complements earlier estimates. This new evidence supports the conclusion that my baseline estimates are not a result of sample selection, while estimates above are not an artifact of the Great Recession.

C. Extended Benefits

Next, I explore the effect of duration of UI availability on grade repetition. Because of the somewhat haphazard roll-out of the UI benefits, states with almost a similar unemployment rate were eligible for two different lengths of benefits. The extensions unveiled during and aftermath of the Great Recession are considered to be the most generous in U.S. history. Extended benefits began coming into effect in some states around May 2008. With the continued rise in the unemployment rate, the government announced the Emergency Unemployment Compensation 2008 (EUC08) in July 2008. These benefits were for shorter duration during the initial phase. The government repeatedly revised the duration, extending the total duration (regular plus extended benefits) up to as long as 99 weeks. These benefits were available to job losers who exhaust their regular benefits.

I exploit the 2008 panel, specifically waves 3 and 10. As the interviews for these waves were collected during the initial phase of the extensions, I am not able to take full advantage of these extensions in my estimation, thus undermining the statistical power of my estimation. I estimate the following model:

$$y_i = \alpha + \beta_1 Potential\ Duration + \beta_2' X_i + f(Parent\ Educ) + + \kappa_1' Z_i + \phi_s + \delta_t + \epsilon_i, \qquad (2)$$

All variables are defined as above. The variable of interest is *Potential Duration* which measures the potential duration of UI availability across states. I calculate the potential duration as the average of potential duration calculated each month in the latest full-academic year (September to June). For example, for children interviewed from September to December 2011, the potential duration is the average of potential durations available from September 2010 to June 2011. I find limited evidence of potential duration on grade repetition, with the affect beling limited to children aged 13 or below. Specifically, a ten-week increase in the duration of benefits decreases the probability of a student repeating a grade by around 0.01 percentage points (Table 9). This finding provides further credibility to this paper's claim that UI affects children's educational achievement.

D. Alternative Sample and Dependent Variable

To further corroborate earlier findings, I choose alternative sample and dependent variable. To do that, I turn to the Current Population Survey (CPS) data. Using the October CPS data, I measure education achievement as the log of the high school dropout rate. Dropout rate[10] is defined as the proportion of 16- to 19-year-olds who are not in school and do not hold a high school diploma or any other equivalent degree. My measure is similar to Loeb and Page (2000) who study the effect of teacher wage on student outcomes.

I aggregate data by state. I provide a brief description of the CPS data in the Appendix. I estimate both the first difference (FD) and fixed-effect (FE) models from 1997 to 2007. My purpose here is to eliminate static differences in states such as other school resources and accountability, which influence student performance. As presented in Table 10, this regression corroborates my main findings. Column 1 contains estimates from the fixed-effect model, and column 2 from the first-difference model. The dependent variable is the log of state-dropout rate. Results from the FE model show that a one-percent rise in maximum

[10]The definition of dropout rate in this paper could be viewed as "status dropout."

UI benefits decreases the state dropout rate by around 0.32 percent. The estimates from the FD model indicate that a one-percent increase in maximum UI benefits decreases the state dropout rate by 0.63 percent.

VII. Possible Mechanisms

I build on the existing empirical literature to explore the pathways through which unemployment insurance (UI) affects children's academic achievement. Because of data limitation, I consider only two pathways: 1) improving health outcomes of parents, thus shielding children from negative consequences of a job loss, and 2) increasing time spent by parents on child care.

A. Parental Health Outcomes

In this subsection, I explore the possibility that improved education performance of children could be driven by better health outcomes of parents. Rege, Telle, and Votruva (2013), using Norwegian administrative data, provide a suggestive evidence that father's health, especially mental stress, stemming from a job loss is a prime reason for deteriorating school performance of children. In line of this literature, I attempt to investigate if a higher level of unemployment insurance helps to avoid developing health problems. In other words, I examine whether a father living in a higher unemployment insurance regime has better health than that of a father in a lower insurance regime.

To study the link between UI and health outcomes, I exploit the topical wave 5 of the 2004 panel and the topical wave 8 of the 2001 panel. These are the only two waves in my sample, containing information about self-reported health status of respondents.[11] I link children from my main sample to parents interviewed in the two samples. And, I use the

[11]Self-reported health status includes "Excellent," "Very Good," "Good," "Fair," "Poor,".

following model to estimate the effect of UI on health outcome.

$$Health\ Status = \alpha + \beta_1 MaxBenefits * Layoff + \beta_2 Layoff + \theta X + \epsilon, \tag{3}$$

where the outcome variable "Health Status" is a self-reported health status on a score 1-5, with 5 being excellent. The variable of interest is the interaction of log of maximum unemployment benefits across states and an indicator variable of layoff. I estimated the model for those aged below 51. Results are reported in Table 11. But the effect is not statistically different from zero for a combined sample of both mothers and fathers. I separately estimate the effect for fathers and mothers. I find a statistically significant effect of UI on fathers' health status, but not on mothers'.[12] This finding could be viewed in line with the existing literature which finds layoff having more severe health outcomes for men than women. Hence, UI could be effective to avoid deterioration of health conditions for men after a job loss. The finding provides a suggestive evidence that UI helps to improve children's educational performance through improved health outcomes of fathers.

B. Parental Time Spent

Another channel through which unemployment insurance (UI) can affect children's academic success is a rise in parental time spent on child care. When generous UI system increases the duration of unemployment, parents might use the resulting extra times for supporting children in their education. To examine this possibility, I turn to the American Time Use Survey (ATUS). The ATUS that began in 2003 is a nationally representative survey that contains an individual's all activities on a given diary day. In particular, the ATUS includes the amount of time individuals spend doing various activities, such as paid work, and child care. I calculate total amount of time spent on child care, including education. Details about data and activities used in this paper are provided in Appendix. I use the following model

[12]Estimates on mother's heath outcome are available upon request.

to estimate the effect of UI on parental time spent on children.

$$y_i = \alpha + \beta_1 MaxBenefits * Layoff + \beta_2 Layoff + \theta X + \epsilon, \tag{4}$$

where y_i is the amount of time spent by an individual on child care on a given diary day. The variable of interest is the interaction of log of maximum unemployment benefits across states and an indicator variable of layoff. X includes personal characteristics like age, age squared, education, and unemployment rate. My analysis covers the period from 2003 to 2007. As contained in Table 12, I could not find any effect of UI on the amount of time parents spend on child care. I also estimate the effect on amount of parental time allocated to only education, but the effect is not different from zero.[13] I also estimate the effect on the amount of mothers' time, and do not find any effect. My results could be viewed in the context of the existing empirical studies examining the effect of parental employment and parental leaves on children's cognitive development. The majority of the literature does not find any effect, suggesting that having more free time does not necessary translate into more time spent with children. A caveat of this analysis is that I cannot link children to parents. I am basically extrapolating these results to explain my baseline estimates on grade repetition.

VIII. Conclusion

Unemployment insurance is among the largest social safety nets in developed countries. The research regarding UI mainly focuses on the labor supply behavior of the unemployed. In this paper, I go beyond its moral hazard effects on labor supply to present the first evidence of its effect on child's educational outcomes. In light of the emerging literature that shows parental job loss negatively affects child education, I examine if social safety nets such as

[13]Results are available upon request.

UI are helpful in mitigating negative effects of a job loss, thus preventing such effects from being extended to affect children's academic achievement.

Using data from the Survey of Income and Program Participation (SIPP), I estimate the effect of UI on grade repetition. My identification strategy exploits the variation in maximum weekly UI benefits across states and over time. States set the maximum amount of benefits that individuals could receive, which is considered to be plausibly exogenous in the literature. I find that one percent increase in maximum UI benefits reduces the likelihood that a child repeats grade by approximately 0.05 percentage points. The effects seem to be concentrated on children of less-educated fathers. I also go on to examine the effect of UI on the high-school dropout rate by state, using the Current Population Survey (CPS). I find that a higher level of UI decreases the high school dropout rate.

My analysis suggests that the major pathway through which UI affects education is improvement in fathers' health outcomes following a job loss. This finding appears to be in line with Rege, Telle, and Votruva (2013). The authors, using the Norwegian administrative data, suggest that fathers' mental stress is a major channel through which a lay-off affects child'd academic success. My findings have implications for research regarding the design of optimum unemployment insurance. One natural extension of this paper is to quantify the externality of UI and incorporate it in the design of optimum UI.

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Table 1: **Summary Statistics: SIPP Data**

	N	Mean	Std. Dev.	Min	Max
Panel A					
Children with Parental Job Loss					
Grade Repetition	29,251	0.05	0.22	0	1
White	29,251	0.71	0.45	0	1
Black	29,251	0.20	0.40	0	1
Other Race	29,251	0.09	0.28	0	1
Female	29,251	0.50	0.50	0	1
Age	29,251	10.81	3.65	5	17
Age Squared	29,251	130.24	81.12	25	289
Father's Education	22,325	39.90	3.39	31	47
Mother's Education	28,636	39.89	3.19	31	47
Panel B					
Children without Parental Job Loss					
Grade Repetition	25,469	0.0218	0.15	0	1
White	25,469	0.85	0.36	0	1
Black	25,469	0.08	0.28	0	1
Other Race	25,469	0.07	0.25	0	1
Female	25,469	0.48	0.50	0	1
Age	25,469	11.53	3.63	5	17
Age Squared	25,469	146.25	82.73	25	289
Father's Education	25469	41.48	2.96	31	47
Mother's Education	25469	41.81	2.76	31	47

Notes: Summary statistics are calculated using the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation. Panel A contains children who faced parental job loss. Panel B contains children whose both parents were always employed.

Table 2: **Summary Statistics: Other Data**

Variables	**N**	**Mean**	**Std. Dev.**	**Min**	**Max**
Maximum Benefits	765	364.7	112.98	175	943
Unemployment Rate	765	5.49	2.02	2.3	13.7
Median Income	765	54920.02	8273.85	37860	78632
Pupil-Teacher Ratio	765	15.47	2.43	10.5	24.1
Expenditure	765	7998633	9744417	577498	6.16e+07
Enrollment	765	948091.6	1106647	68681	6441557

Note: Summary statistics are calculated using data from 1997 to 2011.

Table 3: **Correlation between State Economic Conditions and Maximum Benefits (1997-2011)**

	Max. benefits	Max. benefits	Max. benefits	Max. benefits	Max. benefits
Unemp. Rate	-2.848				
	(2.890)				
GDP Growth Rate		-0.064			
		(0.565)			
Log of Expenditure			-74.291		
			(68.414)		
Log of Pupil-Teacher Ratio				24.211	
				(56.637)	
Log of Enrollment					-14.632
					(84.868)
Observations	765	765	765	765	765
R-squared	0.934	0.934	0.934	0.934	0.934
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: The variable maximum UI benefits is regressed on state economic and school characteristics, separately. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 4: **Effects of Maximum UI Benefits on the Likelihood of Grade Repetition: Main Sample**

	(1)	(2)	(3)
Layoff*Max UI	-0.056***	-0.046***	-0.050**
	(0.018)	(0.018)	(0.021)
Layoff	0.366***	0.288***	0.306**
	(0.110)	(0.106)	(0.126)
Female		-0.009**	-0.009**
		(0.005)	(0.005)
Black		0.009	0.008
		(0.011)	(0.011)
Other race		-0.003	-0.003
		(0.008)	(0.008)
Age		0.011***	0.011***
		(0.004)	(0.004)
Age squared		-0.001***	-0.001***
		(0.000)	(0.000)
Father education		-0.002**	-0.002**
		(0.001)	(0.001)
Mother education		-0.003**	-0.003**
		(0.001)	(0.001)
Median Income		-0.000	0.000***
		(0.000)	(0.000)
Unemp. rate		-0.476***	-0.094
		(0.163)	(0.067)
Unemp. rate squared		0.096***	0.016
		(0.034)	(0.014)
Unemp. Rate cubed		-0.006***	-0.001
		(0.002)	(0.001)
Log expenditure		-0.004	-0.027
		(0.018)	(0.046)
Log enrollment		0.000	0.059
		(0.037)	(0.084)
Pupil-teacher ratio		0.001	0.006*
		(0.001)	(0.003)
Constant	0.022***	0.954***	0.282
	(0.003)	(0.265)	(0.222)
Observations	38,265	33,155	33,155
R-squared	0.009	0.020	0.028
State Fixed Effects	No	No	Yes
Year Fixed Effects	No	No	Yes

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 5: **Heterogenous Effect of Maximum UI Benefits on the Likelihood of Grade Repetition**

	Less Educated Father	More Educated Father
Layoff*Max UI	-0.058**	-0.026
	(0.028)	(0.033)
Layoff	0.367**	0.162
	(0.168)	(0.199)
Female	-0.016***	-0.004
	(0.006)	(0.007)
Black	0.013	0.012
	(0.014)	(0.012)
Other race	0.003	-0.020**
	(0.012)	(0.008)
Age	0.013**	0.017***
	(0.006)	(0.006)
Age squared	-0.001**	-0.001***
	(0.000)	(0.000)
Mother education	-0.003***	-0.010***
	(0.001)	(0.002)
Median Income	0.000**	0.000**
	(0.000)	(0.000)
Unemp. rate	-0.163*	-0.140
	(0.091)	(0.091)
Unemp. rate squared	0.029	0.026
	(0.018)	(0.019)
Unemp. Rate cubed	-0.002	-0.002
	(0.001)	(0.001)
Log expenditure	-0.018	0.008
	(0.060)	(0.073)
Log enrollment	0.086	0.064
	(0.115)	(0.124)
Pupil-teacher ratio	0.006	0.002
	(0.004)	(0.005)
Constant	0.232	0.490
	(0.273)	(0.303)
Observations	24,287	13,633
R-squared 0.031	0.056	

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. The first column contains estimates for those children whose father does not have a bachelor's degree, and the second column for children of fathers with a bachelor's degree. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 6: **Effects of Maximum UI Benefits on the Likelihood of Grade Repetition: Employed Parents**

	Grade Repetition
Log of Maximum Benefits	0.048
	(0.034)
Female	-0.003
	(0.005)
Black	0.002
	(0.013)
Other race	-0.017**
	(0.008)
Age	0.005
	(0.006)
Age squared	-0.000
	(0.000)
Father education	-0.000
	(0.001)
Mother education	-0.003*
	(0.002)
Median Income	0.000
	(0.000)
Unemp. rate	-0.094
	(0.070)
Unemp. rate squared	0.017
	(0.014)
Unemp. Rate cubed	-0.001
	(0.001)
Log expenditure	0.033
	(0.053)
Log enrollment	-0.062
	(0.093)
Pupil-teacher ratio	0.006
	(0.004)
Constant	-0.305
	(313,089.245)
Observations	19,059
R-squared	0.027
State Fixed Effects	Yes
Year Fixed Effects	Yes

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 7: **Using State-Specific Linear Trends**

	Grade Repetition
Layoff*Max UI	-0.050**
	(0.021)
Layoff	0.306**
	(0.126)
Female	-0.009**
	(0.005)
Black	0.008
	(0.011)
Other race	-0.003
	(0.008)
Age	0.011***
	(0.004)
Age squared	-0.001***
	(0.000)
Father education	-0.002**
	(0.001)
Mother education	-0.003**
	(0.001)
Median Income	0.000
	(0.000)
Unemp. rate	2.366
	(16.319)
Unemp. rate squared	-0.521
	(3.437)
Unemp. Rate cubed	0.037
	(0.232)
Log expenditure	0.667
	(5.259)
Log enrollment	-3.007
	(.)
Pupil-teacher ratio	0.084
	(.)
Observations	33,155
R-squared	0.028
State Fixed Effects	Yes
Year Fixed Effects	Yes
State-Specific Linear Trend	Yes

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 8: **The Effect of Maximum UI Benefits on the Likelihood of Grade Repetition: Extended Sample**

	(1)	(2)	(3)
Layoff*Max UI	-0.056***	-0.043**	-0.050**
	(0.018)	(0.017)	(0.021)
Layoff	0.366***	0.264**	0.306**
	(0.110)	(0.104)	(0.126)
Female		-0.010**	-0.009**
		(0.005)	(0.005)
Black		0.010	0.008
		(0.011)	(0.011)
Other race		-0.003	-0.003
		(0.008)	(0.008)
Age		0.011***	0.011***
		(0.004)	(0.004)
Age squared		-0.001***	-0.001***
		(0.000)	(0.000)
Father education		-0.002**	-0.002**
		(0.001)	(0.001)
Mother education		-0.003**	-0.003**
		(0.001)	(0.001)
Median Income		-0.000	0.000
		(0.000)	(0.000)
Unemp. rate		-0.146***	-0.041**
		(0.049)	(0.016)
Unemp. rate squared		0.025***	0.004**
		(0.008)	(0.002)
Unemp. Rate cubed		-0.001***	-0.000**
		(0.000)	(0.000)
Log expenditure		-0.011	0.025
		(0.018)	(0.032)
Log enrollment		-0.001	0.005
		(0.037)	(0.062)
Pupil-teacher ratio		0.001	0.004**
		(0.001)	(0.002)
Observations	54,720	47,179	47,179
R-squared	0.009	0.019	0.028
State Fixed Effects	No	No	Yes
Year Fixed Effects	No	No	Yes

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 9: **The Effect of the Duration of UI Extensions on the Likelihood of Grade Repetition**

	Grade Repetition
UI Duration	-0.001**
	(0.001)
Female	-0.006
	(0.004)
Black	0.007
	(0.007)
Other race	-0.004
	(0.005)
Age	0.011**
	(0.005)
Age squared	-0.001*
	(0.000)
Median Income	0.000
	(0.000)
Unemp. rate	0.146
	(0.128)
Unemp. rate squared	-0.014
	(0.013)
Unemp. Rate cubed	0.000
	(0.000)
Log expenditure	0.218**
	(0.098)
Log enrollment	0.255
	(0.239)
Pupil-teacher ratio	0.005*
	(0.003)
Father education	0.001
	(0.001)
Mother education	-0.002**
	(0.001)
Constant	-8.122**
	(4.118)
Observations	5,523
R-squared	0.021
State Fixed Effects	Yes
Year Fixed Effects	Yes

Notes: The dependent variable is whether an individual aged 5 to 17 year has repeated a grade or not. Standard errors are clustered at the household level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 10: **State Panel Data (1997-2007)**

	FE	FD
Log of Maximum Benefits	-0.321**	-0.629***
	(0.144)	(0.225)
Unemployment Rate	0.418	0.396
	(0.321)	(0.356)
Unemployment Rate Squared	-0.086	-0.073
	(0.065)	(0.068)
Unemployment Rate Cube	0.006	0.004
	(0.004)	(0.004)
Log of Median Income	0.613**	0.419
	(0.263)	(0.364)
Log of Pupil-Teacher Ratio	0.264	0.361
	(0.269)	(0.229)
Log of Expenditure	-0.424***	0.198
	(0.156)	(0.652)
Log of Enrollment	-0.989**	-1.765***
	(0.435)	(0.538)
Constant	-9.465***	-0.015
	(3.367)	(0.029)
Observations	561	510
R-squared	0.134	0.029

Notes: The dependent variable is the high-school state-year dropout rate. Standard errors are clustered at the state level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

Table 11: **The Effect of UI on Health Condition**

	Full Sample	Fathers
Layoff*Max UI	0.064	0.394**
	(0.122)	(0.194)
Layoff	-0.669	-2.623**
	(0.725)	(1.142)
Female	-0.065***	
	(0.016)	
Black	-0.101**	-0.142**
	(0.047)	(0.053)
Other	-0.130**	-0.173***
	(0.050)	(0.056)
Married	0.163***	0.077
	(0.032)	(0.047)
Age	-0.030**	-0.048**
	(0.013)	(0.021)
Age squared	0.000	0.000
	(0.000)	(0.000)
Less than a bachelor's degree	-0.292***	-0.285***
	(0.019)	(0.024)
Unemp. Rate	1.171	2.032**
	(0.740)	(0.821)
Unemp. Rate Square	-0.193	-0.342**
	(0.132)	(0.149)
Unemp. Rate Cube	0.011	0.019**
	(0.008)	(0.009)
Constant	2.636**	1.629
	(1.265)	(1.462)
Observations	15,261	7,183
R-squared	0.075	0.069
State Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Notes: The dependent variable is the self-reported health status, on a score 1-5, with 5 being excellent. The first column contains estimates for the full sample, and the second for fathers. Standard errors are clustered at the sate level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

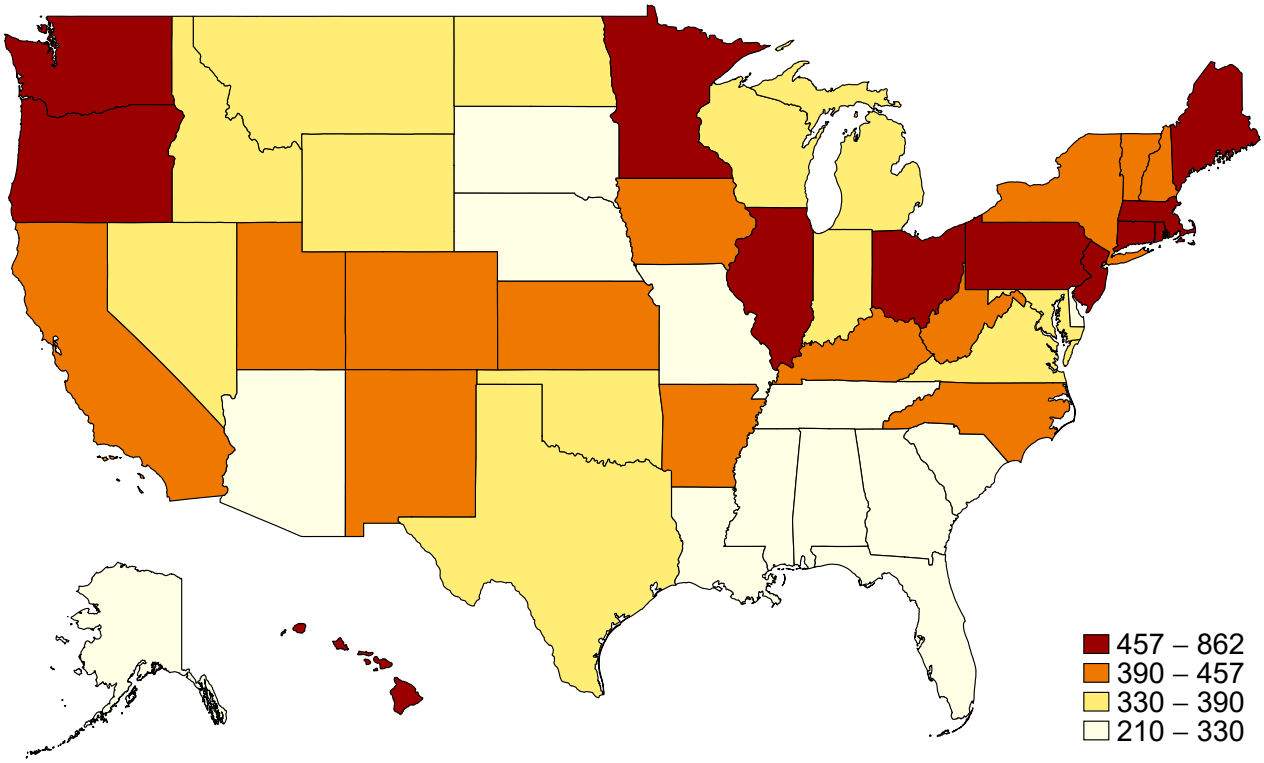
Table 12: **The Effect of UI on Time Spent on Child Care**

	Full Sample	Women
Layoff*Max UI	19.364	46.754
	(39.079)	(93.585)
Layoff	-85.879	-215.310
	(227.681)	(543.516)
Female	24.107***	
	(1.338)	
Black	-16.531***	-20.183***
	(2.615)	(3.945)
Other	-1.035	-2.707
	(2.827)	(4.666)
Age	-7.250***	-10.606***
	(1.132)	(2.053)
Age squared	0.053***	0.086***
	(0.013)	(0.024)
Less than a bachelor's degree	-29.182***	-36.722***
	(1.811)	(2.248)
Unemp. Rate	5.081	-5.107
	(31.507)	(56.103)
Unemp. Rate Square	-1.152	1.286
	(5.910)	(10.320)
Unemp. Rate Cube	0.064	-0.135
	(0.362)	(0.616)
Constant	244.646***	402.786***
	(62.716)	(112.239)
Observations	18,546	9,307
R-squared	0.096	0.102
State Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Notes: The dependent variable is the amount of time spent on child care, including education. The first column contains estimates for the full sample, and the second column for the female. Standard errors are clustered at the state level. *** denotes significance at the ten percent level, ** denotes at the five percent level, and * denotes at the one percent level.

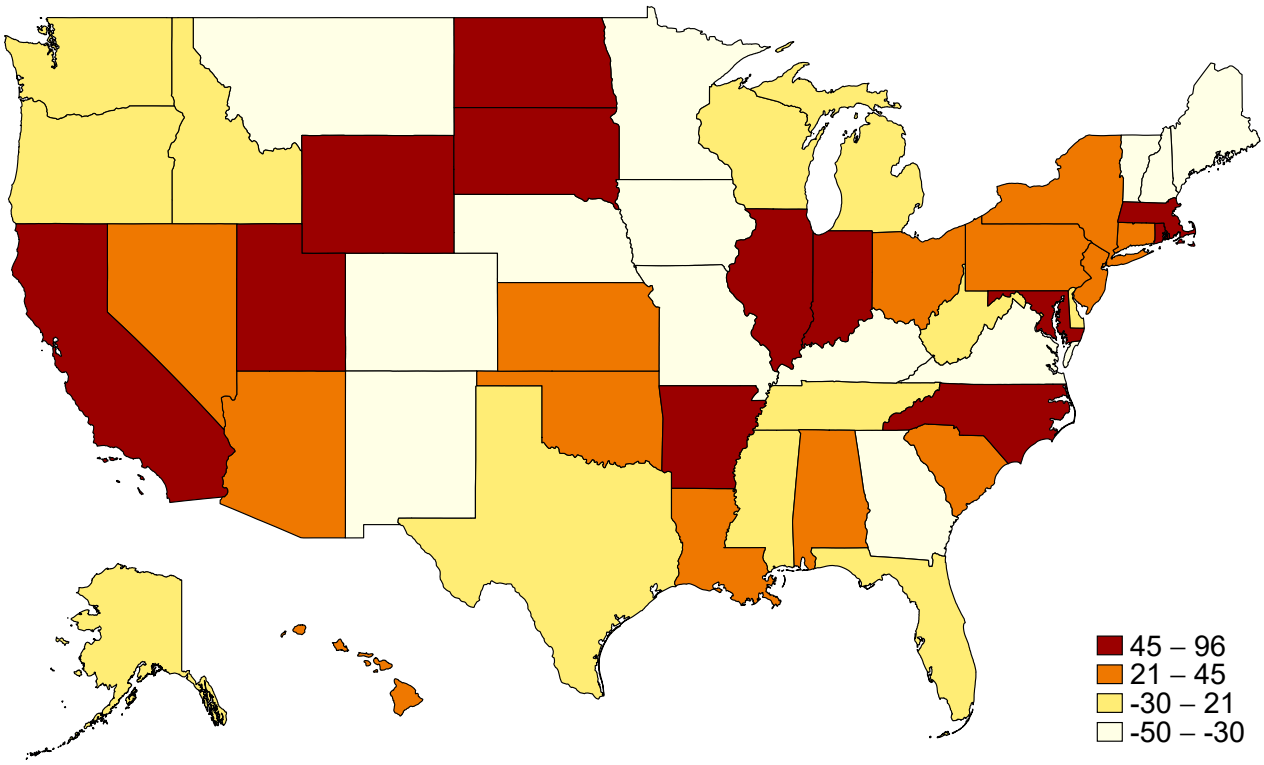
Appendix

Figure A1: Maximum UI Benefits in 2007 by State in Dollars



Notes: : Maximum amount of UI benefits by states.

Figure A2: Growth Rates in Maximum UI Benefits between 1997 and 2007 by State



Notes: Growth rates of UI benefits by states between 1997 and 2007.

Table A1: **Duration of Benefits Under Emergency Unemployment Compensation**

Periods	Tier I	Tier II	Tier III	Tier IV
July 6, 2008 -November 23, 2008	13			
November 24, 2008 to November 7, 2009	20	13		
November 8, 2009 to February 18, 2012	20	14	13	6
February 19, 2012 to May 26, 2012	20	14	13	6
May 27, 2012 to September 1, 2012	20	14	13	6
September 2, 2012 to December 28, 2013	14	14	9	10

Source: Congressional Research Service

A1. Current Population Survey Data

In this section, I describe the October Current Population Survey data. Relative to other monthly CPS surveys, the October survey has more comprehensive information about school enrollment and school graduation status, being much suitable for the purpose of this study. The CPS is the largest monthly labor force survey, and conducts interviews for about 56,000 households with over 100,000 persons in total. The main focus of the survey is to gather information about individuals' employment status, occupation, industry, and demographic characteristics such as race, sex, and marital status. Nonetheless, it collects additional information related to different issues of the interviewees such as health and education in different surveys. The October CPS survey includes questions regarding school enrollment for all those age three or above. In the spirit of Loeb and Page (2000), I categorize individuals aged 16 to 19 years who do not attend school and do not hold a high school diploma or an equivalent degree, as high school dropouts. The United States Department of Educations also defines "status dropout" in the same way. I present summary statistics in Table A2 for the period 1997-2007. In total, around 18 percent of individuals aged 16 to 19 years do not attend school and do not hold a high-school degree or an equivalent credential. So, they are considered to be high-school dropouts.

A2. American Time Use Survey Data

The American Time Use Survey (ATUS) is the only nationally representative survey that contains information about activities that an individual engages on a diary day. Some of the activities include child care, making data suitable for the purpose of this study. The ATUS began collecting data in 2003. Around 20,000 individuals were interviewed in 2003, and the sample size decreased to around 13,000 each year since 2004. I use data from the period 2003 to 2007. The data are repeated cross-sections. Summary statistics are given in Table

A3.

All activities are coded in a three-tiered classification system. Child care activities include activities related to caring for and helping household children and activities related to household children's education, such as reading to/with children, playing with children, playing with children, and talking with/listening to children. All activities related to child care are given in Table A4. I code layoff if an individual states that he/she is unemployed and on layoff. Specifically, I use the labor force status variable TELFS, and code individuals to layoff if they report their labor force status "Unemployment-On Layoff." Likewise, I categories individuals as employed if they report their labor force as employed.

Table A2: **Summary Statistics: CPS Data**

Variables	N	Mean	Std. Dev.	Min	Max
High-School Dropout	30,261	0.18	0.39	0.00	1.00
Age	30,261	17.41	1.12	16.00	19.00
Female	30,261	0.49	0.50	0.00	1.00
Marital Status	30,261	5.90	0.65	1.00	6.00
Other Race	30,261	0.08	0.26	0.00	1.00
Black	30,261	0.15	0.36	0.00	1.00

Notes: Summary statistics are calculated using the Current Population Survey from 1997 to 2007, and applying survey weights.

Table A3: **Summary Statistics: ATUS Data**

Variables	N	Mean	Std. Dev.	Min	Max
Layoff	18,546	0.01	0.09	0	1
Employed	18,546	0.99	0.09	0	1
Female	18,546	0.45	0.50	0	1
White	18,546	0.83	0.37	0	1
Black	18,546	0.11	0.31	0	1
Other	18,546	0.06	0.24	0	1
Age	18,546	41.31	6.61	31	60
Age squared	18,546	1750.27	567.66	961	3600
Bachelor's degree	18,546	0.36	0.48	0	1
Less than a bachelor's degree	18,546	0.64	0.48	0	1

Notes: Summary statistics are calculated using the American Time Use Survey (ATUS) from 2003 to 2007, and applying survey weights.

Table A4: **Description of the ATUS Lexicon Codes and Activities**

Categories	Codes	Activities
For and Helping Household Children		
	030101	Physical care for hh children
	030102	Reading to/with hh children
	030103	Playing with hh children, not sports
	030104	Arts and crafts with hh children
	030105	Playing sports with hh children
	030106	Talking with/listening to hh children
	030108	Organization and planning for hh children
	030109	Looking after hh children (as a primary activity)
	030110	Attending hh children's events
	030111	Waiting for/with hh children
	030112	Picking up/dropping off hh children
	030199	Caring for and helping hh children, n.e.c.
Activities Related to HH Children's Education		
	030201	Homework (hh children)
	030202	Meetings and school conferences (hh children)
	030202	Home schooling of hh children
	030204	Waiting associated with hh children's education
	030299	Activities related to hh child's education, n.e.c.
Activities Related to HH Children's Health		
	030301	Providing medical care to hh children
	030302	Obtaining medical care for hh children
	030303	Waiting associated with hh children's health
	030399	Activities related to hh child's health, n.e.c

Notes: Activities are derived from the American Time Use Survey (ATUS) Activity Coding Lexicon. The ATUS codes all activities in a three-tiered classification system.