Cross-Country Evidence on Labor Market Institutions and Young Adult Employment through the Financial Crisis

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Abstract:

I develop and analyze a set of cross-country facts regarding employment and wage setting institutions over the decade surrounding the 2008 financial crisis. Among long-industrialized countries, young adult employment declined more than prime age employment over this time period. I show that differences in countries' wage setting institutions strongly predict variations in the magnitude of declines in young adult employment. Both unconditionally and conditional on changes in macroeconomic conditions, young adult employment declined 5 percentage points less in countries where wage setting is driven by collective bargaining arrangements than in countries with statutory wage floors. Evidence on the evolution of legislated minimum wage rates and of an asymmetry in the relationship between growth and young adult employment suggest an important role for a standard "wage rigidity" mechanism.

Young adult employment declined considerably over the combined boom, bust, and recovery surrounding the global financial crisis. Across long-industrialized countries in the Organization for Economic Cooperation and Development (OECD), employment among individuals aged 15 to 24 declined by almost 6 percentage points from 2003 to 2013. Over this same time period, employment among individuals aged 25 to 54 declined, on average, by less than 1 percentage point.

This paper considers the capacity for labor market institutions to explain cross-country variations in young adult employment's evolution. Over the time period under analysis, declines in young adult employment are quite strongly correlated with variation in countries' wage setting institutions. I show that young adult employment declined significantly less in countries where wage floors are negotiated through collective bargaining arrangements than in countries where the political process sets statutory minimum wage rates. In the latter set of countries, the bite of statutory wage floors rose because their real value was maintained despite crisis-driven declines in demand. From 2003 to 2013, these countries experienced declines in young adult employment that were, on average, 5 percentage points larger than the declines that occurred in countries with collective bargaining arrangements.

Notably, collective bargaining regimes and statutory minimum wage regimes experienced nearly identical changes in employment rates across all age groups extending from 25 to 29 year olds to 55 to 59 year olds. Explanations for the differential decline in youth and young adult employment must thus involve forces that apply to their segment of the market in isolation from all others. As a mechanism underlying this differential, I propose a straightforward application of rigid wages following declines in aggregate demand and, by extension, to demand for labor.

The framework developed in section 3 distinguishes between demand-side, supply-

side, and institutional determinants of employment.[1] This guides my investigation of alternative explanations for variations in the magnitude of young adult employment declines. I first consider demand-side forces. As it pertains to the wage rigidity mechanism, the key question is whether the forces underlying the financial crisis were stronger in countries with legislated wage floors than in countries with collective bargaining arrangements. I provide evidence that they were not. Real GDP and financial wealth per capita followed quite similar paths across these groups of countries. Within each group there is considerable heterogeneity, as both groups contain a combination of debt crisis countries and countries that experienced less pronounced downturns.[2] Estimates of the differential decline in young adult employment are affected little by controlling for changes in GDP, financial wealth, prime age employment, or combinations of these variables. The inclusion of macroeconomic controls increases the precision with which the differential is estimated without significantly altering its magnitude.

I next consider supply-side forces. One set of measurable supply-side forces involves baseline levels of, and changes in, the generosity of social insurance arrangements. I find that controlling for a range of proxies for variations in the generosity of social insurance programs has essentially no effect on the estimated relationship between employment and wage setting institutions. A second potential supply-side force involves increases in educational attainment.[3] I find that the employment declines associated with variations in countries' labor market institutions are quite weakly associated with changes in

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[1]The conceptual allocation of factors across these categories is familiar from recent efforts including those of Abraham and Kearney (2018) and Aaronson, Cajner, Fallick, Galbis-Reig, Smith, and Wascher (2014) to explain trends in either employment or labor force participation.

[2]In line with standard designations, the countries I label as "debt crisis countries" are Greece, Ireland, Italy, Portugal, and Spain.

[3]Educational attainment may rise due to increases in its perceived value, increases in public subsidy, and/or decreases in labor market opportunities. Increases in educational attainment driven by decreases in labor market opportunities are consistent with this paper's emphasis on wage rigidity, while changes driven by public subsidy or the perceived value of education would constitute alternative explanations.

schooling.

Next, I consider the possibility that wage setting institutions are correlated with other plausibly relevant dimensions of countries' labor market institutions.[4] I investigate this possibility by including proxies for additional institutions of interest in my empirical specifications. I find that young adult employment declines are quite weakly predicted by the OECD's employment protection index as well as more general indices of "labor freedom" and "business freedom." Controlling for these indices has very little effect on the estimated relationship between young adult employment declines and variations in wage setting institutions.

A final set of facts more directly links the evolution of young adult employment to an asymmetry in the relevance of wage setting institutions. First, I show that the long-run divide between the employment declines in countries with and without legislated minimum wage rates was largest in countries where the crisis was most severe. That is, debt crisis countries with relatively responsive labor market institutions experienced much smaller declines in young adult employment than debt crisis countries with legislated minimum wage regimes.

Finally, I divide the analysis sample into three periods, namely the "boom," "bust," and "recovery." Through a series of analyses, I show that the relationship between economic growth and young adult employment exhibits a strong asymmetry. During the boom and recovery periods, countries with legislated minimum wage rates and collectively bargained wage rates exhibit similar relationships between young adult employment and economic growth. During the bust, by contrast, young adult employment was far more sensitive to economic conditions in countries with legislated minimum wage

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[4]Bertola and Rogerson (1997) highlight the importance of jointly considering the relevance of correlated labor market institutions. They observe that the correlation between collective bargaining institutions and stringent employment protections may offset one another in determining rates of job creation and destruction. More specifically, Bertola and Rogerson (1997) emphasize that centralized wage setting can exacerbate job destruction while employment protections simultaneously slow it.

rates than in countries with collective bargaining regimes.

The facts this paper develops relate to two issues of broader interest. First, this paper presents facts from a global context in which analyses of the recent U.S. labor market experience can be cross-validated. Cross-country variations pose difficulties for narratives of the young adult labor market's evolution that point uniformly to employment declines. More specifically, such narratives face the difficulty of explaining why young adult employment has risen in several long-industrialized economies. By contrast, explanations that generate cross-country variations in young adults' employment opportunities may have more traction. Trade patterns (Autor, Dorn, and Hanson, 2013) and variations in the severity of financial and housing declines (Charles, Hurst, and Notowidigdo, 2013), for example, have the potential to extend from the U.S. context to the cross-country context.

Second, the analysis speaks to the role of wage rigidity as a mediator of the magnitudes of employment declines during recessions.[5] Wage floors are a source of rigidity with greatest relevance for the job finding of low education, low experience individuals. In the U.S. context, it has long been observed that the employment of young individuals is more cyclically sensitive than employment among other demographic groups (Clark and Summers, 1981). My analysis highlights that this feature of the U.S. context is not universal. Wage setting institutions are strongly predictive of the extent to which employment among low-skilled groups exhibit excess sensitivity to business cycle downturns.

This paper's analysis shows that labor market institutions and their interactions with

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[5]Cyclical employment fluctuations are puzzling in part because their magnitude significantly exceeds what one would predict on the basis of microeconomic labor supply elasticity estimates (Chetty, 2012; Chetty, Guren, Manoli, and Weber, 2012). Any friction that would amplify the employment declines that result from the deterioration of macroeconomic conditions with which it interacts can be viewed as a potential resolution of this puzzle. This line of thought can be cast as the motivation for the business cycle literature's strong interest in rigidities and frictions.

changes in macroeconomic conditions correlate strongly with cross-country developments in young adult labor markets. Recent analyses from Denmark (Kreiner, Reck, and Skov, 2017), Greece (Yannelis, 2014), Sweden (Saez, Schoefer, and Seim, 2017), and the United States (Clemens and Wither, 2014) provide complementary evidence that youth and/or young adult employment tends to be higher, all else equal, when its cost to firms is lower. The evidence in these studies is thus consistent with the current paper's hypothesis that the rigidity of labor costs significantly shaped young adult employment outcomes during the global financial crisis.

The remainder of this paper proceeds as follows. Sections 1 and 2 describe the labor market institutions and trends under analysis. Section 3 models the relevant differences between legislatively driven wage floors and collective bargaining arrangements. Section 4 describes the empirical models I estimate. Section 5 presents the results of my empirical analysis and section 6 concludes.

1 Overview of Labor Market Institutions, Data Sources, and Sample Inclusion Criteria

This section discusses the macroeconomic data I analyze, the information I use to categorize countries' labor market institutions, and the criteria I use to divide the full set of OECD countries into my primary and supplemental analysis samples. The macroeconomic data I analyze come from a set of OECD databases (2016c; 2016d; 2015b). My categorization of labor market institutions draws on a variety of sources discussed below.

1.1 Categorizing Labor Market Institutions

I characterize countries' labor market institutions using information from several sources. The broad distinction my analysis maintains is between regimes with wage floors set through the political process and regimes with wage floors set through collective bargaining. The key difference lies in whether the final decision-making body consists of government officials or representatives of labor and business. In practice, of course, the relative influence of these groups may exhibit continuous variation.

A baseline look at countries' wage setting institutions comes from Neumark and Wascher (2004), who draw in turn on summaries from Dolado et al (1996). Several countries' wage setting institutions have changed since these studies. The United Kingdom, for example, shifted from a system of "Wage Councils" to a statutory wage floor in 1999. Ireland similarly shifted from a system of "Joint Labor Committees" to a statutory wage floor in 2000. Germany adopted a statutory wage floor in 2015, but operated under collective bargaining in earlier years. Greece's wage setting regime is described by Neumark and Wascher (2004) and Dolado et al (1996) as collective bargaining. In 2012, reductions in Greece's wage floors were externally imposed through IMF bailout terms. My coding of countries' institutions is summarized in column 1 of table 1.

1.2 Youth Minimum Wage Rates

Because my analysis focuses on employment among individuals aged 15 to 24, I now summarize countries' youth minimum wage policies.[6] Summary information on the characteristics of youth minimum wage rates in countries with statutory minimum wage regimes can be found in table 2.[7] The information presented comes primarily from

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[6]Neumark and Wascher (2004) find, for example, that the minimum wage's disemployment effects appear weaker in countries with youth minimum wage rates than in those without.

[7]The table describes Canada, France, and the United States as having "Limited" coverage through youth minimum wage provisions. In the U.S. context, this refers to the fact that the exception to the federal

Kelly and McGuinness (2017) and OECD (2015a). This coding of youth minimum wage rates is similar to that adopted in recent work by Marimpi and Koning (2018).[8]

Most of the countries under analysis exempt youth from the adult minimum wage. That is, they allow wage rates lower than the adult minimum wage to be paid to the very young. For purposes of my empirical analysis, two features of these policy regimes are important. First, youth minimum wage rates tend to phase out by the time an individual is aged 20 or 21. When I analyze employment among individuals aged 20 to 24, I am thus analyzing employment among a population that must, with relatively few exceptions, be paid the full minimum wage.

Second, Kelly and McGuinness (2017) document that youth minimum wage rates tend to move in proportion to adult minimum wage rates. Among countries with statutory minimum wage rates, Kelly and McGuinness (2017) write that "just under two-thirds have special rates for young people. The evidence demonstrates that, in terms of their construction and design, youth rates are predominately expressed as some proportion of the adult minimum wage rate." The variations in minimum wage rates that apply to youth thus tend to mirror variations in adult minimum wage rates.

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minimum wage is restricted to a 90 day training period for teenagers. State policies either follow federal requirements or tend to differ from them modestly. France similarly limits the youth minimum wage to the first months of job tenure, as described by Kelly and McGuinness (2017). In Canada, federal law does not provide for separate youth and adult minimum wage rates. Ontario allows for a student-specific (under age 18) minimum wage, while Nova Scotia distinguishes between "experienced" and "inexperienced" workers. Most provinces elect not to differentiate their minimum wage rates on the basis of either age or experience levels.

[8]The countries described in table 2 as having "Limited" youth minimum wage exceptions are countries coded by Marimpi and Koning (2018) as having minimum wage policy that is not differentiated by age. The limited nature of these countries' youth minimum wage exceptions are further described in the previous footnote. Marimpi and Koning (2018) finds that youth and young adults have higher employment rates than moderately older individuals in countries that employ youth minimum wage rates as compared with those that do not.

1.3 Selection of the Primary Analysis Sample

My primary analysis sample consists of the 23 countries I describe as high income, long-industrialized countries. The OECD consists of these 23 countries plus an additional 12 countries described in appendix table A.2. Analysis in which I extend the sample to include other OECD countries can be found in appendix A.5. In the remainder of this section, I describe the combination of data quality and conceptual issues underlying this division of the OECD countries.

The countries I describe as high income, long-industrialized countries differ from the remainder of the OECD along several dimensions. The countries outside of my primary analysis samples experienced quite different economic trajectories than the countries on which I focus. As shown in table A.2, the more recently industrialized countries experienced quite strong economic growth over the period under analysis. Among these countries, cumulative growth in real GDP per capita averaged 28 percentage points from 2003 to 2013. Among countries in the primary analysis sample, cumulative growth averaged just under 6 percentage points over this time period. These groups' wage setting institutions thus faced quite different pressures. The more recently industrialized countries are of interest for analyzing the effects of wage floors during prolonged economic expansions. They are less relevant for this paper's focus on cycles of boom and bust.

A separate set of issues involves the quality of data on both labor market institutions and the economic developments of interest. Recently industrialized countries' labor market institutions are less comprehensively documented than those of long industrialized countries. None of these countries' institutions, for example, are described by Neumark and Wascher (2004) or Dolado et al (1996). As discussed further in Appendix 1.1, they are also more difficult to classify. Binding or near-binding consultations between public officials and representatives of business and labor are common.

Further issues involve the comprehensiveness and quality of the OECD's series on

several variables that proxy for either changes in economic conditions or social insurance institutions. Financial wealth data for Chile, Korea, Mexico, and Turkey are not available for the early years of the period under analysis. Among the more recently industrialized countries, missing data are particularly problematic for analyses in which I control for variations in social insurance generosity and employment protections. These data are complete for all 23 of the countries in my primary analysis sample. Data on baseline employment protections are missing for 5 of the 12 supplemental countries. Data on baseline social insurance generosity are missing for 7 of the 12 supplemental countries. These issues notwithstanding, estimates that include the supplemental countries are quite similar to estimates that exclude them.

2   Key Trends in Employment across Countries

This section presents the trends in young adult employment and macroeconomic conditions that are central to this paper's analysis. Figure 1 presents trends in prime age and young adult employment separately for countries that have legislatively driven and collectively bargained wage floors. Panel A displays young adult employment. From 2003 to 2007, employment among young adults changed little in either group. Over these initial years, young adult employment averaged just over 47 percent in countries with collective bargaining institutions and just over 46 percent in those with legislated wage floors. By 2013, employment in this age group had declined to just under 45 percent in countries with collective bargaining institutions and to just under 40 percent in those without. The differential decline was roughly 5 percentage points.

Panel B of figure 1 shows the evolution of employment among prime aged adults. Over this time period, employment among prime aged adults moved along roughly parallel trends when comparing countries with collective bargaining regimes to countries

with legislated wage floors. The forces underlying the differential decline in young adult employment thus had no apparent impact on more experienced workers.

How might wage setting institutions have shaped declines in young adult employment? Figure 2 presents data on wage floors averaged across countries for which such data are available.[9] Wage floors rose significantly during the economic expansion. On average across countries where legislatures exert greatest influence (Panel A), wage floors rose by about \$1, or roughly 15 percent, in real terms. Importantly, these wage floors were, on average, held constant in real terms during the financial crisis. The average wage floor in Belgium, Greece, and the Netherlands also increased during the period of economic expansion (Panel B). By contrast, however, these countries' wage floors declined significantly during the crisis. The failure of legislated wage floors to accommodate declines in demand is thus a plausible mechanism through which wage setting institutions may have influenced this period's employment declines.

What else might explain the declines in young adult employment that occurred in countries with legislated wage floors? The leading alternative hypothesis is that these countries may have experienced relatively severe financial crises. As presented in figure 3, however, data on GDP and financial wealth per capita push against this view. Panel A of figure 3 shows that real GDP per capita followed quite similar paths in long-industrialized countries with and without legislated wage floors. This is true in both levels and changes. Panel B similarly shows that financial wealth per capita evolved quite similarly across these groups of countries.

Underlying these aggregated trends are substantial country-level variations, which

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[9]Data on real hourly wage floors for countries with statutory wage setting regimes come from OECD (2016b). The OECD also provides wage floor data for Greece, Belgium, and the Netherlands. These countries, which have hybrid systems described by Stancanelli, Keese, and Gittleman (1998), provide a window into wage setting outside of regimes in which legislatures exert greatest influence. As shown in column 3 of table 1, long-run changes in these countries' effective wage floors were much smaller than those enacted by legislatures.

are presented in figure 4. Panel A of figure 4 plots changes in young adult employment rates against changes in prime age employment rates, while panel B plots changes in young adult employment rates against changes in the log of real GDP per capita. The y-axis variations in changes in young adult employment are dramatic. They range from declines exceeding 10 percentage points among several debt crisis countries to small increases in Germany, Finland, Austria, Iceland, and Sweden.

Changes in prime age employment and GDP growth, as captured on the x-axes of panels A and B respectively, also exhibit substantial variations. The best fit lines in each panel summarize the declines in young adult employment that one would predict on the basis of a country's decline in either GDP growth or prime aged employment. The key fact in each panel is that the hollow diamonds representing countries with legislated wage rates are systematically lower, with respect to the corresponding best fit line, than are the solid triangles representing countries with collective bargaining regimes. That is, young adult employment declined systematically more in countries with legislated wage floors, as compared to those with collective bargaining regimes, than one would predict on the basis of changes in either prime aged employment or per capita GDP. Summary statistics on each of these macroeconomic and employment indicators, presented separately for countries with legislated minimum wage rates and those with collective bargaining regimes, can be found in table 3.

3 A Framework for Analyzing Employment Changes

This section introduces a framework for analyzing the cross-country variations in employment that were presented above. The framework's objective is to provide a platform for attributing employment changes to supply-side, demand-side, and institutional mechanisms. As with any such framework, it leaves many of the labor market's nuances

unmodeled. Because the framework's notation and basic elements come from a 2016 version of Clemens and Wither (2014), portions of this section draw liberally from that paper's text.[10]

Individual i has a reservation wage, driven by non-market opportunities, social insurance benefits, and the value of job search, of $v_{i,t}$ at time t. Labor demand from firms reflects the value of what potential workers can produce. Individual i's productivity, the product of the quantity and market price of his or her output, is $a_{i,t}$ per hour.

Firms' wage offers arise from a combination of competitive market forces and bargaining institutions, as in Bound and Johnson (1992). When bargaining occurs at the individual level, profit maximizing firms employ all individuals they can hire at wage rates less than or equal to the value of their output. Bargaining frictions raise the possibility that firms offer individuals wage rates that are below their productivity. Such frictions can be modeled as arising from search costs, which can lead the value of workers' outside options to fall short of the value of their output. Letting $\theta_{i,t} \in (0, 1]$, describe such deviations, I write firms' unconstrained wage offers as $\theta_{i,t}a_{i,t}$.

The final determinant of wage offers and employment is the legally binding wage floor, w_t^{min}. So long as $a_{i,t} \geq w_t^{min}$, so that the value of the individual's expected output exceeds the wage floor, firms will offer employment at w_t^{min} when $\theta_{i,t}a_{i,t} < w_t^{min}$. When $a_{i,t} < w_t^{min}$, on the other hand, firms will not offer the individual employment.

3.1 Wage Setting Institutions and Macroeconomic Conditions

The employment implications of a wage floor depend largely on where it falls in the productivity distribution. My emphasis for this paper's analysis is on how this effect can vary with economic conditions. At time t, let a_i be distributed according to the probability density function $f_t(\cdot)$ with cumulative distribution function $F_t(\cdot)$. The fraction of individuals who lack employment due to a wage floor of w_t^{min} is then

$$\int_0^{w_t^{min}} f_t(a) \times 1\{\theta_i a_i \geq v_i\} d(a).\tag{1}$$

Equation (1) describes the fraction of the population that would desire to work at firms' unconstrained wage offers ($\theta_i a_i \geq v_i$), but whose productivity falls below the wage floor.

Suppose that a decline in aggregate demand occurs between periods t and t + 1. A decline in aggregate demand reduces output prices and hence shifts the nominal productivity distribution downward, such that the old and "good" distribution $F_g(a)$ first order stochastically dominates the new and "bad" distribution $F_b(a)$, implying that $F_b(a) \geq F_g(a)$ for all a. This downward shift in the value of workers' output implies an increase in a given wage floor's bite, as described by equation (1).

When faced with a rigid wage floor, the employment and wage implications of a shock to the productivity distribution depend in part on how such shocks affect workers' bargaining power (θ_i) and reservation wages (v_i). If bargaining power simultaneously erodes, for example, then the wage floor's positive effect on wages and negative effect on employment will both rise as the floor's bite increases. This combination of effects is intuitively likely, as workers' outside options will tend to erode when aggregate demand declines. The implications of changes in reservation wages are more nuanced. If demand and reservation wages decline simultaneously, for example, a rigid wage floor may alter both the wage and employment prospects of those who are newly seeking work.

As an empirical matter, the wage floors set under legislatively driven regimes rose during the mid-2000s economic expansion and did not decline during the financial crisis (see figure 2). By contrast, the wage floors set by collective bargaining arrangements moved with economic conditions during both the boom and the bust. Equation (1) implies that the employment consequences of legislated wage floors would have increased when their real value was maintained over the course of the financial crisis. By contrast, the effects of wage floors set through collective bargaining arrangements would have changed little during either the boom or the bust.

Collective bargaining can add additional wrinkles to the wage and employment determination process.[11] For present purposes, the most relevant distinction is that employment is less tied to an individual's profitability to firms under collective bargaining. This follows from the fact that, subject to internal participation constraints, a collective bargaining unit can distribute the wage bill across its members as it pleases.

Suppose, for example, that workers' overall fraction of output under collective bargaining is $\bar{\theta}^u$. Letting each individual's wage be $w_{i,t}^u = \theta_{i,t}^u a_{i,t}$, where $\theta_{i,t}^u$ can exceed 1, employment and wage determination can be described by

$$
w_{i,t} = \begin{cases} \theta_{i,t}^u a_{i,t} \text{ if } \theta_{i,t}^u a_{i,t} \geq v_{i,t} \\ \\ 0 \text{ if } \theta_{i,t}^u a_{i,t} < v_{i,t}. \end{cases} \tag{2}
$$

The overall wage bill constrains $\theta_{i,t}^u$ to satisfy

$$
\frac{\int \theta^u a \times 1\{\theta_{i,t}^u a_{i,t} \geq v_{i,t}\} f_t(a) d(a)}{\int a \times 1\{\theta_{i,t}^u a_{i,t} \geq v_{i,t}\} f_t(a) d(a)} \leq \bar{\theta}^u. \tag{3}
$$

So long as the above constraint is met, individuals with productivity less than the pre-

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[11]The implications of collective bargaining can depend crucially on the bargaining unit's objective function (Blair and Crawford, 1984; Farber, 1986). The empirical literature emphasizes that union objectives may vary across settings, as should be expected given the political nature of a bargaining unit's preference formation (Farber, 1978; Dertouzos and Pencavel, 1981; MaCurdy and Pencavel, 1986; Pencavel, 1986).

vailing wage floor may retain employment through collective bargaining.[12] This aspect of collective bargaining differs sharply from individual-level contracting, under which no worker whose productivity falls below the wage floor remains employed.

In sum, collective bargaining and legislatively driven regimes differ along two dimensions of interest. The first involves an empirical difference in their behavior: the real value of legislatively determined wage floors was held constant during the financial crisis, while the real value of collectively bargained wage floors declined. The second difference involves the capacity of collective bargaining arrangements to redistribute across workers, rendering wage floors less relevant to employment determination.

3.2 Connecting the Framework to Data

In the above framework, the young adult employment rate in country c at time t is

$$Emp_{c,t}^{young} = \int_0^\infty f_t(a) \times 1\{w_t^{min} \le a_i\} \times 1\{w_i \ge v_i\}d(a). \tag{4}$$

In words, this expression describes the fraction of the group that is willing to work at firms' wage offers ($w_i \ge v_i$) and that firms are willing to hire at a wage equal to or greater than the wage floor ($w_t^{min} \le a_i$). Suppressing time subscripts for ease of presentation, long run changes (Δ_L) in employment, which are the focus of my empirical investigation, can be written as:

$$\Delta_L Emp_c^{young} = \Delta_L \int_0^\infty f(a) \times 1\{w^{min} \le a_i\} \times 1\{w_i \ge v_i\}d(a). \tag{5}$$

This paper's primary focus is on wage floors, which affect employment when $w^{min} >$

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[12]Empirical research has long found that unions engineer transfers of this sort. Unions' effect on wage dispersion has often been analyzed with regards to variations in union density within the United States (Freeman, 1980; Card, Lemieux, and Riddell, 2004). More relevant to the current analysis is that wage dispersion is lower in countries with national collective bargaining arrangements than in countries with fragmented union groups and statutory minimum wage rates (Freeman, 2005).

a_i. If wage floors do not accommodate declines in demand or productivity, the job loss they generate will rise. Employment variations can arise from several additional sources. Employment will fall when declines in demand or productivity lead wage offers to fall below individuals' reservation wage rates, resulting in $w_i < v_i$. Similarly, v_i could rise above w_i due to increases in the generosity of social insurance programs, increases in the value of leisure time (Aguiar, Bils, Charles, and Hurst, 2017), or increases in the value of home production relative to market work. Finally, there may be unmodeled sources of rigidity that lead firms to forego making wage offers even when $w^{min} \leq a_i$. As laid out in the following section, the potential relevance of these factors motivates my investigation of proxies for macroeconomic conditions, proxies for social insurance generosity, and proxies for features of labor market institutions other than those associated with wage floors. Summary statistics on the variables utilized in the empirical analysis can be found in tables 3 and A.1.

4   Line of Empirical Investigation

This section describes the empirical specifications I estimate, which include a set of purely descriptive regressions and a set of regressions more directly motivated by the previous section's theoretical framework. The purely descriptive analysis, for which Δ_L denotes changes from 2003 to 2013, begins with the bivariate regression below:

$$\Delta_L Emp_c^{young} = \gamma_0 + \gamma_1 1\{\text{Legislative}\}_c + \varepsilon_c. \tag{6}$$

The variable $1\{\text{Legislative}\}_c$ is a binary indicator for whether a country's wage floor was determined legislatively. The coefficient γ_1 is thus an estimate of the difference between the otherwise unconditional expectation of the decline in young adult employment in

countries with legislative wage setting institutions relative to countries with collective bargaining institutions.

Next, I augment equation (6) with controls for factors that may plausibly have exerted independent influence on young adult employment. I begin with the most obvious potential factors, namely variations in overall economic conditions. I further consider the potential relevance of labor market institutions and social insurance institutions. I consider these factors by estimating variants of the equation below:

$$\Delta_L Emp_c^{young} = \gamma_0 + \gamma_1 1\{\text{Legislative}\}_c + \Delta_L \textbf{Macro Covariates}_c \phi$$

$$+ \textbf{Labor Institutions}_c \beta + \textbf{Social Insurance}_c \psi + \varepsilon_c. \tag{7}$$

The variables in Δ_L**Macro Covariates**$_c$ include combinations of changes in the log of real GDP per capita, $\Delta_L \ln(\text{GDP})_c$, the log of real financial wealth per capita, $\Delta_L \ln(\text{Wealth})_c$, and the employment rate among 25 to 54 year olds, $\Delta_L Emp_c^{prime}$. I estimate equation (7) using combinations of these variables because they track different aspects of economic conditions and have different strengths and weaknesses for the purpose at hand.

A separate question is whether the indicator $1\{\text{Legislative}\}_c$ is appropriately interpreted as a proxy for wage setting institutions. Bertola and Rogerson (1997) show, for example, that variations in wage setting institutions are correlated with labor market institutions such as restrictions on employer discretion in firing employees. I thus investigate whether estimates of γ_1 are sensitive to controlling for other characteristics of countries' labor market institutions, **Labor Institutions**$_c$, which includes an index of employment protections (OECD, 2016e) as well as indices of "labor freedom" and "business freedom" constructed by Miller, Holmes, and Feulner (2013).

A third question is whether the indicator $1\{\text{Legislative}\}_c$ was correlated with baseline levels of social insurance generosity or changes in social insurance generosity over

this time period. The relevant controls are those in **Social Insurance**$_c$. They include estimates of the baseline levels of and changes in the 5-year income replacement rates available through social insurance programs, both with and without cash welfare assistance (OECD, 2016a).

I next estimate a series of specifications that are more directly motivated by the model from section 3. First, I estimate the equation below, which interacts proxies for variations in labor market institutions and proxies for variations in macroeconomic conditions:

$$\Delta_L Emp_c^{young} = \gamma_0 + \gamma_1 1\{\text{Legislative}\}_c$$
$$+ \Delta_L \textbf{Macro Covariates}_c \phi$$
$$+ \gamma_2 1\{\text{Legislative}\}_c \times \Delta_L \text{Macro Proxy}_c + \varepsilon_c. \tag{8}$$

I estimate equation (8) allowing four different variables to play the role of $\Delta_L\text{Macro Proxy}_c$. The estimates of γ_2 provide evidence on whether declines in young adult employment were particularly large when labor markets were subject to relatively severe financial crises while also operating under legislatively driven wage floors.

Next, I estimate three equations that emphasize the model's implication that γ_1 may differ during the bust relative to expansions. For this analysis, I divide the data into three periods, namely the boom (2003 to 2006), the bust (2006 to 2012), and the recovery (2012 to 2015). I then allow the relationship between young adult employment and the Legislative regimes to differ in the bust relative to the boom and recovery. The sample for this and the subsequent analyses will thus have 69 observations (23 countries, denoted c, over 3 periods, denoted $P \in \{Boom, Bust, Recovery\}$):

$$\Delta Emp_{P,c}^{young} = \gamma_0 + \gamma_1 1\{\text{Legislative}\}_c + \gamma_2 1\{\text{Legislative}\}_c \times 1\{\text{Bust}\}_P + \varepsilon_{P,c}. \tag{9}$$

The coefficient γ_2 estimates whether the relationship between young adult employment and the Legislative regime differed in the boom and recovery relative to the bust.

I then incorporate continuous variations in the size of countries' booms, busts, and recoveries. More specifically, I estimate the two equations below:

$$\Delta Emp_{P,c}^{young} = \gamma_0 + \phi \Delta ln(GDP)_{P,c} + \gamma_1 1\{\text{Legislative}\}_c$$
$$+ \gamma_2 1\{\text{Legislative}\}_c \times \Delta ln(GDP)_{P,c} + \varepsilon_{P,c}. \qquad (10)$$

$$\Delta Emp_{P,c}^{young} = \gamma_0 + \phi_1 1\{\text{Positive}\}\Delta ln(GDP)_{P,c} + \phi_2 1\{\text{Negative}\}\Delta ln(GDP)_{P,c}$$
$$+ \gamma_1 1\{\text{Legislative}\}_c + \gamma_3 1\{\text{Legislative}\}_c \times 1\{\text{Positive}\}\Delta ln(GDP)_{P,c}$$
$$+ \gamma_4 1\{\text{Legislative}\}_c \times 1\{\text{Negative}\}\Delta ln(GDP)_{P,c} + \varepsilon_{P,c}. \qquad (11)$$

Equation (10) provides evidence on whether young adult employment was, in general, more sensitive to GDP movements in countries with Legislative regimes than in countries with collective bargaining regimes. Equation (11) investigates asymmetries in the relationship between GDP movements and young adult employment. The key coefficient is γ_4, which will provide evidence on whether young adult employment was unusually responsive to GDP movements under Legislative regimes at times when GDP growth was negative.

For all estimates of equations (9), (10), and (11), the dependent variable and time-varying covariates are expressed in "per year" terms. In estimating standard errors on the coefficients from these equations, I allow for country-level correlation clusters in the error terms. I also estimate variants of equations (9), (10), and (11) that include period

fixed effects or both period and country fixed effects rather than a common intercept term.

5 Empirical Analysis of Young Adult Employment

This section presents my empirical analysis of the relationship between employment changes and variations in countries' labor market institutions. Sections 5.1 presents estimates of the relationship between young adult employment changes and macroeconomic conditions. Section 5.2 presents my estimates of the differential employment changes experienced by countries with legislatively driven minimum wage floors. Section 5.3 discusses additional robustness checks and pieces of analysis that are presented in the appendices. Section 5.4 presents an analysis of asymmetries in the relationship between wage setting institutions, economic conditions, and young adult employment.

5.1 Macroeconomic Conditions and Young Adult Employment

This section presents an initial investigation of the capacity for proxies for macroeconomic conditions to predict changes in young adult employment. The estimates, presented in table 4, reveal that macroeconomic conditions predictively explain just over half of the variation in changes in young adult employment. Column 1 shows that changes in real GDP per capita and prime age employment predict 56 percent of the variation in young adult employment across the countries in my primary analysis sample. Columns 2 and 3 show that, by themselves, each of these variables strongly predict changes in young adult employment. In isolation, changes in both GDP and prime age employment predictively explain 48 percent of the variation in changes in young adult employment (see columns 2 and 3). Column 4 shows that changes in financial wealth predict a more modest 21 percent of the variation in changes in young adult employ-

ment. Column 5 shows that a model including changes in GDP, prime age employment, and financial wealth has no more predictive power than the model that excludes changes in financial wealth.

5.2 Analysis of the Relationship between Wage Setting Institutions and Long-Run Changes in Young Adult Employment

This section presents estimates of equations (6) and (7). The estimates are reported in tables 5 and 6, as well as in figure 5. Column 1 of table 5 presents my estimate of equation (6). The binary indicator for whether a country has a legislatively driven wage floor predictively explains 19 percent of the variation in young adult employment changes over the time period under analysis. The point estimate reveals that, on average across the sample, young adult employment declined 5.5 percentage points less under national collective bargaining regimes than under legislatively driven regimes.

Columns 2 through 5, which present estimates of equation (7), provide evidence that the estimate from column 1 is not driven by variations in broader economic developments. That is, controlling for differences in countries' overall economic growth and/or changes in prime age employment has essentially no effect on the estimate. The inclusion of these controls does, however, substantially improve precision. These specifications' r-squared statistics provide further indication that the variations predicted by countries' labor market institutions are largely independent of the variations predicted by proxies for macroeconomic conditions. This can be seen by comparing r-squared statistics in table 4 with r-squared statistics in table 5.

The grouping of individuals aged 15 to 24 is rather coarse and opens the door to multiple questions. First, one might hypothesize that changes in the age composition of

the 15 to 24 year old population may influence some of the results presented in table 5.[13] Analysis of OECD's more granular employment data, which track employment across 5-year age bins, can speak to this hypothesis. Second, it is possible that increases in either the demand for or public subsidy of education caused some of the changes in young adult employment that occurred over this time period. Separate analysis of the 15 to 19 year old age bin and the 20 to 24 year old age bin can shed an initial bit of light onto this issue as well.[14] Third, separate analysis of the 15 to 19 and 20 to 24 year old groupings can provide insight into the relevance of youth minimum wage rates.[15]

Table 6 presents additional estimates of equations (6) and (7). Columns 1 and 2 replicate columns 1 and 6 from table 5. Columns 3 and 4 present equivalent specifications for which the dependent variable is the change in the employment rate among individuals ages 15 to 19. Columns 5 and 6 present equivalent specifications for which the dependent variable is the change in the employment rate among individuals ages 20 to 24. The estimates reveal that similar employment changes occurred among both the 15 to 19 and 20 to 24 year old subsets of the population aged 15 to 24. Importantly, this reveals that the relationship between labor market institutions and employment declines does not stem from substantial shifts in the composition of the underlying population across these finer age groupings.

Panels A and B of figure 5 present estimates of equations (6) and (7) for 5-year age bins that fully partition the population aged 15 to 64. The estimates for age bins be-

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[13]More specifically, if the young adult population has shifted towards relatively young ages to a greater degree in the countries with legislated minimum wage rates relative to countries with collective bargaining regimes, then the estimates would be biased towards negative values.

[14]The following subsection speaks to this issue more directly through analysis of educational attainment itself.

[15]As noted in the discussion of table 2, youth minimum wage rates tend to move in tandem with adult minimum wage rates (Kelly and McGuinness, 2017). Consequently, I did not undertake this analysis with a prior that individuals ages 15 to 19 would be either more or less exposed to employment reducing rigidities than individuals ages 20 to 24.

tween the ages of 25 and 60 are uniformly quite close to 0. When comparing countries with collective bargaining regimes to countries with legislated wage floors, differential employment declines were concentrated almost exclusively among those aged 15 to 19 and 20 to 24. The estimates reported in the figure thus provide evidence that differential employment declines across these groups of countries were not driven by forces that affected the labor market as a whole.

In tables 7 and 8 I investigate the relevance of variations in countries' labor market and social insurance institutions. The estimates in table 7 reveal that alternative proxies for variations in labor market institutions have little correlation with changes in young adult employment. They have essentially no impact on the estimated relationship between my proxy for wage setting institutions and young adult employment declines. The same is true of the relationship between social insurance replacement rates and young adult employment declines. The final column of table 8 incorporates the proxies for both labor market and social insurance institutions, and the estimated relationship between my proxy for wage setting institutions and young adult employment is, once again, unaffected. Variations in these institutional characteristics appear to have little relevance for understanding variations in the decline in young adult employment across high income countries over the course of the financial crisis.

5.3   Additional Robustness Checks and Analyses

Additional analyses of the robustness of the estimates in table 5 can be found in appendix tables A.3 and B.1. Table A.3 reports results in which I extend the analysis sample to include the full set of OECD countries. The results, which are further discussed in appendix A are little changed from those reported in table 5. Table B.1 presents results in which I control for the baseline levels of the dependent variable and/or the macroeconomic covariates in addition to controlling for their changes. Although these controls

are not directly motivated by the conceptual framework discussed in section 3, they may nonetheless speak to statistical concerns related to mean reversion. The estimate in column 2 reveals that controlling for baseline employment rates among young adults modestly increases the magnitude of the point estimate of primary interest. Estimates of the differential employment decline experienced by young adults in countries with legislated minimum wage rates range from 4.1 to 6.4 percentage points across specifications that control for various permutations of the baseline levels and changes of the macroeconomic covariates considered throughout the analysis presented above.

Appendices A.6, A.7, and A.8 present three additional sets of analyses. Appendix A.6 explores whether labor market institutions were associated with differential changes in educational attainment. The analysis suggests that little if any of the differential declines in young adult employment were associated with increases in educational attainment. Appendix A.7 presents an analysis of whether the standard errors reported in section 5.2 result in insufficiently conservative inference. The analysis shows that inference using the relatively conservative Wild Cluster Bootstrap and permutation test approaches yield p-values quite similar to those reported in the main text. Finally, section A.8 provides context regarding the plausibility of the magnitudes of the differential employment changes presented above.

5.4   Analysis of Asymmetries Over the Boom, Bust, and Recovery

I next present estimates of equation (8). As discussed in section 4, this specification investigates the relevance of interactions between wage setting institutions and changes in macroeconomic conditions. The estimates provide evidence on whether young adult employment declines were particularly large in countries that have legislatively driven minimum wage rates and that experienced particularly severe downturns during the global financial crisis. The estimates, which I present in table 9, consider interactions

involving four proxies for the severity of the economic downturn. The first three proxies are changes in prime age employment, changes in real GDP per capita, and changes in financial wealth per capita. The fourth proxy is an indicator for whether a country was among those commonly described as debt crisis countries.

The coefficients on all four of the interaction terms reveal that the employment declines associated with legislated wage floors were particularly large when countries experienced relatively large economic downturns. With the exception of the interaction involving financial wealth per capita, the coefficients on these interactions are statistically distinguishable from 0 at the 0.05 level.

Finally, table 10 presents an analysis of asymmetries in the relationship between wage setting institutions, economic conditions, and young adult employment. Column 1 presents an estimate of equation (9). The coefficient on $1\{\text{Legislative}\}_c$ indicates that there was a modest positive relationship between legislative wage setting and young adult employment during the 2003-2006 boom and 2012-2015 recovery. By contrast, the relationship between legislative wage setting and young adult employment was strongly negative during the 2006-2012 bust. The sum of the coefficients on $1\{\text{Legislative}\}_c$ and $1\{\text{Legislative}\}_c \times 1\{\text{Bust}\}_P$ indicates that, in each year of the bust, employment among young adults declined nearly a full percentage point more under legislated minimum wage regimes than under collective bargaining regimes.

Columns 2 and 3 of table 10 present estimates of equation (10). The estimates reveal, first, that young adult employment moves strongly with overall economic conditions. Second, they reveal that young adult employment exhibited modestly greater sensitivity to economic conditions in countries with legislated minimum wage rates across the boom, bust, and recovery. Averaged across the boom, bust, and recovery, this differential is statistically indistinguishable from 0.

Columns 4 and 5 present estimates of (11), in which the sensitivity of young adult

employment to wage setting institutions and economic conditions is allowed to differ when comparing periods of growth to periods of decline. The estimates in row 1 indicate that young adult employment was remarkably sensitive to economic conditions in countries with legislated minimum wage rates in periods during which real GDP per capita contracted. The point estimate suggests that each percentage point decline in annual growth predicted an additional 2 percentage point decline in young adult employment. The magnitude of this estimate is quite large in comparison with periods of growth in this same set of countries as well as in periods of either growth or contraction in countries with collective bargaining institutions.

Tables B.2 and B.3 present complementary estimates of regressions that augment equations (9), (10), and (11) through the addition of either time period fixed effects or both country and time period fixed effects. The inclusion of period fixed effects has little impact on either the point estimates or the precision of the estimates. Since the dependent variable is, in all cases, a change in young adult employment, the inclusion of country fixed effects amounts to controlling for trends in country-specific changes that span the boom, bust, and recovery. Because these trends strip away much of the long-run employment variation of interest, the inclusion of country fixed effects significantly reduces the precision with which the coefficients of interest are estimated. The point estimates are nonetheless quite stable across these specifications.

6 Concluding Discussion

This paper presents and analyzes a set of facts relating labor market institutions and the evolution of employment during the global financial crisis. Over the decade surrounding the crisis, employment changes varied significantly across countries. While employment changes were strongly correlated with changes in macroeconomic condi-

tions, there was substantial variation among countries that experienced similar changes in real GDP and financial wealth per capita. I show that these residual variations were strongly correlated with differences in countries' labor market institutions. Young adult employment declined far more in countries with legislatively driven wage floors than in countries in which wage floors are set through collective bargaining arrangements.

The analysis highlights an important point regarding the labor market's response to changes in macroeconomic conditions. Specifically, the labor market's response to macroeconomic conditions is mediated by its institutional environment. During the global financial crisis, I show that legislated wage floors were held constant in real terms and, consequently, did not accommodate declines in demand. The resulting wage rigidity was associated with substantial declines in young adult employment.

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Figures and Tables

Evolution of Employment: Countries Separated by Labor Market Institutions

Panel A

Panel B
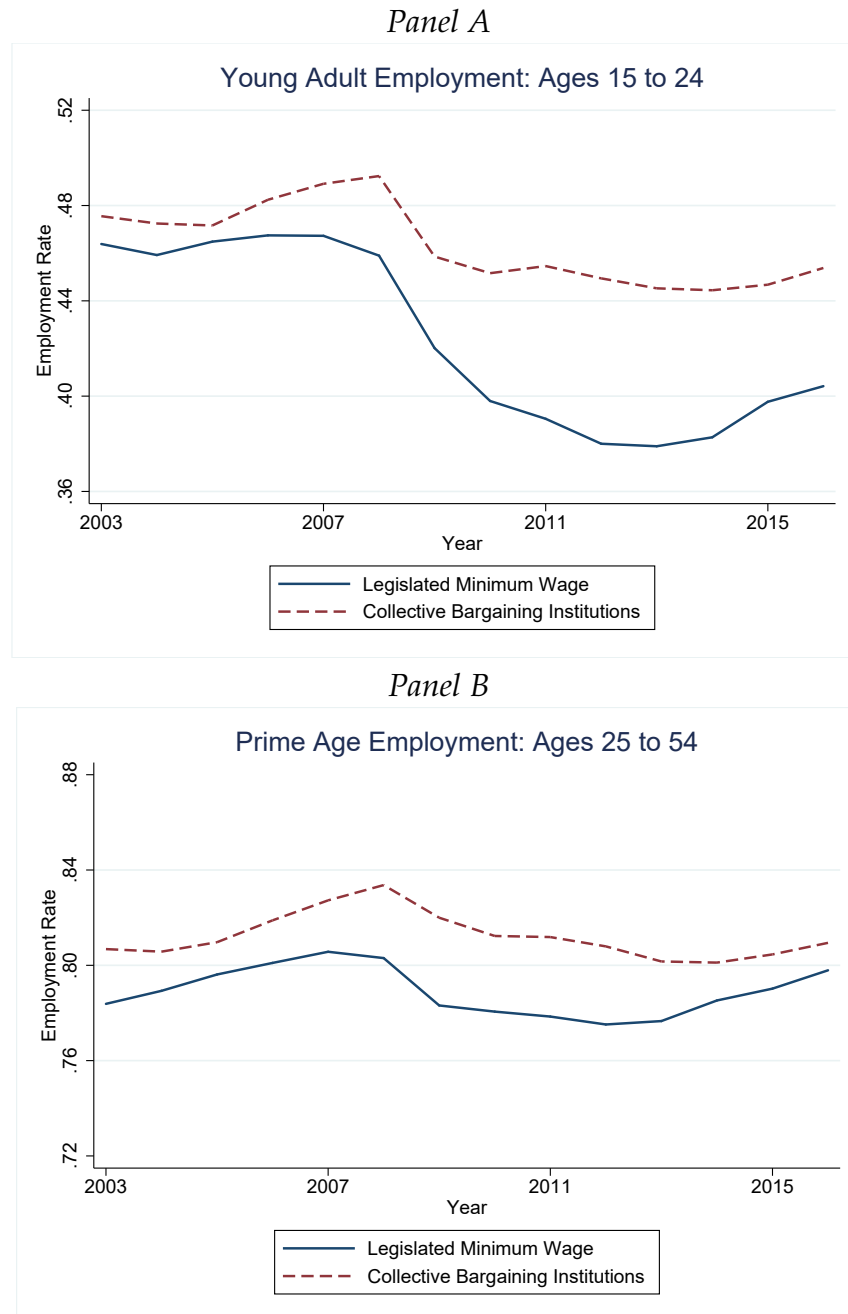
Figure 1: **Evolution of Employment (Countries Separated by Labor Market Institutions):** Employment data come from OECD (2016c). The sample of countries is listed in table 1. Countries are divided according to whether they have legislatively driven minimum wage rates or collective bargaining institutions, again as described in table 1.

Evolution of the Average Real Hourly Minimum Wage

Panel A

Evolution of the Real Hourly Minimum Wage in Countries with Statutory Minimum Wage Rates

Panel B

Evolution of the Real Hourly Minimum Wage in Countries with Collective Bargaining Institutions
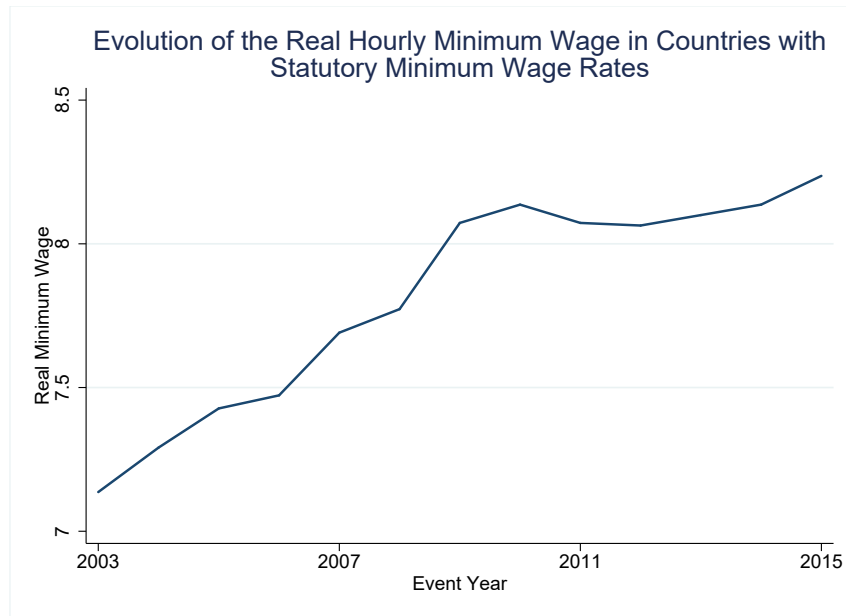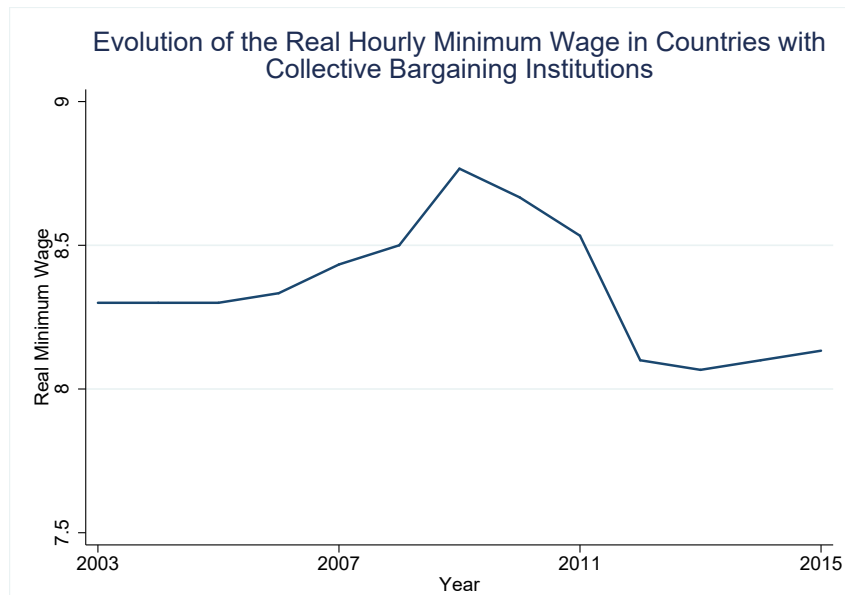
Figure 2: **Evolution of the Average Real Hourly Minimum Wage:** The figure presents data from OECD (2016b) on the average real hourly minimum wage across countries. Panel A presents minimum wage rates for countries with legislatively driven minimum wage regimes. Panel B presents data for Belgium, Greece, and the Netherlands. These are the three countries with collective bargaining institutions for which the OECD database reports an hourly minimum wage rate.

Evolution of Employment and GDP: Countries Separated by Labor Market Institutions

Panel A

Panel B
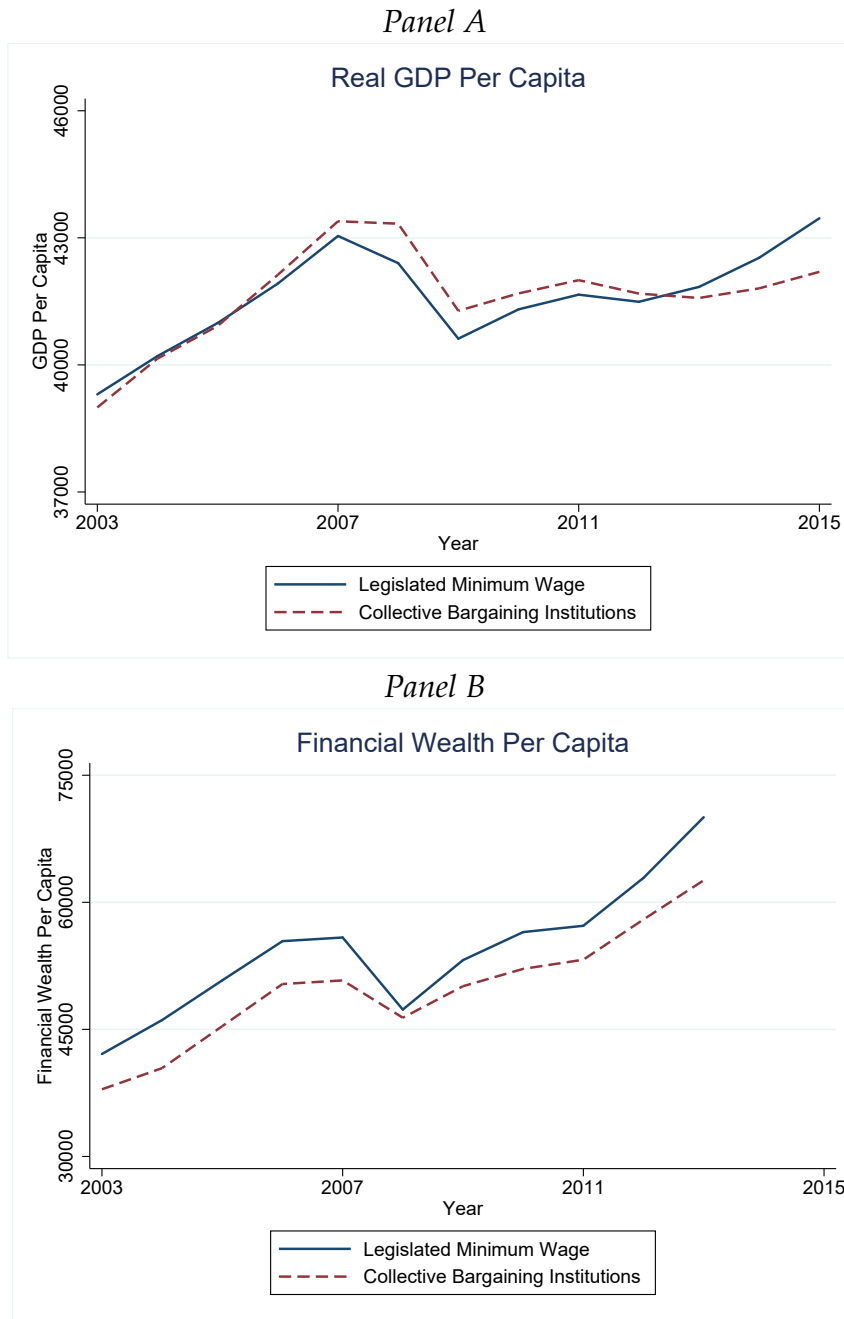
Figure 3: **Evolution GDP and Financial Wealth (Countries Separated by Labor Market Institutions):** GDP data come from OECD (2016d). Wealth data come from OECD (2015b). The sample of countries is listed in table 1. Countries are divided according to whether they have legislatively driven minimum wage rates or collective bargaining institutions, again as described in table 1.

Young Adult Employment and Broader Measures of Economic Activity
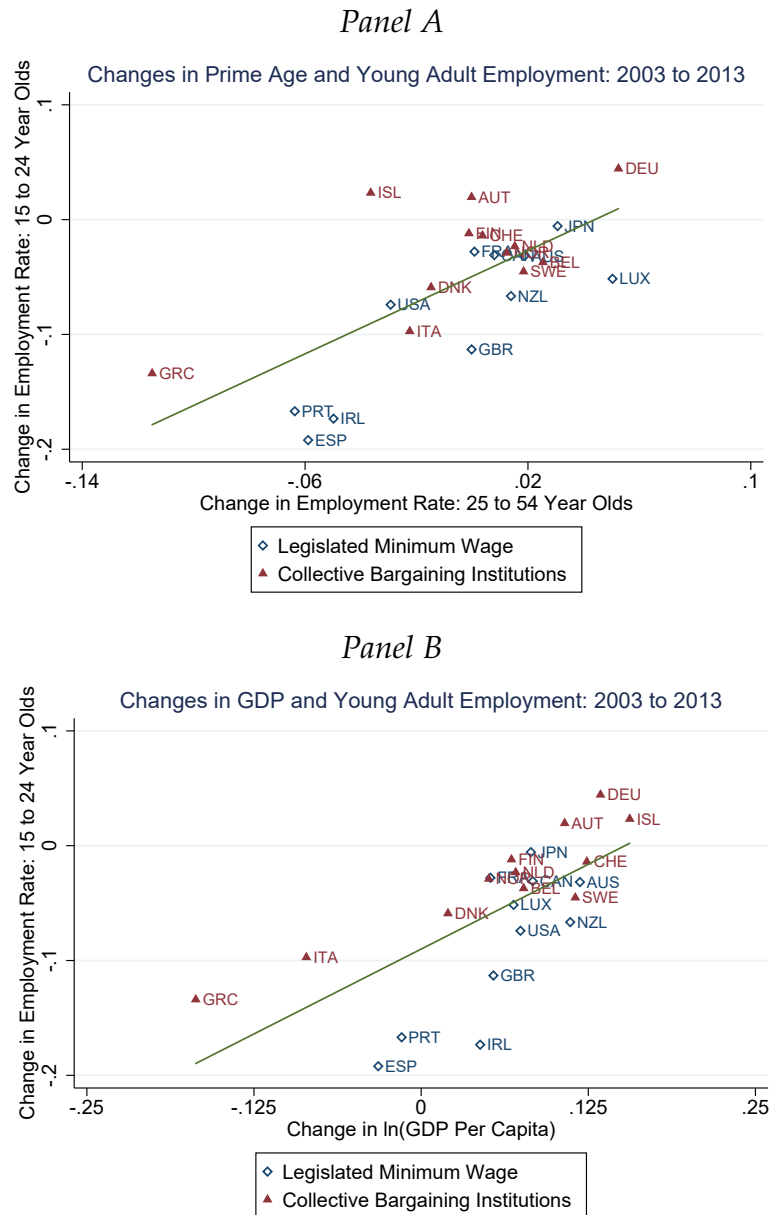
Panel A

Panel B

Figure 4: **Young Adult Employment and Broader Measures of Economic Activity** Employment and GDP data come from OECD (2016c) and OECD (2016d). The sample of countries is listed in table 1. The best fit line in each panel is estimated on the samples displayed using Ordinary Least Squares.

Estimates of Differential Employment Changes across Age Bins

Panel A

Differential Employment Changes by Age Group: No Controls

Panel B

Differential Employment Changes by Age Group: w/ Controls
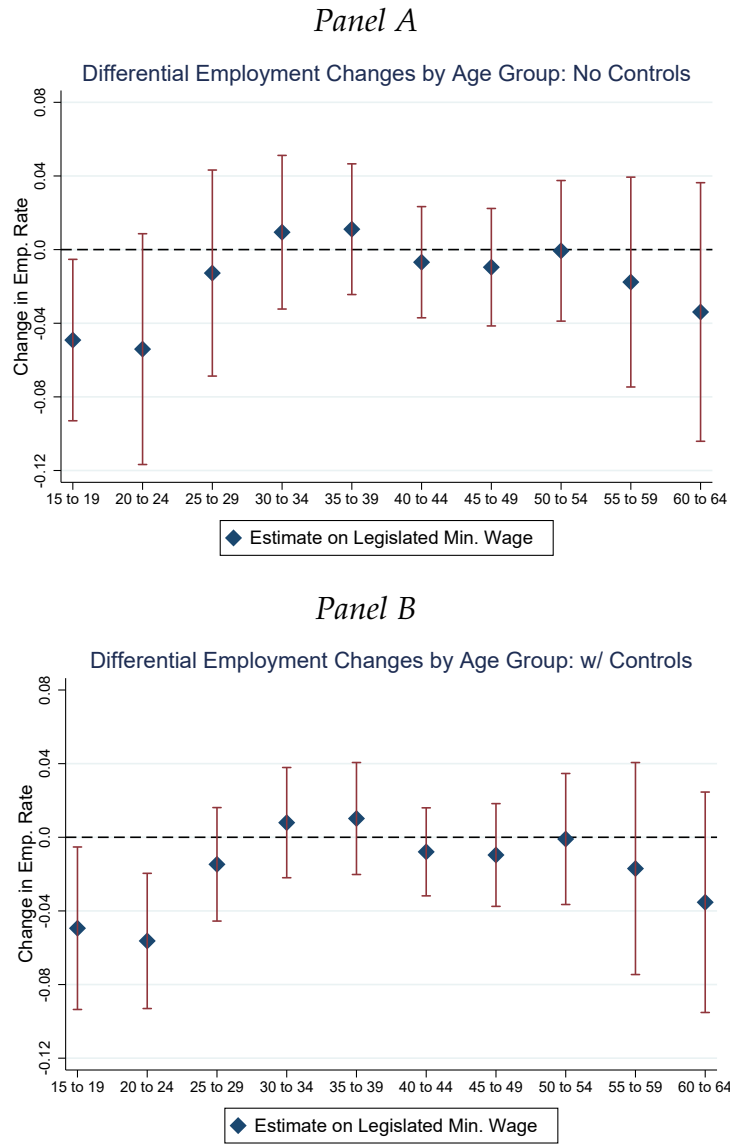
Figure 5: **Estimates of Differential Employment Changes across Age Bins:** In panel A, each dot is an estimate of a regression of the same form as that presented in column 1 of table 5. Panel B presents the results of regressions that additionally include changes in the log of real GDP per capita and changes in per capita financial wealth. In both panels, the estimates describe employment changes in countries with statutory minimum wage regimes relative to employment changes in countries with collective bargaining regimes. Each dot corresponds with an estimate involving employment rates for individuals in a different 5-year age bin. The age group associated with each estimate is indicated in the figure's x-axis labels.

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Table 1: **Descriptions of Policy Variables**

Country Name	(1) Collective Bargaining	(2) Debt Crisis	(3) Net Real Min. Wage Increase
Austria	1	0	n/a
Switzerland	1	0	n/a
Sweden	1	0	n/a
Iceland	1	0	n/a
Germany	1	0	n/a
Italy	1	1	n/a
Finland	1	0	n/a
Norway	1	0	n/a
Denmark	1	0	n/a
Belgium	1	0	0.02
Greece	IMF	1	-0.14
Netherlands	1	0	-0.02
Australia	0	0	0.06
Luxembourg	0	0	0.07
United Kingdom	0	0	0.11
Spain	0	1	0.11
United States	0	0	0.11
Japan	0	0	0.12
Portugal	0	1	0.13
France	0	0	0.14
Ireland	0	1	0.15
Canada	0	0	0.21
New Zealand	0	0	0.23

Note: The sample of countries consists of those with 2003 GDP per capita, as reported by OECD (2016d) exceeding $25,000. With the exception of Turkey, these countries coincide 1 for 1 with the list of countries whose OECD membership pre-dates 1990. The sample can thus be described as consisting of high income, long industrialized countries. Appendix A discusses a variety of issues that arise in classifying more recently industrialized countries' labor market institutions and tracking their economic outcomes. The classification of debt crisis countries adopts the standard treatment of Portugal, Ireland, Italy, Greece, and Spain as meeting that description. Net increases in countries' real minimum wage rates between 2003 and 2013 were constructed using the Purchasing Power Parity adjusted hourly minimum wage rates reported by OECD (2016b). A baseline look at countries' wage setting institutions comes from Neumark and Wascher (2004), who draw in turn on summaries from Dolado et al (1996). Several countries' wage setting institutions have changed since that time, including the United Kingdom and Ireland. Germany introduced a statutory minimum wage regime in 2015, but is classified as having collective bargaining from 2003 through 2014.

Table 2: **Descriptions of Youth Minimum Wage Policy**

Country Name	(1) Has a Youth Minimum	(2) Age at Which Adult Minimum Binds	(3) Does Youth Wage Tend to Move with Adult Wage?
Australia	Yes	21	Yes
Canada	Limited	Varies	Varies
France	Limited	19	Yes
Ireland	Yes	18	Yes
Japan	No	n/a	Yes
Luxembourg	Yes	19	Yes
New Zealand	Yes	20	Yes
Portugal	Yes	18	Yes
Spain	No	n/a	Yes
United Kingdom	Yes	21	Yes
United States	Limited	Varies	Varies

Note: The table describes youth minimum wage policy among the analysis sample's countries that operate under legislated minimum wage regimes. Details on the age below which youth minimum wage rates may apply come from OECD (2015a). Details on the extent to which youth minimum wage rates tend to move with each countries' adult minimum wage rates come from Kelly and McGuinness (2017), Stancanelli, Keese, and Gittleman (1998), and a variety of additional sources.

Table 3: **Summary Statistics on Economic Conditions and Wage Setting Institutions**

	(1) Full Sample	(2) Collective Bargaining	(3) Legislated Minimum
2003 Emp. Rate: Ages 15 to 24	0.470	0.476	0.464
	(0.137)	(0.154)	(0.122)
Emp. Change '03 to '13: Ages 15 to 24	-0.0564	-0.0303	-0.0849
	(0.0635)	(0.0504)	(0.0661)
2003 Emp. Rate: Ages 25 to 54	0.796	0.807	0.784
	(0.0433)	(0.0527)	(0.0277)
Emp. Change '03 to '13: Ages 25 to 54	-0.00617	-0.00519	-0.00723
	(0.0390)	(0.0416)	(0.0379)
2003 Emp. Rate: Ages 55 to 64	0.506	0.507	0.504
	(0.148)	(0.182)	(0.107)
Emp. Change '03 to '13: Ages 55 to 64	0.0655	0.0790	0.0507
	(0.0718)	(0.0879)	(0.0489)
2003 Financial Wealth Per Capita	39924.2	37929.0	42100.7
	(21364.3)	(20909.5)	(22654.7)
Change in ln(Financial Wealth Per Capita)	0.503	0.492	0.514
	(0.232)	(0.287)	(0.165)
2003 Real GDP Per Capita	40953.2	40920.7	40988.7
	(11305.2)	(7287.4)	(14925.0)
Change in Real GDP Per Capita '03 to '13	0.0570	0.0556	0.0584
	(0.0743)	(0.0951)	(0.0467)
Debt Crisis Countries	0.217	0.167	0.273
	(0.422)	(0.389)	(0.467)
Collective Bargaining Arrangements	0.522	1	0
	(0.511)	(0)	(0)
Legislated Wage Floor	0.478	0	1
	(0.511)	(0)	(0)
Observations	23	12	11

Note: Data on employment by age group comes from OECD (2016c). Data on GDP per capita comes from OECD (2016d). Data on financial wealth per capita come from OECD (2015b). The classification of debt crisis countries adopts the standard treatment of Portugal, Ireland, Italy, Greece, and Spain as meeting that description. Table 1 presents the list of countries that are and are not categorized as having legislated minimum wage rates.

Table 4: **Predicting Changes in Young Adult Employment with Macroeconomic Covariates**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Real GDP Per Cap. Changes	0.346	0.591***			0.383
	(0.222)	(0.153)			(0.271)
Emp. Changes: Ages 25 to 54	0.654		1.124***		0.651
	(0.431)		(0.287)		(0.448)
Financial Wealth Change				0.127**	-0.016
				(0.038)	(0.062)
R-Squared	0.56	0.48	0.48	0.21	0.56
N	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD (2016c) and OECD (2016d). Data on financial wealth per capita come from OECD (2015b). Standard errors are robust to heteroskedasticity.

Table 5: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate	(6) Emp. Rate
Legislatively Driven Min. Wage	-0.055* (0.025)	-0.054** (0.015)	-0.056** (0.016)	-0.052** (0.016)	-0.058* (0.022)	-0.054** (0.015)
Real GDP Per Cap. Changes		0.375* (0.134)	0.598*** (0.092)			0.392* (0.163)
Emp. Changes: Ages 25 to 54		0.595* (0.271)		1.106*** (0.184)		0.594* (0.282)
Financial Wealth Change					0.133** (0.045)	-0.008 (0.041)
R-Squared	0.19	0.75	0.68	0.65	0.43	0.75
N	23	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors are robust to heteroskedasticity.

Table 6: Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions: Finer Age Groupings

	(1) Emp. 15-24	(2) Emp. 15-24	(3) Emp. 15-19	(4) Emp. 15-19	(5) Emp. 20-24	(6) Emp. 20-24
Legislatively Driven Min. Wage	-0.055*	-0.054**	-0.049*	-0.047*	-0.054+	-0.055**
	(0.025)	(0.015)	(0.021)	(0.020)	(0.030)	(0.017)
Real GDP Per Cap. Changes		0.392*		0.042		0.619**
		(0.163)		(0.204)		(0.182)
Emp. Changes: Ages 25 to 54		0.594*		0.639		0.439
		(0.282)		(0.383)		(0.360)
Financial Wealth Change		-0.008		-0.021		0.005
		(0.041)		(0.055)		(0.042)
R-Squared	0.19	0.75	0.21	0.43	0.13	0.77
N	23	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors are robust to heteroskedasticity.

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Table 7: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Legislatively Driven Min. Wage	-0.054**	-0.057**	-0.055**	-0.054**	-0.058**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Real GDP Per Cap. Changes	0.375*	0.343*	0.369*	0.403*	0.381*
	(0.134)	(0.145)	(0.155)	(0.143)	(0.149)
Emp. Changes: Ages 25 to 54	0.595*	0.612*	0.600+	0.590+	0.592+
	(0.271)	(0.274)	(0.291)	(0.283)	(0.297)
Employment Protections Index		-0.006			-0.011
		(0.007)			(0.008)
Labor Freedom Index			0.004		-0.025
			(0.033)		(0.042)
Business Freedom Index				-0.061	-0.076
				(0.067)	(0.080)
R-Squared	0.75	0.75	0.75	0.75	0.76
N	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. The "employment protection index" is taken from OECD (2016e). The "labor freedom index" and "business freedom index" are taken from Miller, Holmes, and Feulner (2013). Standard errors are robust to heteroskedasticity.

Table 8: Estimates of the Relationship between Young Adult Employment Declines, Labor Market Institutions, and Social Insurance Institutions

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate	(6) Emp. Rate
Legislatively Driven Min. Wage	-0.061** (0.017)	-0.057** (0.015)	-0.057** (0.016)	-0.054** (0.015)	-0.058** (0.018)	-0.057* (0.020)
Real GDP Per Cap. Changes	0.445** (0.137)	0.486** (0.128)	0.382* (0.140)	0.383** (0.130)	0.486** (0.125)	0.497* (0.169)
Emp. Changes: Ages 25 to 54	0.581* (0.237)	0.630* (0.250)	0.605* (0.282)	0.590* (0.276)	0.576* (0.246)	0.574+ (0.268)
Baseline Replacement Rate w/o Cash	-0.059 (0.037)				-0.054 (0.057)	-0.058 (0.097)
Baseline Replacement Rate w/ Cash		-0.074+ (0.038)			-0.037 (0.056)	-0.037 (0.072)
Change in Replacement Rate w/o Cash			0.028 (0.053)		-0.058 (0.073)	-0.060 (0.099)
Change in Replacement Rate w/ Cash				0.117 (0.110)	0.085 (0.141)	0.098 (0.227)
Employment Protections Index						0.003 (0.019)
Labor Freedom Index						0.007 (0.075)
Business Freedom Index						0.003 (0.164)
R-Squared	0.77	0.78	0.75	0.76	0.79	0.79
N	23	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Baseline replacement rates are the 2003 values of the 5-year social insurance replacement rates (with and without access to cash welfare benefits, as reported by OECD (2016a). Changes in social insurance replacement rates are calculated using data from OECD (2016a) for 2003 and 2014. Standard errors are robust to heteroskedasticity.

Table 9: **Interactions between Labor Market Institutions and Changes in Economic Conditions**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Legislatively Driven Min. Wage	-0.054** (0.015)	-0.033* (0.014)	-0.085*** (0.015)	-0.124** (0.041)	-0.048** (0.013)
Debt Crisis w/ Legislative		-0.085** (0.023)			
Legislative X Real GDP Per Cap. Changes			0.520** (0.166)		
Legislative X Real Financial Wealth Changes				0.136+ (0.073)	
Legislative X Emp. Changes: Ages 25 to 54					1.031** (0.272)
Debt Crisis		0.005 (0.037)			
Real GDP Per Cap. Changes	0.392* (0.163)	0.442** (0.122)	0.358* (0.160)	0.471** (0.139)	0.495*** (0.101)
Real Financial Wealth Changes	-0.008 (0.041)	-0.006 (0.037)	-0.005 (0.040)	-0.049 (0.037)	-0.007 (0.031)
Emp. Changes: Ages 25 to 54	0.594* (0.282)	0.181 (0.193)	0.424 (0.273)	0.492+ (0.261)	0.009 (0.195)
R-Squared	0.75	0.86	0.80	0.79	0.84
N	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors are robust to heteroskedasticity.

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Table 10: **Interactions between Labor Market Institutions and Changes in Economic Conditions**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Legislative x Neg. GDP Per Cap. Changes				2.199*** (0.269)	1.849*** (0.295)
Legislative x Pos. GDP Per Cap. Changes				-0.035 (0.172)	-0.128 (0.169)
Legislative x Bust	-0.012* (0.006)				
Legislative x Real GDP Per Cap. Changes		0.335+ (0.183)	0.181 (0.154)		
Real GDP Per Cap. Changes		0.342*** (0.086)	0.144 (0.127)		
Neg. Real GDP Per Cap. Changes				0.397*** (0.055)	0.130 (0.131)
Pos. Real GDP Per Cap. Changes				0.318* (0.129)	0.222 (0.135)
Emp. Changes: Ages 25 to 54			0.774* (0.277)		0.578* (0.271)
Legislatively Driven Min. Wage	0.003 (0.003)	-0.006* (0.002)	-0.005* (0.002)	0.001 (0.002)	0.001 (0.002)
R-Squared	0.33	0.39	0.48	0.52	0.56
N	69	69	69	69	69
Estimator	Changes	Changes	Changes	Changes	Changes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. The table presents estimates of equation (9) in columns 1 and 2, of equation (10) in columns 3 and 4, and of equation (11) in columns 5 and 6. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors allow for clusters at the country level.

A Online Appendix 1: Further Description of the Data and Analysis on an Expanded Sample

This section provides further discussion of the data used in this paper's empirical analysis. It begins with a brief elaboration on the main text's description of my primary data sources. Next, I provide further discussion of the key differences between the countries included in the primary analysis sample and the remainder of the countries in the OECD. Finally, I present analysis in which I incorporate the full set of OECD countries into the sample.

A.1 Further Description of Data Sources

All of this paper's data on economic conditions come from data sets maintained by the OECD. Data on employment by age group comes from OECD (2016c). The data describe employment rates across a standardized set of population groups, namely those aged 15 to 24, those aged 25 to 54, and those aged 55 to 64. In line with convention, I describe these groups as young adults, prime aged adults, and the near elderly, respectively. The data also include more employment rates across more finely grained 5-year bins across the entirety of the working age population.

Macroeconomic covariates relevant to countries' experiences over the financial crisis include variables describing overall economic output and financial wealth. Data on GDP per capita comes from OECD (2016d). Data on financial wealth per capita come from OECD (2015b). Both of these variables are expressed, as taken directly from OECD, in real purchasing power parity adjusted dollars.

As discussed in the main text, my baseline analysis sample consists of the 23 longest industrialized, highest income OECD members. The OECD consists of these 23 countries plus an additional 12 countries described in appendix table A.2. As the table reveals, the

countries in the primary analysis sample include the full set of OECD countries that had real per capita incomes in excess of $25,000 in 2003. With the exception of Turkey, these countries are also those with the longest tenure as OECD member states. Their labor market institutions have been relatively widely documented and studied, and their data has been reported with consistency over the period under analysis.

A.2 Concerns Regarding Data Quality Outside of the Primary Analysis Sample

Because they have been OECD member states for many years, the countries in my primary analysis sample are countries for which the relevant economic data have long been consistently collected. For the employment outcomes of interest, no imputations were required for countries in the primary analysis sample.[16] The OECD's GDP data are complete for all of the countries in the primary analysis sample over the full time period under analysis. Wealth data are available for all countries in the primary analysis but New Zealand. In the employment and GDP data, the experiences of Australia and New Zealand are highly comparable. I thus impute the evolution of New Zealand's financial wealth to be the same as Australia's. Among countries outside of the primary analysis sample, the OECD's wealth data are less complete. Baseline wealth data for Chile, Korea, Mexico, and Turkey must be imputed.

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[16]Note that this is not true of all versions of the age-based employment database available through OECD. In some versions of the database, employment data for Germany must be imputed for 2003 and 2004. The same is true of baseline employment data for Chile, Mexico, and Turkey. Some versions of the OECD's employment database also suggest that the employment series for Israel suffer from a significant break in variable construction. In that version, the employment rate rises from 26 to 43 percentage points among 15 to 24 years olds between 2011 and 2012. There is a similar break in Israel's prime aged employment series. This break is not present in the OECD database currently under analysis.

A.3 Concerns for Characterizing the Labor Market Institutions of Countries Outside of the Primary Analysis Sample

A more widespread difficulty with analysis of countries outside of the primary sample involves characterizing their labor market institutions. The histories of recently industrialized countries' labor market institutions are less comprehensively documented than the histories of the long-industrialized countries' institutions. None of these countries' institutions, for example, are described by Neumark and Wascher (2004) or Dolado et al (1996). Their design also appears, in many cases, to be intermediate between the more traditional "collective bargaining" and "statutory wage floor" arrangements. As described by Fric (2016), their wage setting institutions regularly mandate collaboration between government, labor leaders, and business leaders.

Regarding Estonia, Fric (2016) writes that "Since 2002, the minimum wage in Estonia has been negotiated between the Estonian Trade Union Confederation (EAKL) and the Estonian Employers Confederation (ETTK)." Brixiova and Égert (2012) similarly describe the Estonian minimum wage as being "determined annually by agreement between trade unions and representatives of employers." I thus code Estonia as having a collective bargaining regime.[17]

Slovenia, Hungary, and South Korea have regimes that are more politically driven. Union coverage is almost universal, making the relevance of the minimum wage *per se* difficult to evaluate (Banerjee, Vodopivec, and Sila, 2013). Fric (2016) describes Hungary as a country in which "according to the Labour Code, the Government sets the minimum wage after consultation with the National Economic and Social Council (NGTT)." The Korean system involves wage councils operating in consultation with the Ministry of Employment and Labor (Bureau of Labor Statistics, 2011). Members of the Council

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[17]Brixiova and Égert (2012) point out that, though Estonia's collectively bargained wage floor grew substantially over the period under analysis, it remains low by international standards.

represent workers, employers, and the public interest and are nominated by the executive branch. In Slovenia, minimum wage setting shifted from a more strictly statutory system to a system involving greater consultation of worker and employer stakeholders during the mid-2000s.

For the primary analysis sample, comparable data on countries' effective minimum wage rates come from OECD (2016b). This database contains minimum wage rates for all of the countries traditionally described as having statutory minimum wage regimes as well as several of the countries described as having collective bargaining regimes. The reliability of the database for countries outside of the primary analysis sample is less clear. Although Latvian wage setting institutions are described in terms very similar to those of Estonia and Hungary, for example, the OECD minimum wage database contains no information on Latvian minimum wage rates.[18]

A final complication involves enforcement. Goraus and Lewandowski (2016) find that minimum wage enforcement is quite porous in several of the Central European economies. Among the countries in my extended analysis samples, this includes Slovenia, Poland, Hungary, and Latvia. Violation rates in the Czech Republic and Estonia appear more modest. Further, violation rates rose in Poland, Latvia, and Slovenia over Goraus and Lewandowski's (2016) analysis period, which corresponds almost perfectly with mine. Goraus and Lewandowski (2016) find that increases in the minimum wage's bite, as measured using the Kaitz Index, quite strongly predict variations in the extent of violations.

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[18]Tāre (2010), for example, describes Latvian labor law as calling for government to determine minimum wages following consultation with employers and trade unions.

A.4 Key Differences in the Economic Experiences of Countries within and outside of the Primary Analysis Sample

The economic trajectories of the higher and lower income OECD countries underlie an interesting difference in the pressures faced by their wage setting institutions. As shown in table A.2, the lower income, more recently industrialized countries experienced quite strong economic growth over the period under analysis. From 2003 to 2013, cumulative growth in real GDP per capita averaged roughly 6 percentage points among the countries in the primary analysis sample. Among the more recently industrialized countries, cumulative growth averaged roughly 28 percentage points. As can be seen from perusing the list of countries, the latter group appears to be in the process of convergence towards the outcomes of the relatively long-industrialized countries (Barro and Sala-i Martin, 1992). Many of the more recently industrialized countries began this process only after the fall of the Soviet Union (Matkowski and Prochniak, 2007).

A.5 Empirical Analysis of Expanded Sets of OECD Countries

Table A.3 presents estimates of equation (7) in which the sample is expanded to include the full set of 35 OECD countries. The analysis shows that the differential young adult employment decline in countries with and without politically driven minimum wage regimes is affected modestly by expanding the sample to include countries outside of the long-industrialized, high income countries. When no effort is made to account for variations in economic conditions, the differential young adult employment decline is 3 percentage points and is not statistically distinguishable from 0. When either variations in per capita GDP or variations in prime aged employment are included as controls, the point estimate rises to an average of 5 percentage points and is strongly statistically distinguishable from 0. Across the full set of OECD countries, it is thus quite clear that

young adult employment declined relatively more in countries with legislated minimum wage rates than one would have predicted on the basis of their GDP growth and changes in prime aged employment.

A.6 Were Labor Market Institutions Associated with Changes in Educational Attainment?

I next explore whether young adults in countries with legislated minimum wage rates increased their accumulation of schooling as their employment rates declined. The education measures come from the Barro-Lee education data set (Barro and Lee, 2013) and the UIS Data Centre (UNESCO, 2018). These data sets have different strengths and weaknesses for the purpose at hand.

The Barro-Lee data set reports cross-country data on the total years of schooling obtained by population groups defined by the same 5-year age bands analyzed above in table 6. A drawback of these data is that the series extend only through 2010 and are reported in five year intervals. Consequently, they do not capture the last years in my primary analysis window. Because the Barro-Lee variables represent stocks of educational attainment, they will move slowly with changes in enrollment.

The UIS data set reports cross-country enrollment rates at levels of schooling including "lower secondary," "upper secondary," and "tertiary." Upper secondary and tertiary are the levels of schooling that would be standard for the vast majority of the population aged 15 to 24. Because of differences in educational systems across countries, the UIS data for a given level of schooling may correspond with different age groups in different countries. In each country, the gross enrollment series captures the number of individuals enrolled in a given level of education divided by the number of individuals in

the relevant age range.[19] As described in the data's documentation, "upper secondary" marks the initial years of education that are not compulsory, and typically begins at 15 or 16 years of age. "Lower secondary" thus involves levels of education that are below the levels typically attended by the 15 to 24 year olds on which my analysis is focused.

A benefit of the UIS data is that they exist for each of the years covered by the employment series I analyze. A drawback of the UIS data is that they exist for fewer countries. "Upper secondary" enrollment rates are reported for 19 of the 23 countries in my primary analysis sample. Even with two imputations of base year data, only 16 of the 23 countries have data on tertiary enrollment rates.

Tables A.4, A.5, and A.6 present estimates of the relationship between labor market institutions and changes in educational attainment. Using the Barro-Lee data, I present estimates of changes in years of schooling from 2005 to 2010 in table A.4 and from 2000 to 2010 in table A.5. For both 15 to 19 year olds and 20 to 24 year olds, the estimates are quite close to 0 and more often negative than positive. The results thus suggest little linkage between labor market institutions and changes in educational attainment over this time period.

Using the UIS data, I present estimates of changes in enrollment rates from 2003 to 2013 in table A.6. While there is no evidence of differential changes in either "upper secondary" or "tertiary" enrollments, statutory minimum wage regimes were associated with a substantial increase (7 percentage points) in "lower secondary" enrollments. This is somewhat puzzling in that lower secondary education typically ends by age 14 or 15, which is below the ages at which individuals can be employed. The gross enrollment rate may, however, be affected by the return of individuals who had, for one reason or another, initially failed to complete these grade levels on time. Across the Barro-Lee and

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[19]Lee and Lee (2016) note that this often yields "gross enrollment" rates in excess of 100 percent, because individuals may either be counted twice in the numerator and once in the denominator or may appear in the numerator despite not appearing in the denominator.

UIS estimates, there is very modest evidence that educational attainment rose as young adult employment declined in countries with legislated minimum wage rates.

A.7 Discussion of Statistical Inference

Because the number of countries in my analysis sample is modest, I investigate whether my statistical inferences are appropriately conservative. My baseline approach to inference is motivated by simulations reported by Bertrand, Duflo, and Mullainathan (2004). For standard difference-in-differences settings, Bertrand et al (2004) find that simple aggregation of "pre" and "post" policy change periods generates consistent standard error estimates. Importantly for present purposes, their result extends to "small sample" settings including simulations on samples with 20 geographic units.[20] In the regressions I estimate, the sample of 23 observations reflects the fact that I have collapsed the data into country-level changes. On this 23 observation data set, my baseline approach to inference utilizes heteroskedasticity robust standard errors. In this section I consider three alternatives approaches.

Tables A.7 and A.8 replicate table 5 with inference conducted using two bootstrap-based methods. In both tables, the values in parentheses beneath each point estimate are p-values rather than standard errors. Inference using the Pairs Cluster Bootstrap method yields essentially the same p-values as my baseline approach. Focusing on columns 1, 2, and 5 of table A.7, the p-values on the coefficients on $1\{\text{Legislative}\}_c$ are 0.019 (column 1), 0.000 (column 2), and 0.002 (column 5).

Cameron, Gelbach, and Miller (2008) show that the Pairs Cluster Bootstrap approach can be insufficiently conservative when the number of clusters is less than 30.[21] They

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[20]See, for example, row 6 of Table VI in Bertrand, Duflo, and Mullainathan (2004).

[21]As reported in the rows for estimator 5 in Table 3, simulations using Pairs Cluster Bootstrap standard errors reject the null with 95 percent confidence just over 7 percent of the time when there are 25 clusters (Cameron, Gelbach, and Miller, 2008). Inference is thus modestly less conservative than it ought to be.

recommend the Wild Cluster Bootstrap method. Table A.8 reports p-values constructed using this approach. The p-values on the coefficients on $1\{\text{Legislative}\}_c$ are 0.034 (column 1), 0.002 (column 2), and 0.004 (column 5).

My final alternative approach to inference is commonly described as a permutation test (Imbens and Rosenbaum, 2005; Abadie, Diamond, and Hainmueller, 2012). The procedure involves estimating "placebo treatment effects" on samples across which treatment status has been assigned at random. I construct a distribution of such estimates by estimating placebo treatment effects on 1000 independently drawn assignments of "treatment" status across countries. The permutation test uses the position of the true estimate within the resulting distribution of placebo treatment effects for purposes of statistical inference. Loosely speaking, the fraction of placebo treatment effects with values below the true estimate can be interpreted as the p-value on a one-sided significance test. If the distribution is symmetric, twice this value can be interpreted as the p-value on a two-sided significance test.

Figure A.2 shows that inference using the permutation test approach yields p-values marginally larger than those generated using the Wild Cluster Bootstrap method. The p-value for the two-sided test involving the simple bivariate regression of young adult employment changes on the indicator for legislatively driven minimum wage rates is 0.05. The p-value on the specification that controls for changes in prime aged employment and GDP per capita is 0.004. Finally, the p-value on the specification that controls for changes in prime aged employment, GDP per capita, and financial wealth per capita is 0.006.

A.8 Gauging Plausible Magnitudes in the U.S. Context

An as yet unanswered question is whether it is plausible for a 5 percentage point decline in young adult employment to be attributed to wage setting institutions. To

provide evidence on plausibility, I present wage distributions across the U.S. population ages 16 to 24 during the years surrounding the financial crisis.[22] The data are presented so as to illustrate where wage floors intersect the distribution of wage rates agreed upon between firms and workers. The figure emphasizes two aspects of employment and wages. First, it presents distributions such that the group's employment rate corresponds with the x-axis value at the right end of each distribution. In panel A, for example, the employment rate across individuals ages 16 to 24 was roughly 55 percent in 2006 and 45 percent in 2010. Second, the figure presents distributions such that the x-axis distance covered by the data points between any two y-axis wage values describes the fraction of young adults that worked at wage rates within that range. In 2006, for example, 20 percent of young adults were employed at wage rates of roughly $12 or greater (in 2015 dollars).

The distributions reveal that interactions between wage floors and declines in labor demand would have been capable of generating substantial declines in young adult employment over this time period. Panel A presents the years immediately surrounding the crisis. A unique but helpful feature of the U.S. experience is that its wage floor rose during the crisis itself.[23] This provides an opportunity to observe the pre-crisis (2006) density of the wage distribution between the pre- and post-crisis levels of the wage floor. In 2006, roughly 12 percent of all individuals ages 16 to 24 were employed at wage rates between the 2006 and 2010 wage floors. Given the declines in labor demand that occurred over this time period, the new wage floor would thus have been binding on a large fraction of this skill group's wage distribution.

Panel B provides a longer-run look at the difference between the wage distributions

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[22]Note that the sample is restricted to individuals in states that maintain wage floors equal or very close to equal to the federal floor, such that a common wage floor applies across all individuals in the sample associated with each year.

[23]In most of the countries in this paper's analysis, legislated wage floors rose during the boom and were held roughly constant during the bust, as presented in figure 2.

of 2003 and 2015. In 2003, nearly 7 percent of the young adult population was employed at wage rates between the 2003 and 2015 values of the wage floor (both displayed on the figure in 2015 dollars). This is modestly larger than the magnitude of the net decline in this age group's employment rate over this time period.

Panel B reveals that the long-run change in young adult employment can plausibly be understood as reflecting movement, induced by the wage floor, along a stable distribution of transacted wage rates. That is, it plausibly reflects movement along a distribution that shifted negligibly, on net, from the years preceding the boom to the late stage of the post-crisis recovery.[24] To be clear, the figure does not demonstrate that movement along a stable wage distribution is the only force at work. Rather, the figure reveals that this interpretation is capable of rationalizing the data. In my comparisons of countries with statutory wage floors to those with collective bargaining regimes, the 5 percentage point differential I estimate is thus within the range of what the U.S. wage data reveal to be plausibly caused by variations in wage setting institutions.

Recent country-specific analyses by Clemens and Wither (2014), Kreiner, Reck, and Skov (2017), Yannelis (2014), and Saez, Schoefer, and Seim (2017) provide additional support for a role of wage setting institutions as a factor behind this period's employment changes. Clemens and Wither (2014) analyze the effects of minimum wage changes in the United States, where federal minimum wage increases were differentially binding across states. They find this period's minimum wage increases significantly reduced employment among low-skilled population groups, as identified using a combination of data on individual-level wage histories and demographics.[25] Kreiner, Reck, and Skov (2017) use administrative data extending from 2012 to 2015 to analyze the employment effects of an

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[24]Panel B's most striking feature may be the fact that the densities of the distributions are almost indistinguishable from one another at all wage values exceeding $8.

[25]While Zipperer (2016) contests this conclusion, additional evidence presented in Clemens (2017) and Clemens and Wither (2017) supports the original finding.

age-based discontinuity in Danish minimum wage rates. They find that the differential wage floors applicable to 18 and 17 year olds substantially reduce the employment of the former relative to the latter. Yannelis (2014) analyzes reductions in Greece's minimum wage rates that were implemented in 2012 in accordance with IMF bailout terms. He finds that the disproportionately large reduction in the minimum wage rates applicable to young workers relative to older workers led to substantial substitution across these skill groups. Finally, Saez, Schoefer, and Seim (2017) analyze Swedish payroll tax reductions implemented in the late 2000s. They find that these tax changes, which reduced the cost of young workers to firms, led to substantial increases in the employment of young workers relative to older workers.

Young Adult Employment and Broader Measures of Economic Activity

Panel A

Changes in GDP and Young Adult Employment: 2003 to 2013

Panel B

Changes in Prime Age and Young Adult Employment: 2003 to 2013
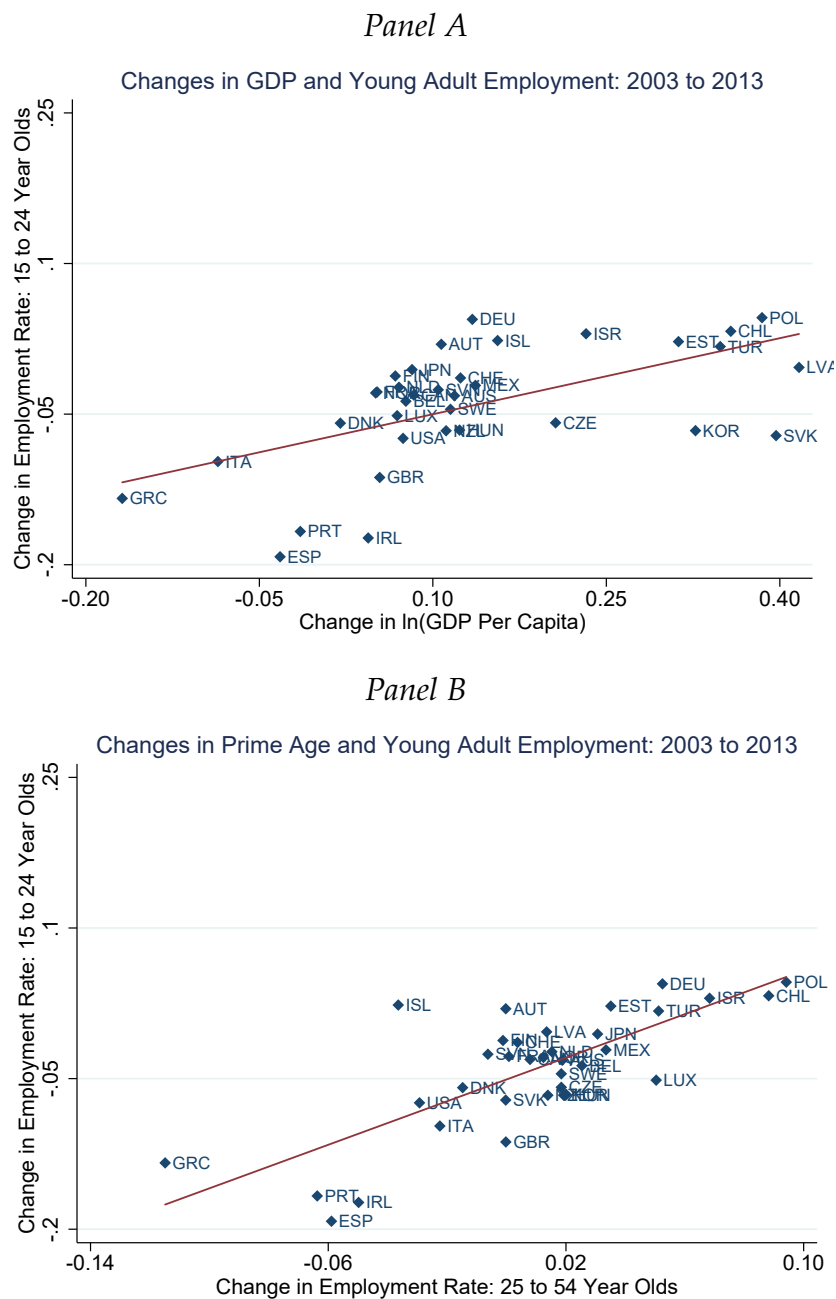
Figure A.1: **Young Adult Employment and Broader Measures of Economic Activity** Employment and GDP data come from OECD (2016c) and OECD (2016d). The sample of countries is listed in table A.2. The best fit line in each panel is estimated on the samples displayed using Ordinary Least Squares.

Comparison of Estimates with Distributions of Placebo Estimates
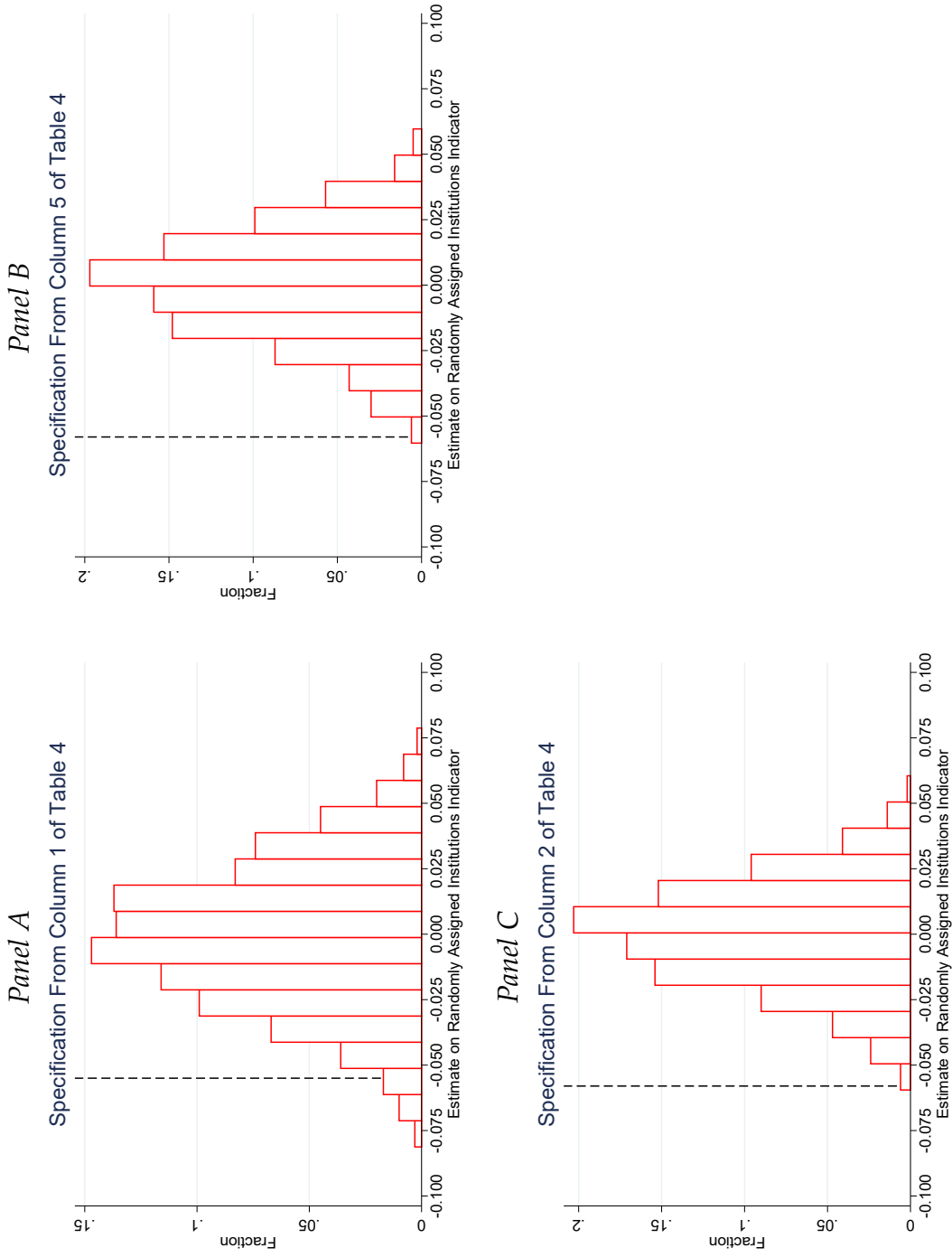
Figure A.2: **Comparison of Estimates with Distributions of Placebo Estimates:** Each panel compares a true point estimate from table 5 with a distribution of placebo estimates. The true estimates are indicated by vertical dashed lines. The specification from which the estimate is taken is described in the title of the figure in each panel. The placebo distribution is constructed by randomly assigning "placebo treatment status" across the countries in the analysis sample and estimating the associated placebo treatment effect. Each distribution consists of 1,000 placebo treatment effect estimates of this form.

Evolution of Young Adults' Individuals' Wage Distributions

Panel A

Employment and Wages (in 2015 Dollars)
Individuals Ages 16 to 24

Panel B

Employment and Wages (in 2015 Dollars)
Individuals Ages 16 to 24
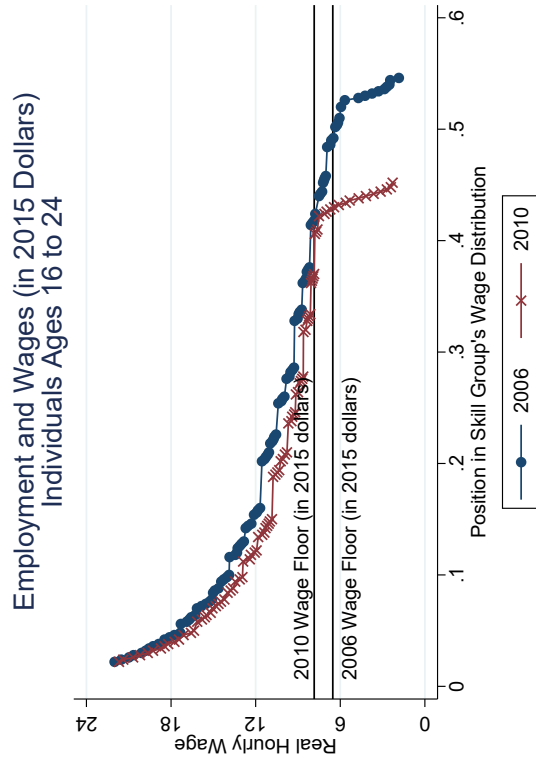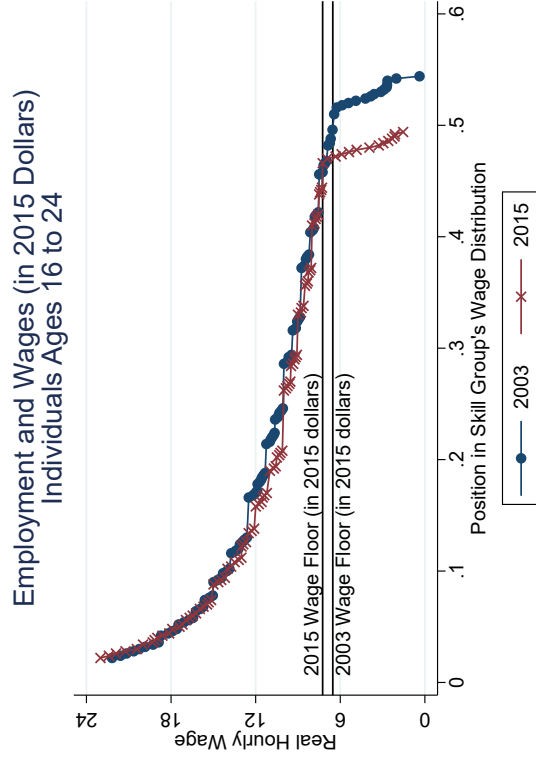
Figure A.3: Low-Skilled Individuals' Wage Distributions Surrounding the Financial Crisis
Note: The panels of the figure present wage distributions constructed using data from the NBER's CPS-MORG files for 2003, 2006, 2010, and 2015. The presented series describe the wage distributions of young adults ages 16 to 24. The samples consist of individuals residing in states that have historically maintained wage floors at or quite close to the federal floor so that the same wage floor applies across the sample. When available, individual-level wages are taken to be the reported values of the variable "earnhre" divided by 100. When "earnhre" is missing, individual-level wages are estimated as "earnwke/hours." Workers were sorted according to their wage rates, with unemployed individuals assigned wage rates of 0. The wage rates for each year were then divided into 500 quantiles with application of the CPS's population weights. The markers indicate all positive wage quantiles outside of the top 2 percentiles of each distribution.

Table A.1: **Summary Statistics on Supplemental Analysis Variables**

	(1) Full Sample	(2) Collective Bargaining	(3) Legislated Minimum
Tertiary Enrollment Change	11.02	10.72	11.52
	(13.55)	(15.67)	(10.41)
Upper Secondary Enrollment Change	6.903	6.756	7.156
	(10.53)	(11.73)	(8.965)
Lower Secondary Enrollment Change	1.464	-1.429	5.804
	(7.195)	(4.683)	(8.376)
Schooling Change '05 to '10: Ages 15 to 19	0.398	0.359	0.441
	(0.701)	(0.791)	(0.623)
Schooling Change '05 to '10: Ages 20 to 24	-0.149	0.182	-0.511
	(1.117)	(0.427)	(1.506)
Schooling Change '00 to '10: Ages 15 to 19	0.671	0.851	0.475
	(1.570)	(1.789)	(1.349)
Schooling Change '00 to '10: Ages 20 to 24	0.169	0.442	-0.129
	(1.479)	(1.249)	(1.706)
Labor Freedom Index (x100)	64.45	60.68	68.55
	(19.48)	(17.56)	(21.45)
Business Freedom Index (x100)	86.91	86.72	87.12
	(8.085)	(8.781)	(7.675)
Employment Protection Index	2.094	2.329	1.838
	(0.850)	(0.433)	(1.116)
2003 Replacement Rate (no Cash)	0.401	0.456	0.341
	(0.199)	(0.213)	(0.173)
Replacement Rate Change (no Cash)	-0.0513	-0.0892	-0.01000
	(0.108)	(0.133)	(0.0535)
2003 Replacement Rate (w/ Cash)	0.606	0.622	0.589
	(0.191)	(0.240)	(0.129)
Replacement Rate Change (w/ Cash)	-0.0361	-0.0358	-0.0364
	(0.0546)	(0.0588)	(0.0524)

Note: Data on social insurance replacement rates come from OECD (2016a). Data on employment protections come from (OECD, 2016e), while the indices of "labor freedom" and "business freedom" come from Miller, Holmes, and Feulner (2013). Data on educational attainment come from, (Barro and Lee, 2013) while data on enrollment rates come from (UNESCO, 2018). Table 1 presents the list of countries that are and are not categorized as having legislated minimum wage rates.

Table A.2: **Sample Selection Characteristics**

Country Name	(1) Sample	(2) 2003 GDP	(3) OECD Year	(4) ΔGDP	(5) ΔPrime Emp.	(6) ΔMin. Wage
Turkey	Expanded	12602	1961	0.35	0.05	0.38
Latvia	Expanded	13612	2016	0.42	0.01	n/a
Mexico	Expanded	13972	1994	0.14	0.03	0.00
Chile	Expanded	14287	2010	0.36	0.09	0.28
Poland	Expanded	15169	1996	0.38	0.09	0.41
Slovak Republic	Expanded	17390	2000	0.40	-0.00	0.53
Estonia	Expanded	17907	2010	0.31	0.04	0.41
Hungary	Expanded	19656	1996	0.12	0.02	0.20
Czech Republic	Expanded	22064	1995	0.21	0.02	0.03
Korea	Expanded	23585	1996	0.33	0.02	0.44
Slovenia	Expanded	23960	2010	0.10	-0.01	0.31
Israel	Expanded	24185	2010	0.23	0.07	0.04
Portugal	Primary	25749	1961	-0.01	-0.06	0.13
Greece	Primary	28369	1961	-0.17	-0.11	-0.14
New Zealand	Primary	29242	1973	0.11	0.01	0.23
Spain	Primary	31678	1961	-0.03	-0.06	0.11
Japan	Primary	32113	1964	0.08	0.03	0.12
France	Primary	34574	1961	0.05	0.00	0.14
Iceland	Primary	34792	1961	0.16	-0.04	n/a
United Kingdom	Primary	35080	1961	0.05	-0.00	0.11
Finland	Primary	35442	1969	0.07	-0.00	n/a
Italy	Primary	35506	1962	-0.09	-0.02	n/a
Belgium	Primary	36374	1961	0.08	0.03	0.02
Germany	Primary	36693	1961	0.13	0.05	n/a
Sweden	Primary	37672	1961	0.12	0.02	0.00
Canada	Primary	38247	1961	0.08	0.01	0.21
Austria	Primary	38580	1961	0.11	-0.00	n/a
Australia	Primary	38845	1971	0.12	0.02	0.06
Denmark	Primary	40866	1961	0.02	-0.01	n/a
Netherlands	Primary	41296	1961	0.07	0.02	-0.02
Ireland	Primary	42737	1961	0.04	-0.05	0.15
Switzerland	Primary	45983	1961	0.12	0.00	n/a
United States	Primary	46221	1961	0.07	-0.03	0.11
Norway	Primary	56386	1961	0.05	0.01	n/a
Luxembourg	Primary	77877	1961	0.07	0.05	0.07

Note: Data on employment by age group comes from OECD (2016c). Data on GDP per capita comes from OECD (2016d). Data on financial wealth per capita come from OECD (2015b). Both 2003 GDP and the change in GDP are expressed in real per capita terms. Changes in real minimum wage rates between 2003 and 2013 were constructed using the Purchasing Power Parity adjusted hourly minimum wage rates reported by OECD (2016b). The change in both GDP and employment, which is among prime age adults, are calculated from 2003 to 2013.

Table A.3: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions: Binary Indicator**

	(1)	(2)	(3)	(4)
	Emp. Rate	Emp. Rate	Emp. Rate	Emp. Rate
Legislatively Driven Min. Wage	-0.030	-0.046**	-0.045***	-0.047***
	(0.019)	(0.016)	(0.012)	(0.012)
Real GDP Per Cap. Changes		0.285***		0.087
		(0.071)		(0.055)
Emp. Changes: Ages 25 to 54			1.164***	0.973***
			(0.139)	(0.202)
R-Squared	0.06	0.47	0.70	0.72
N	35	35	35	35
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). For countries in the primary analysis sample, the coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Coding of labor market institutions for countries outside of the primary sample is based on descriptions from sources including Fric (2016) and on minimum wage data presented in OECD (2016b). There is cause for skepticism in describing these countries' institutions, as many of their institutions appear to be intermediate between the more traditional "legislated minimum wage" and "collective bargaining" regimes. Further, no minimum wage data were available for Latvia despite its designation as having a statutory minimum wage. Latvia is thus excluded from the sample. Standard errors are robust to heteroskedasticity.

Table A.4: **Estimates of the Relationship between Changes in Years of Schooling and Labor Market Institutions: 2005 to 2010**

	(1) Schooling 15-19	(2) Schooling 15-19	(3) Schooling 20-24	(4) Schooling 20-24
Legislatively Driven Min. Wage	0.082	0.070	-0.694	-0.696
	(0.296)	(0.284)	(0.470)	(0.453)
Real GDP Per Cap. Changes		7.034+		5.799*
		(3.397)		(2.230)
Emp. Changes: Ages 25 to 54		-8.793*		-9.647*
		(3.664)		(3.940)
Financial Wealth Change		-1.132		-1.529
		(0.770)		(1.294)
R-Squared	0.00	0.20	0.10	0.21
N	23	23	23	23
Changes	'05 to '10	'05 to '10	'05 to '10	'05 to '10

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Schooling data come from the Barro and Lee (2013) education data set. Standard errors are robust to heteroskedasticity.

Table A.5: **Estimates of the Relationship between Changes in Years of Schooling and Labor Market Institutions: 2000 to 2010**

	(1) Schooling 15-19	(2) Schooling 15-19	(3) Schooling 20-24	(4) Schooling 20-24
Legislatively Driven Min. Wage	-0.376 (0.658)	-0.375 (0.637)	-0.571 (0.628)	-0.535 (0.608)
Real GDP Per Cap. Changes		13.982+ (6.718)		10.614+ (6.038)
Emp. Changes: Ages 25 to 54		-6.331 (9.828)		-7.422 (10.935)
Financial Wealth Change		-2.388 (1.759)		-3.670* (1.632)
R-Squared	0.01	0.17	0.04	0.21
N	23	23	23	23
Changes	'00 to '10	'00 to '10	'00 to '10	'00 to '10

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Schooling data come from the Barro and Lee (2013) education data set. Standard errors are robust to heteroskedasticity.

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Table A.6: **Estimates of the Relationship School Enrollment Rates and Labor Market Institutions: 2003 to 2013**

	(1) Lower Sec.	(2) Lower Sec.	(3) Upper Sec.	(4) Upper Sec.	(5) Tertiary	(6) Tertiary
Legislatively Driven Min. Wage	7.234*	7.550*	0.400	0.371	0.801	-1.192
	(3.223)	(2.845)	(4.769)	(4.300)	(6.517)	(4.725)
Real GDP Per Cap. Changes		-7.420		-4.882		30.648
		(24.222)		(39.778)		(47.652)
Emp. Changes: Ages 25 to 54		24.638		-99.920*		-225.673*
		(36.133)		(46.370)		(72.906)
Financial Wealth Change		-13.997+		-5.857		-17.436
		(6.725)		(14.050)		(15.646)
R-Squared	0.26	0.47	0.00	0.25	0.00	0.55
N	20	20	19	19	16	16
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Data on enrollment rates come from UNESCO (2018). Standard errors are robust to heteroskedasticity.

Table A.7: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions: Binary Indicator (Cluster Bootstrap P-Values)**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate	(6) Emp. Rate
Legislatively Driven Min. Wage	-0.055*	-0.054***	-0.056***	-0.052**	-0.058**	-0.054**
	(0.020)	(0.000)	(0.001)	(0.001)	(0.007)	(0.002)
Real GDP Per Cap. Changes		0.375*	0.598***			0.392
		(0.042)	(0.000)			(0.103)
Emp. Changes: Ages 25 to 54		0.595+		1.106***		0.594+
		(0.068)		(0.000)		(0.087)
Financial Wealth Change					0.133**	-0.008
					(0.010)	(0.905)
R-Squared	0.19	0.75	0.68	0.65	0.43	0.75
N	23	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). Data on financial wealth per capita come from OECD (2015b). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors are calculated using the bootstrap method with 1000 repetitions.

Table A.8: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions: Binary Indicator (Wild Bootstrap P-Values)**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate	(6) Emp. Rate
Legislatively Driven Min. Wage	-0.055*	-0.054**	-0.056**	-0.052**	-0.058*	-0.054**
	(0.034)	(0.002)	(0.002)	(0.008)	(0.016)	(0.004)
Real GDP Per Cap. Changes		0.375*	0.598***			0.392*
		(0.004)	(0.000)			(0.032)
Emp. Changes: Ages 25 to 54		0.595		1.106***		0.594
		(0.08)		(0.000)		(0.096)
Financial Wealth Change					0.133*	-0.008
					(0.024)	(0.948)
R-Squared	0.19	0.75	0.68	0.65	0.43	0.75
N	23	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). Data on financial wealth per capita come from OECD (2015b). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors are calculated using the Wild bootstrap method with 1000 repetitions.

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B   Online Appendix 2: Additional Tables and Figures

Table B.1: **Estimates of the Relationship between Young Adult Employment Declines and Labor Market Institutions: Including Controls for Baseline Economic Indicators**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Legislatively Driven Min. Wage	-0.054** (0.015)	-0.057** (0.016)	-0.041* (0.015)	-0.061* (0.022)	-0.045* (0.020)
Real GDP Per Cap. Changes	0.375* (0.134)	0.677*** (0.134)			0.249 (0.263)
Emp. Changes: Ages 25 to 54	0.595* (0.271)		0.967*** (0.226)		0.804+ (0.443)
Financial Wealth Change				0.144* (0.054)	-0.021 (0.056)
2003 Emp.: Ages 15 to 24		-0.078 (0.065)	-0.011 (0.076)	-0.011 (0.073)	-0.040 (0.095)
2003 Emp.: Ages 25 to 54			0.503+ (0.267)		0.396 (0.375)
2003 Financial Wealth Per Capita				0.000 (0.000)	0.000 (0.000)
2003 GDP Per Capita		0.000 (0.000)			-0.000 (0.000)
R-Squared	0.75	0.70	0.75	0.48	0.77
N	23	23	23	23	23
Changes	'03 to '13	'03 to '13	'03 to '13	'03 to '13	'03 to '13

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). Data on financial wealth per capita come from OECD (2015b). The coding of minimum wage policy variables is based on data available in OECD (2016b), and is further described in the note to table 1. Standard errors are robust to heteroskedasticity.

Table B.2: **Interactions between Labor Market Institutions and Changes in Economic Conditions: With Time Fixed Effects**

	(1) Emp. Rate	(2) Emp. Rate	(3) Emp. Rate	(4) Emp. Rate	(5) Emp. Rate
Legislative x Neg. GDP Per Cap. Changes				2.092***	1.738***
				(0.320)	(0.315)
Legislative x Pos. GDP Per Cap. Changes				-0.131	-0.225
				(0.199)	(0.183)
Legislative x Bust	-0.012*				
	(0.006)				
Legislative x Real GDP Per Cap. Changes		0.253	0.116		
		(0.207)	(0.180)		
Real GDP Per Cap. Changes		0.419**	0.211		
		(0.135)	(0.206)		
Neg. Real GDP Per Cap. Changes				0.328***	0.059
				(0.057)	(0.119)
Pos. Real GDP Per Cap. Changes				0.454*	0.351
				(0.192)	(0.216)
Emp. Changes: Ages 25 to 54			0.705*		0.577*
			(0.292)		(0.240)
Legislatively Driven Min. Wage	0.003	-0.005*	-0.004+	0.002	0.002
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
R-Squared	0.33	0.47	0.54	0.58	0.62
N	69	69	69	69	69
Changes	Changes	Changes	Changes	Changes	Changes
Period FE	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. The table presents estimates of equation (9) in columns 1 and 2, of equation (10) in columns 3 and 4, and of equation (11) in columns 5 and 6. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors allow for clusters at the country level.

Table B.3: Dynamics of Employment Changes and Labor Market Institutions: With Time and Country Fixed Effects

	(1)	(2)	(3)	(4)	(5)
	Emp. Rate	Emp. Rate	Emp. Rate	Emp. Rate	Emp. Rate
Legislative x Neg. GDP Per Cap. Changes				2.077*	1.367
				(0.892)	(0.959)
Legislative x Pos. GDP Per Cap. Changes				-0.077	-0.140
				(0.319)	(0.267)
Legislative x Bust	-0.012				
	(0.007)				
Legislative x Real GDP Per Cap. Changes		0.372	0.194		
		(0.264)	(0.174)		
Real GDP Per Cap. Changes		0.431*	0.136		
		(0.198)	(0.305)		
Neg. Real GDP Per Cap. Changes				0.298+	-0.153
				(0.170)	(0.313)
Pos. Real GDP Per Cap. Changes				0.395	0.235
				(0.260)	(0.302)
Emp. Changes: Ages 25 to 54			0.752+		0.746
			(0.411)		(0.453)
R-Squared	0.48	0.60	0.66	0.64	0.69
N	69	69	69	69	69
Changes	Changes	Changes	Changes	Changes	Changes
Period FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. The table presents estimates of equation (9) in columns 1 and 2, of equation (10) in columns 3 and 4, and of equation (11) in columns 5 and 6. Employment and GDP data come from OECD OECD (2016c) and OECD (2016d). The coding of the "legislated minimum wage" indicator is presented in table 1 and is further discussed in both that table's note and the main text. Standard errors allow for clusters at the country level.