Using Federal Minimum Wages to Identify the Impact of Minimum Wages on Employment and Earnings across the U.S. States*

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Abstract

The magnitude of the impact of minimum wages on employment is a hotly debated topic in policy and academic circles. In this paper, we use cross-state differences in the impact of adjustments in federal minimum wages on effective minimum wages in each state - the maximum of federal and state minimum wages - to reassess this question and explain biases in past research. A rise in the federal minimum wage will have a larger impact on a state's effective minimum wage in states in which federal minimum wages are binding. Using CPS data for 1977-2007, we find notable wage impacts and large corresponding disemployment effects, yet only when we utilize the differential influences of federal minimum wages to instrument for state wage floors. State effective minimum wages are procyclical. Accounting for the endogenous determination of effective minimum wages at the state level turns out to be materially important for drawing accurate inferences about the impact of minimum wages on employment.

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1 Introduction

Today, more than 65 years after Stigler's (1946) classic analysis, the magnitude of the impact of minimum wages on employment remains a hotly debated topic in policy and academic circles. By the 1980s, a clear consensus had developed that increases in minimum wage rates had statistically significant but economically modest effects (Brown, Gilroy, and Kohen 1982; Brown 1988). Since then, as the use of micro data became more popular, a large body of research has provided conflicting evidence regarding the impact of minimum wages on employment. While some research supports the neoclassical view that minimum wages substantially reduce employment, (Neumark and Wascher, 1992, 1995, 2000; Deere, Murphy and Welch, 1995; Burkhauser et al., 2000; Machin, Manning and Rahman, 2003), other studies fail to find disemployment effects from minimum wages (Card, 1992a,b; Katz and Krueger, 1992; Card and Krueger, 1994; Machin and Manning, 1994; Card and Krueger, 1995; Dickens, Machin and Manning, 1999).[1]

The most popular empirical approaches - the cross-market and case-study approaches - use state effective minimum wages in each state - the maximum of federal and state minimum wages - to identify employment and earnings effects on low-wage workers. Researchers have implicitly assumed that state-level decisions to adjust state minimum wage rates in response to federal minimum wage policies are exogenous to fluctuations in the local demand for unskilled labor. Political discontinuities (state borders) within local markets were employed to further account for latent local shocks, yet, by limiting that analysis to particular "non-tradable" low-wage services (for example the fast-food industry; Katz and Krueger, 1992; Card and Krueger, 1994).

In this paper, we offer a new approach to identify the impact of minimum wage rates on employment and earnings in the cross-state setting. We make two conceptual contributions. First, at a very simple, direct level, a rise in the federal minimum wage will have a differential effect on a state's effective minimum wage. If the old and new federal minimums are not binding in a state, then the federal laws and changes in those laws will not directly influence the state effective minimum wage. Alternatively, if the federal minimum is legally binding, then an increase in the federal minimum will have a direct effect on a state's effective minimum wage. Thus, adjustments in the federal minimum can have differential effects depending on the pre-existing level of the state's minimum wage rate. This is the first paper to exploit the fact that a change in

[1] See Brown (1999), Card and Krueger (1995) and Neumark and Wascher (2008) for comprehensive surveys on the literature.

the federal minimum wage has differential effects on the effective minimum wage rate operating in each state.

Second, although we join past researchers in taking federal minimum wage rates as exogenous in examining state-level responses (Card, 1992a), we break from past researchers in that we do not assume that a state's choice of its own minimum wage rate is exogenous to state-level politics and labor market conditions. We recognize that a state's minimum wage rate responds to fluctuations in the demand for low-paid workers and may respond to adjustments in the federal minimum wage rate - even when the federal standard is not binding – based on the political and economic conditions. We utilize the persistent cross-state disparities in living standards and political preferences - rather than recent policy choices - to isolate the external effect of federal adjustment in national minimum wages on state effective minimum wages.

There is a notable dispersion in the degree to which federal minimum wages are binding on states, i.e. the degree to which federal minimum wages define a state's effective minimum wage, as shown in Figure 1. Furthermore, much of the cross state variation in state minimum wage policy is associated with persistent cross-state disparities in living standards and political preferences regarding state minimum wage policies, as shown in Table 1. This highlights the applicability of our methodological contribution: It is possible to differentiate the impact of federal minimum wage laws on the effective minimum wage rate in each state by using historical measures of income and political preferences rather than recent policy choices.

Intuitively, a rise in federal minimum wage is fully reflected in a state's effective minimum wage in states where those federal minimums were already binding and is expected to have a milder impact on other states. Therefore, it is not surprising to find that federal minimum wages have a larger impact on effective minimum wages in states that were traditionally restricted by federal wage floors (Table 2).

In this paper, we utilize the differential impact of federal minimum wages on state effective minimum wages - depending on the persistent cross-state disparities in living standards and political preferences regarding state minimum wage policies - to identify an external source of variation in state effective minimum wages and evaluate the impact of minimum wages on the employment and wage rates of teenagers. Accounting for the endogenous determination of effective minimum wages at the state level turns out to be materially important for drawing accurate inferences about the impact of minimum wages on employment.

Using data on federal and state minimum wages for the years 1968 to 2007 and

proxies of income per capita and political preferences, measured in the 1960s (Berry's et al.,1998), we impute states' propensity to be restricted by federal minimum wages. We use both the crude proportion of years between 1968 to 1976 that a state was restricted by federal minimum wages and convert (using a Probit model) income per capita and political preferences into a time invariant state-specific propensity score.[2] Following previous national-level cross-state studies, we use state-year teenage aggregate outcomes constructed from the Current Population Survey (hereafter CPS) May files to estimate minimum wage effects on employment and earnings. Since the CPS identifies only 22 states prior to 1977, our main analysis focuses on the years 1977 to 2007. To compare our strategy and findings with previous studies, we take two lines within a common framework. Our benchmark reduced form model follows Card's and Krueger's (1995) preferred state-year specification. Since long-run differences in wage rates are subject to composition bias, we restrict our wage analysis to first-difference specifications.

In contrast to past work, we find substantial disemployment effects of minimum wages on teenagers. The estimated Two Stage Least Squares (TSLS) employment elasticity with respect to minimum wages in the standard state-year level specification is approximately -1. These results are robust to the use of alternative specifications for imputing states' propensity to be bounded by federal minimum wages. Furthermore, consistent with recent findings by Dube, Lester, and Reich (2010), we find that OLS estimates are somewhat milder and statistically insignificant once we account for spatial heterogeneity using regional time effects. Yet, in contrast, our TSLS estimates are robust to the inclusion of regional time effects and state-specific long-run trends.

We also show that state effective minimum wages are procyclical, yet only for states that typically were NOT restricted by federal minimum wages. These findings are consistent with the interpretation that state legislators increase state specific wage floors when the local economy is booming. From the evaluation perspective, these findings suggest that the use of state effective minimum wages to estimate employment effects understates the impact of labor floor prices on the employment of low-wage workers.

Adjustments in minimum wages should be reflected instantaneously in wages and not much later (if at all) in employment. Therefore, changes in employment and wages around the actual times of adjustments in minimum wages allows to further separate

[2]The government ideology index by Berry et al (1998) has previously been utilized in the political economy setting by Besley and Case (2003) and Besley (2004).

the impacts of minimum wages from state-specific trends. Employed with the 1977-2007 May files, we evaluate the short-run impacts of minimum wages by estimating reduced form employment and wage first order difference equations.

Consistent with our long-run estimates, the source of variation in state effective minimum wages matter. We find no employment effects and mild wage effects using state effective minimum wages. In contrast, we find notable wage effects and corresponding disemployment effects when we utilize the adjustments in federal minimum wages. The short-run effect of minimum wage (in logs) on employment ranges between -0.3 to -0.5, whereas the impact on hourly wages is approximately as twice larger. These results hold when we control for regional year effects and state-specific non-linear trends in employment and wage changes.

We are not the first to take federal minimum wage rates as exogenous in examining state-level responses in employment and earnings. In an influential paper, Card (1992a) builds on Stigler's (1946) observation that a uniform national minimum wage floor is implicitly more restrictive in states with lower average wages. Using the April 1990 increase in federal minimum wage and the cross states variation in the proportion of teenagers reporting hourly wages between January 1989's federal minimum wage ($3.35) and April 1990's federal minimum wage ($3.79) in 1989 - the "fraction affected" - Card estimates, indirectly, the impact of minimum wages on teenagers' employment and wage rates. Card found that the rise in the minimum wage raised average teenage wages and no evidence of corresponding losses in teenage employment.

Interestingly, the same set of adjustments in federal minimum wages lead to conflicting reduced form employment effects, depending whether we utilize those to approximate the fraction of workers affected or the influences on state effective minimum wage floors. A possible explanation is that the fraction of affected workers is not exogenous to fluctuations in the demand (and supply) for labor at the state-level. The correlation between the fraction of affected workers and lagged changes in state aggregate unemployment confirms this concern. The fraction of workers affected exhibits procyclical patterns. While the adjustments in federal wage standards are presumably exogenous to local fluctuations in demand and supply their reflection on the fraction of workers affected is not.

In what follows, section II provides an overview of the data sources and processing. Section III presents the econometric setting. Section IV portraits the differential influence of adjustments in federal minimum wages on state effective wage floors. In section V, we report our findings using the cross-year cross-state setting. Sections VI

and VII use the timing around the adjustments in federal minimum wages to identify alternative treatments and estimate short run effects. We conclude in section VIII.

2 Data

Minimum Wage Data

Our minimum wage sample covers the years between 1968 and 2007. Except for the District of Columbia, all the minimum wage data used in this study are taken from the Bureau of Labor Statistics (BLS).[3] We use state and federal minimum wages in May when using CPS May files. Following Card et al. (1994) and Card and Krueger (1995), we do not deflate the states' effective minimum wages with the average adult wages of the state. Rather, we deflate by the Consumer Price Index for All Urban Consumers provided by BLS to 2000 dollars.[4] Finally, since the coverage of the minimum wages has been fairly stable since mid-1970s, as shown by Brown (1999), we follow the practice by Card et al. (1994), Card and Krueger (1995) and Burkhauser et al. (2000) and do not adjust minimum wages by coverage rates.[5]

Aggregate Employment and Earnings Outcomes: CPS May Data

Following existing cross-state studies, we use the Current Population Survey May files (CPS May) to obtain state-year employment and earnings. Prior to 1977 states cannot be separately identified in the CPS. Therefore we focus on the period 1977 to 2007.[6] Our main sample contains 1550 state-year observations, excluding the District of Columbia. We also follow the literature, such as Neumark and Wascher (1992), Card

[3]For District of Columbia, where there are multiple minimum wages for different occupations and experience before 1993, we used the weighted average rates as used by Neumark and Wascher (1992), Card et al. (1994), Card and Krueger (1995) and Burkhauser et al. (2000) for January of each year. For 1994 and onwards, i.e. the period in which District of Columbia implemented uniform rate for all occupations, the data has been obtained from BLS and Department of Labor. A particular practice observed in some states is the multiple-track minimum wage system, where the lower rate applied to the newly covered persons or learners. For such cases, we strictly follow the earlier practices the literature, such as Neumark and Wascher (1992), Card et al. (1994), Card and Krueger (1995) and took the higher rate as the state minimum wage.

[4]The CPI Data that we used is available at ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt.

[5]The practice of minimum wages in United States started in early 20th century. However, the federal minimum wage was introduced for the first time in 1938 with the Fair Labor Standards Act (FLSA). While many low-wage sectors, such as agriculture, retail trade and services were not initially obliged with paying federal minimum wage, the coverage rate of federal minimum wages has increased steadily overtime, and is fairly stable around 85 percent of all workers since mid-1970s.

[6]In 1973-76 only 22 states can be separately identified.

et al. (1994) and Burkhauser et al. (2000), and exclude individuals that are younger than 16 years of age, self-employed, unpaid family workers or persons indicating agricultural production and agricultural services as their current or most recent industry. We use the demographic weights in CPS May supplements to generate state-year aggregates.

Similarly, as with past studies, we focus on employment and earnings of teenagers, aged 16 to 19. To compute state level employment-population ratios for teenagers (and unemployment rates for males aged 25 to 64) we used the "employment status" variable for the year 1977 to 1988 and the "labor force status" variable for the year 1989 to 2007. The average hourly wages for teenagers aged 16 to 19 have been constructed from usual hourly wages stated in CPS May files. Finally, following Card et al. (1994), we weight the state-level observations with the fraction of states' population in United States population when we estimate.

3 The Empirical Setting

The Standard Cross-State Cross-Year Setting

To replicate findings from traditional approaches and assess the differences between our approach and previous settings we follow Card's and Krueger's (1995) preferred cross-state cross-year employment specification:

$$E_{st} = \beta MW_{st} + X_{st}^{'}\gamma + \theta_s + \theta_t + \varepsilon_{st}, \tag{1}$$

where E_{st} is the employment-to-population ratio among less skilled labor (teenagers) in state s and year t, MW_{st} is the *effective minimum wage* in state s and year t, X is a set of state-year control variables, θ_s and θ_t are state and national time effects and ε_{st} are idiosyncratic state-year specific influences on teenagers' employment. The parameter of interest β, is the reduced form long-run effect of minimum wages on the employment rate of teenagers.

The minimum wage laws in the United States imply that a worker is entitled to receive the *higher* of the *federal* minimum wage and the *state* minimum wage:

$$MW_{st} = F_{st}FMW_t + (1 - F_{st})\, SMW_{st}, \tag{2}$$

where SMW_{st} and FMW_t represent state-specific and federal minimum wages in year t respectively and F_{st} is an indicator that equals to one if federal minimum wage in

time t is higher than s state specific wage floor:

$$F_{st} = 1\left(FMW_t \geq SMW_{st}\right). \tag{3}$$

It is a common practice in cross-state cross-year studies to use the variation in state effective minimum wages MW_{st} to estimate β. The impact of minimum wages is identified, implicitly, assuming that adjustments in state-specific wage floors are not correlated with state-specific shocks to the employment of low-wage (potential) workers.[7]

But, state adjustments in minimum wages might not be exogenous to fluctuations in the demand for less-skilled labor and the unemployment of low-paid (potential) workers. If state minimum wages are affected by the state's labor market, however, this could bias the results of past research. We next illustrate formally this source of bias, discuss its potential implications and provide an alternative source of variation in state effective minimum wages.

Federal Minimum Wages, State Minimum Wage Policy and the Bias in the Traditional Setting

For simplicity of illustration, yet without loss of generality, let us decompose the choice of state s to be restricted by federal minimum wages in time t (F_{st}) into two components: (i) a time invariant state specific "traditional propensity" (F_s) and (ii) state-year choices (V_{st}):

$$F_{st} = F_s + V_{st}. \tag{4}$$

By substituting (4) into (2), we re-express minimum wage in state s in time t as linear combination of *federal wage policy* and *state specific choices*:

$$MW_{st} = F_s FMW_t + S_{st}, \tag{5}$$

where: $S_{st} = (1 - F_s)\, SMW_{st} + V_{st}\,(FMW_t - SMW_{st})$.

The first term ($F_s FMW_t$) reflects the expected impact of federal minimum wage policy on state effective minimum wages. The second term (S_{st}) represents state-year specific adjustments in minimum wages. Equation (5) portrays the potential *bias* from

[7] Recent studies control for local trends in the employment of low-wage (potential) workers and minimum wages using region-year effects or linear state specific time trends (Dube, Lester and Reich, 2010).

the use of state effective minimum wages (MW_{st}) and offers a useful source of variation to eliminate that bias.

The Bias in the Traditional Setting

Our primary concern is that state-year choices regarding minimum wages - reflected in S_{st} - are not exogenous to state-specific shocks in the employment of low-wage (potential) workers (ε_{st}). In this case the omitted variable formula implies that:

$$\beta^{OLS} = \beta + \frac{cov\left(S_{st}, \varepsilon_{st}\right)}{var\left(MW_{st}\right)}. \tag{6}$$

If state specific minimum wages are "procyclical" - that is adjusted when teenagers employment rates are particularly high ($cov\left(S_{st}, \varepsilon_{st}\right) > 0$) - then the traditional OLS estimates understate the negative impact of minimum wages on employment ($\beta^{OLS} > \beta$).

The Main Idea in Brief

We use the differential impact of adjustments to the federal minimum wage on the effective minimum wages within states to evaluate the impact of minimum wages on employment. In particular, a rise in the federal minimum wage should have a larger impact on minimum wages in states with lower incomes per capita and in states with higher minimum wage rates. Critically, a state's choice of its minimum wage, and hence the degree to which federal wage floors bind, is not exogenous. It reflects political considerations. We account for both endogenous state-level decisions regarding minimum wage rates and the differential impact of federal wage floors to identify the impact minimum wages rate on the employment decisions of teenagers.

The intuition underlying our setting is illustrated in equation (5). Federal adjustments in national wage floors have a larger impact on a state's effective minimum wage when the state has a greater propensity to be restricted by federal standards $F_s FMW_t$. We utilize the variation in state effective minimum wages due to federal adjustments in national wage floors - that typically affect wage floors in some states more than others - to identify the impact of minimum wages on employment and illustrate biases in existing studies.

The Statistical Model

State legislators choose whether to have specific wage floors above federal requirements. Let U_{st}^{*} denote a latent index of state legislators "utility" from keeping state minimum wages at the federal standards. The state minimum wage equals the federal standard if and only if the 'benefits' exceed the 'costs', which means:

$$F_{st} = 1\left(U_{st}^{*} = Z_{s}^{'}\pi + \omega_{st} \geq 0\right), \tag{7a}$$

where Z is a set of pre-determined time invariant observable factors and ω_{st} are state-year influences. In this framework F_s - the time invariant propensity of a state to be restricted by federal minimum wages, the "traditional propensity" - is equal to the probability that $F_{st} = 1$ conditional on state time invariant observed (by the econometrician) characteristics.

We estimate the preferences of state legislators regarding the establishment of a state minimum wage above that set by the federal government. Thus, using pre-existing cross-state disparities in measures of income per capita, political preferences and lagged choices (proportion of year that $F_{st} = 1$ during far lagged previous years), F_s can be approximated by estimating the probability model in equation $(7a)$ and projecting the following values:

$$F_{s} = P\left(Z_{s}^{'}\pi\right), \tag{7b}$$

where $P(*)$ is the probability function. Employed with F_s we turn to estimate the effect of minimum wages on the employment of low-paid workers (teenagers). We use the differential impacts of federal adjustments in national wage floors ($F_s FMW_t$) as the source of variation in state effective minimum wages.

Our empirical strategy takes the following form. The employment to population ratio equation follows the preferred specification in Card et al. (1994) and Card and Krueger (1995) for estimating the state-year variations in employment to population ratio for teenagers:

$$E_{st} = \beta MW_{st} + X_{st}^{'}\gamma + \theta_t + \theta_s + \varepsilon_{st}. \tag{8a}$$

Practically, we also allow for region-year effects, "F-States" year-effects and state-specific long-run changes in the employment of teenagers using pre-post mid of the sample period state effects, which we discuss in detail when we turn to the data. The

first stage equation exhibits the same structure:

$$MW_{st} = \alpha F_s FMW_t + X_{st}^{'}\delta + \phi_s + \phi_t + \epsilon_{st}, \tag{8b}$$

where the parameter α is the elasticity of state effective minimum wages with respect to federal influences on state effective minimum wages ($F_s FMW_t$). The reduced-form employment equation is[8]:

$$E_{st} = \beta\alpha F_s FMW_t + X_{st}^{'}\eta + \tilde{\theta}_s + \tilde{\theta}_t + \tilde{\varepsilon}_{st}. \tag{8c}$$

Structural Interpretation

Federal adjustments in national wage standards influence differentially state effective minimum wages ($\alpha F_s FMW_t$). It is this arguably exogenous source of variation in minimum wages, across state and over time, that we use to estimate the effects of minimum wages on the employment (and wages) of teenagers.

The key identifying assumption is that federal adjustments in national wage floors are not particularly biased toward high (or low) F_s states. This is not a trivial assumption. Federal minimum wage policy is exogenous neither to national trends nor to specific developments in the employment of low-wage workers. Furthermore, the federal administration pays presumably more attention to employment shocks in the "affected regions", where national wage floors are more likely to be relevant, than to fluctuations in the employment of low-wage workers in other regions of the country.

We address this concern, however. By modeling F_s to reflect cross-state differences in standards of living, political preferences and pass state minimum wage policy, the estimated "traditional propensity" varies within geographic and political regions of the US. The "within regions" variation in F_s permits us to account for "affected regions" biases in federal adjustments of national minimum labor prices. By introducing region-year effects and differential time effects for states that were always restricted by federal minimum wages (denoted by "F-States"), our setting also allows us to assess the extent that federal adjustment in national wage floors are particularly influenced from fluctuations in the employment of low-wage workers in the "affected regions". To the extent that federal adjustments are exogenous to state specific shocks within geographic and minimum wages "regions", our TSLS estimator provides a consistent estimate of the effect of minimum wages on the employment of teenagers (or other low-wage workers).

[8] Where $\eta = (\gamma + \beta\delta)$, $\tilde{\theta}_s = (\theta_s + \beta\phi_s)$, $\tilde{\theta}_t = (\theta_t + \beta\phi_t)$ and $\tilde{\varepsilon}_{st} = (\varepsilon_{st} + \beta\epsilon_{st})$.

Differential Time Effects

To further distinguish between time effects and minimum wage impacts, we take two approaches. First, we allow for time effects to vary by a state's traditional propensity to be restricted by federal wage floors. Second, we utilize the exact timing around adjustments in federal minimum wages to separate between heterogeneous trends and minimum effects by estimating short run effects. We discuss these conceptually and report the corresponding estimates in section VII.

The Effect of Minimum Wages on Wage Rates

While the employment status is observed for all teenagers, wages are reported only by those who work. Thus, the change in teenagers' mean wages might reflect the impact of minimum wages on the skill composition of low-wage workers rather than the average effect on wages. An intuitive way to account for selection bias is to estimate price effects in the "short run". Intuitively, the employment effect should lag and not lead the price effect. Under this assumption, the contemporaneous effect of a change in minimum wage on the change in mean wages is less likely to reflect supply side effects. We discuss this in further detail in the section that introduces the short-run analysis.

4 Federal Minimum Wages, State Specific Minimum Wages and Effective Minimum Wages

Using state and federal minimum wage data, Figure 1 reports, for each of the 51 states, the number of years that state-specific minimum wages were higher than federal minimum wages between 1968 and 2007. Over this 40 years period state effective wage floors in 22 states – hereafter the "F-States" - were always equal to federal minimum wages (that is $F_{st} = 1$ for all years between 1968 and 2007). Interestingly, Alaska is the only state, among the other 29 states, with self-imposed state-specific minimum wages higher than federal floors for all years.

Critical for our analysis, pre-existing cross-state disparities in standards of living and political preferences help explain the cross-state differences in the degree to which federal minimum wages determine a state's effective minimum wage. Using Berry et al.'s (1998) "Government Ideology Index" (hereafter GII) to proxy the ideology of a state's elected leaders, we find that states with higher income per capita and greater taste for liberal ideology in the 1960s were more likely to self-impose specific minimum

wages higher than federal standards a decade later and onwards. Results are found in Table 1. The population sample includes all states but District of Columbia, for which Berry's et al. (1998) GII is not available.[9]

The first panel reports coefficients of OLS regressions for the proportion of years that federal minimum wages were higher (or equal) to state specific minimum wages, the average F_{st}, against income per capita (in 1969) and Berry et al.'s (1988) GII average values for the years 1960-1968. Columns (i) and (ii) report estimates for the years 1968-2007 and for the period of interest 1977-2007, respectively.

Consistent with arguments by Stigler (1946), we find that low income per capita states were more likely to be restricted by federal minimum wages than others. Political preferences matter, too. States with liberal government ideology during the 1960s were more likely to exhibit specific wage floors above federal standards than others states. Furthermore, these proxies for pre-existing differences in political preferences and income per capita account for half of the cross-state variation in the average F_{st} between 1977 and 2007.[10]

Both income per capita and GII are crude proxies for cross-state disparities in the demand for labor and taste for re-distribution. To proxy latent state specific persistent factors we take advantage of the federal and the state minimum wage data prior to 1977. We calculate for each state the proportion of years between 1968 and 1976 that state effective minimum wages were equal to the federal wage floors (denoted with F_s^{68-76} hereafter).

State history matters. The proportion of years between 1968 to 1976 that a state was effectively restricted by federal minimum wages (F_s^{68-76}) accounts for most of the cross state variation in states propensity to be restricted by federal wage floors between 1977 to 2007 (as measured by the average F_{st} during these years). It is worth noticing that while disparities in income per capita in late 1960s have no explanatory power once we account for F_s^{68-76}, pre-existing political preferences in the 1960s still matter many years later (column iv). The political economy literature has long recognized that differences exist in institutions, ideology, and legislative and policy outcomes (Besley and Case, 2003; Lee, Moretti and Butler, 2004).[11] Our findings indicate that this is

[9] The Berry et al.'s (1998) measure is the average ideology of the governor and the state legislature, where these state politicians' ideology is inferred from the ADA and COPE scores of their partisan counterparts in the state's congressional delegation. The index takes zero for most conservative, and 100 for most liberal case.

[10] The correlation between the income per capita in 1969 and 1999 is 0.87. The correlation between Berry et al.'s (1998) GII average values for the years 1960 to 1968 and from 1977 to 2006 is 0.66.

[11] Besley and Case (2003) find that measures of citizen ideology are significantly correlated with

also relevant in the context of minimum wages.

Whether state s is restricted in time t by federal minimum wages (or not) reflects both persistent factors - the "traditional propensity" - and transitory shocks. We approximate states' "traditional propensity" to be restricted by federal minimum wages by estimating the probability model in equation $(7a)$, for the years 1977 to 2007, assuming that the state-year influences ('errors') are normally distributed (that is, using a Probit model). The dependent variable in all specifications is F_{st}.

We use two main specifications to proxy state s "traditional propensity" (F_s). Our benchmark specification contains time invariant variables only. These include income per capita (in 1969), Berry et al.'s (1988) GII average values for the years 1960-1968 and the proportion of years between 1968 to 1976 that state effective minimum wages were equal to the federal wage floors (F_s^{68-76}). In our second main speciation, we allow states' "traditional propensity" to vary gradually over time. We use the proportion of years between $t-2$ and 1968 that state effective minimum wage floors were equal to federal restrictions to proxy state latent factors.

Probit marginal effect estimates (dF/dx) are found in the 2^{nd} panel of Table 1. The first four specifications employ the same set of explanatory variables as in the corresponding columns in panel (A). Column (v) reports the time-varying specification.

We find a notable persistency in states' choices on whether to introduce specific wage floors higher than federal standards, reflecting traditional disparities in political preferences and standards of living. In brief, crude measures of pre-existing political preferences and standards of living account for one quarter of the state-year variation in state-year binary minimum wage status (F_{st}) many years later. State choices whether to introduce specific wage floors higher than federal standards are highly correlated with past choices. Yet, pre-existing cross-state variation in political preferences, as measured by Berry et al.'s (1988) GII, measured in the 1960s, account for a non-trivial part of the cross-state cross-year disparities, above and beyond past choices. This holds both in the static measure (column iv) or the dynamic moving average measure (column v).

Employed with these estimates we use the time invariant model in column (iv), hereafter $P1$, and the time varying specification in column (v), hereafter $P2$, to project for each state her "traditional propensity" to be restricted by federal minimum wages.

The political economy literature recognized the symbiotic relationship between electoral outcomes and the subsequent performance of the economy. Voters' tastes and

state taxes and spending.

electoral outcomes are exogenous neither to economic conditions nor to required social policy. Yet, to the extent that pre-existing preferences and time invariant choices are correlated with later choices, these are unlikely to reflect future state specific shocks to employment.

The Impact of Federal Minimum Wages on State Effective Minimum Wages

Employed with states' projected propensities to be restricted by federal minimum wages (F_s), we approximate the differential impact of federal minimum wages on state effective minimum wages using the following linear in parameters specification:

$$MW_{st} = \alpha F_s FMW_t + X_{st}^{'}\delta + \phi_s + \phi_t + \epsilon_{st}, \qquad (8b^{'})$$

where MW_{st} is the effective minimum wage (in logs) in state s and year t. X_{st} is the same set of state-year control variables included in the employment equation, where ϕ_s and ϕ_t are state and national time effects, respectively. Practically, we also allow for region-year effects, differential year effects for the 22 "F-States" and all others, and state-specific long-run changes in the employment of teenagers.

Intuitively, a rise in the federal minimum wage should be fully reflected in states in which federal standards are binding and is expected to have somewhat milder impact on other states. Therefore, we expect the elasticity of state effective minimum wages (MW_{st}) with respect to federal adjustments in national wage floors (FMW_t) to be larger in states where national minimum labor prices are binding (high F_s) than in other states, that is $\alpha > 0$.

Employed with this setting, we turn to the data. We estimate equation ($8b^{'}$) and it's between years first difference version, using a sample consisting of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).[12]

The results are shown in Table 2 in two panels. The dependent variable in the first panel is state effective minimum wages (in logs), deflated using the Consumer Price Index for Urban Wage Earners and Clerical Workers provided by BLS to 2000 prices. All specifications include, in addition to state effects and national time effects, a standard set of state year aggregates commonly used employed in the cross-state cross-year studies to control for factors that affect employment and earning outcomes other than minimum wages (unemployment rate of males aged 25 to 64 and the fraction of

[12] The between years specification is: $\Delta MW_{st} = \alpha F_s \Delta FMW_t + \Delta X_{st}^{'}\delta + \Delta\phi_t + \Delta\epsilon_{st}$.

teenagers). The dependent and the explanatory variables in the second panel are the corresponding between year differences. These leave us with 1550 and 1500 observations in the first and the second panels, respectively. We estimate four specifications that differ by the set of state, region and time effects included.

Two main facts emerge: First, the reduced form effect of federal minimum wages on state effective wages increases with state projected propensity to be restricted by federal minimum wages. This holds regardless of whether we estimate the effect in levels or first difference. The reduced form effect is robust to region-year effects. Second, our main variable of interest, the interaction between states' "traditional propensity" to be restricted by federal wage standards and federal minimum wages in time t ($F_s FMW_t$) accounts for much of the variation that is not associated with state and time effects (Figure 2.1). This also holds when we look at the changes in minimum wages. The exact timing of changes in federal minimum wages explains much of the changes in state effective minimum wages (Figure 2.2).

The elasticity of state effective minimum wages with respect to federal minimum wages (α) ranges between $1.1F_s$ and $0.7F_s$ when we control for state and national time effects (columns i and v). The effects are somewhat milder when we allow for regional non-parametric time trends (columns ii and vi).[13] The "long" and the "short" run estimates, in panels (a) and (b) respectively, are similar in magnitude and statistically indistinguishable, as long as we do not introduce state-specific long-run trends. While the short run effects are robust to state-specific trends, the long run effects of federal adjustment in national wage floors shrink (columns iii-iv and vii-viii).

These results indicate that in explaining the variation of the de-trended state effective minimum wages, the exact timing of federal adjustments matters mainly in the short run. Therefore, to the extent that regional year effects and long-run varying state effects control for other contaminating unobserved factors, the traditional long-run setting is useful. Yet, to further control for state-specific time varying factors, we should utilize the short-run setting. The exact timing that federal adjustments in national wage floors influence state effective minimum wages allows sorting out state-specific latent factors from the impact of minimum wages on the employment of teenagers.

[13] BLS classification of the US to 4 regions.

5 Evidence from the Cross State Cross Year Setting

State Effective Minimum Wages

To compare our findings with previous studies, we preview our main analysis by estimating the impact of minimum wages on the employment of teenagers using state effective minimum wages. Table 3 reports the employment effects for a sample of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia). The dependent variable is the employment to population ratio in state s and time t for teenagers in 16-19 age group. All specifications include a standard set of state year aggregates, commonly used in the cross-state cross-year studies to control for other factors that might affect the employment of teenagers than minimum wages (unemployment rate of males aged 25 to 64 and the fraction of teenagers).

We find mild negative association between minimum wages and the employment of teenagers. The employment elasticity ranges from -0.24 (evaluated at the mean teenage employment-to-population ratio), controlling for state and national time effects, to approximately 0, when we allow for differential year effects across regions and state-specific long-run trends.[14] In some detail, the first column reports the regression coefficient of employment on state effective minimum wages controlling for state and national time effects. In the second column, we control for local time trends using BLS classification of the US to 4 regions. Controlling for region year effects the regression coefficient drops from -0.10 (column i) to -0.071 (column ii).

To further control for local co-movements in the employment of teenagers and minimum wages, we introduce non-linear state-specific time trends. Using two sets of state effects for the periods before and after 1992 we allow for different state-specific effects during the first 15 years of our sample and the following 15 years (column iii). We find no association between state effective minimum wage and the employment rates of teenagers once we allow for state-specific long-run time effects. The long-run effect shrinks to -0.008. This result is robust to the inclusion of differential year effects for the 22 "F-States" and all other states. To summarize, we find no association between minimum wages and the employment rates of teenagers when we use the cross-state cross-year variation in states' self-determined wage floors.

[14] See appendix Table A2 for state average teenage employment-to-population ratios

Federal Minimum Wages: Reduced Form Effects

Do federal adjustments in minimum wages have larger impact on the employment of teenagers in states that federal wage floors are binding than in other states? To address this question, we estimate the reduced form differential effects of federal minimum wages on the employment of teenagers (see equation (8c)). The main variable of interest is the interaction between federal minimum wages (FMW_t) and a state's propensity to be restricted by federal wage floors (F_s). We approximate a state's "traditional propensity" to be restricted by federal minimum wages using the time invariant ($P1$) and the time variant ($P2$) measures. Results are found in Table 4.

Federal adjustments in national wage floors have larger disemployment effects in states that federal minimum wages are binding than in other states. This holds also when we allow for heterogeneous time trends in the employment of teenagers across geographic regions and between the "F-States" and all other states. For instance, the employment elasticity is approximately $-0.5F_s/E_s$ controlling for state effects, national time effects and region year effects (columns i and ii).

We already noticed that the long-run elasticity of state minimum wages with respect to federal minimum wages is milder once estimated within periods (Table 2, columns iii and iv). Therefore, it is not surprising to find that the employment elasticity is also milder $-0.165F_s/E_s$ once we introduce pre-post 1992 state-specific effects. These findings hold whether we employ the time invariant specification ($P1$) or the time varying specification ($P2$) to approximate states' propensity to be restricted by federal wage standards. It is worth noticing that, with specifications allowing for pre-post 1992 state-specific effects, we do find that federal adjustments in minimum wages have larger impact on the employment of teenagers in states that federal wage floors are binding than in other states, while we find no association between the employment rates of teenagers and state self-determined minimum wages.

Instrumental Variables Estimates

Next we turn to estimate the "long-run" effect of minimum wages on the employment of teenagers using the differential impact of federal adjustment in minimum wages as the excluded source of variation in state minimum wages. Results are found in Table 5.

There are two main panels. The first four columns report TSLS estimates using the interaction between federal minimum wages and state propensity to be re-

stricted by federal minimum wages approximate using the time-invariant specification ($P1$; $F_{1s}FMW_t$). The next four columns report estimates using ($P2$; $F_{2s}FMW_t$) as the excluded variable. All specifications include the same standard set of state year aggregates (unemployment rate of males aged 25 to 64 and the fraction of teenagers) as in the OLS models (Table 3 and Table 4).

One main fact emerges: We find notable negative impact of minimum wages on the employment rate of teenagers. The negative association between the federal influences on state effective minimum wages and the employment of teenagers cannot be attributed to regional trends, "F-States" time varying factors or state-specific long run changes in the employment of teenagers. Controlling for region year effects, pre-post 1992 state effects and differential time effects for the "F-State" and all other states the estimated effect ranges between -0.40 and -0.41 with corresponding implicit elasticity of approximately -1. Estimates are remarkably similar whether we use $P1$ or $P2$ to approximate the differential effect of federal minimum wages on state wage floors (panel (a) and panel (b) respectively). The instrumental variable estimates are in sharp contrast with the traditional estimates using self-determined state-year variation in minimum wages.

In some detail, controlling for national time effects and time invariant state effects, the estimated effect ranges between -0.512 to -0.429 (columns i and v respectively). These estimates are 4 times larger than the OLS estimates using same set of controllers (Table 3, -0.106). Estimates are a bit larger (in absolute terms) once we allow for differential regional trends in the employment rates of teenagers (columns ii and vi). Allowing for state-specific long-run changes in the employment of teenagers using pre and post 1992 state effects, we find milder but yet notable disemployment effects (columns iii and vii).

Finally we account for the potential endogeneity of federal adjustments in minimum wages to particular developments in the employment of low paid workers in the states were federal floors matter. In columns (iv) and (viii) we control for latent by year factors for the 22 states and all other states. Allowing for differential time effects the point estimates are a bit (although statically insignificantly) larger, pointing out to a mild procyclicality of federal minimum wages with respect to the employment of low paid workers in the states where federal minimum wage policy is mostly relevant.

Latent Time Effects vs. Minimum Wage Impacts

The structural interpretation of the IV estimates rests on the assumption that the only reason that the employment of low-wage workers drops in high "propensity" states more than in other states with federal minimum wage adjustments is the larger impact of federal wage standards on state effective wage floors in those states. To assess whether our findings reflect factors other than federal influences on state effective minimum wages, we estimate an "unrestricted" TSLS model. This model allows factors other than federal adjustments in national wage floors to influence state effective minimum wages.

In this case the first stage "unrestricted" equation takes the following form:

$$MW_{st} = F_s\varphi_t + X'_{st}\eta + \psi_s + \psi_t + \upsilon_{st}, \tag{9a}$$

where $F_s\varphi_t$ is a vector of interactions between state propensity to be restricted by federal wage floors, F_s, and aggregate year effects φ_t. Note that the later term (φ_t) aggregates all national-year factors, including federal minimum wages, into one by-year term.

In the second stage, we run a "horse race" between the federal component in state effective minimum wages (F_sFMW_t) and all other national factors that might explain, interacted with F_s, state effective minimum wages:

$$E_{st} = \hat{\beta} MW_{st} + \beta^* F_s FMW_t + X'_{st}\tau + \sigma_s + \sigma_t + \xi_{st}. \tag{9b}$$

There are two parameters of interest, $\hat{\beta}$ and β^*. The later (β^*) approximates the impact of federal influences on state minimum wages on the employment of teenagers. The parameter $\hat{\beta}$ measures the extent that national factors other than federal minimum wages drive our previous results.

We report our findings in Table 6. The table contains 4 panels that vary by the set of latent factors we control for. The first column reports the estimated effect of minimum wages on the employment rate of teenagers when state minimum wages are instrumented using the "unrestricted" specification in equation (9a) and the second stage equation does not include the federal influences on state effective minimum wages (does not include F_sFMW_t). The second column reports the reduced form effect of the federal component in state minimum wages. The third column reports second stage estimates based on the statistical model in equations (9a) and (9b).

We find negative association between the employment of teenagers and state min-

imum wages when these are instrumented using the unrestricted model. Yet, this reflects solely the impact of the federal components in state minimum wages. We find no negative association between all other aggregate factors and the employment of teenagers once we account for the direct impact of federal influences on state minimum wages.

For instance, the first entry in column (i) reports the regression coefficient of state minimum wages, when these are instrumented by the unrestricted model, on employment (-0.192). Allowing for direct differential impact of federal wage floors on the employment of teenagers the employment elasticity drops to zero (-0.001) whereas the estimated β^* equals to -0.525 (se. 0.137). Furthermore, allowing for state-specific long-run changes in the employment of teenagers using pre and post 1992 state effects, we find no evidence for negative impact of state minimum wages when these are instrumented by the unrestricted model. This holds even in the specifications that do not allow for direct differential effect of federal wage floors on the employment of teenagers.

To summarize, the "unrestricted" estimates indicate that our benchmark IV estimates reflect the differential impact of federal adjustments in minimum wage on state effective wage floors and the effects of these external changes in state effective minimum wages on the employment of teenagers.

Reverse Causality

Why do our IV estimates differ from the zero effect found using state effective minimum wages? Is it possible that state legislators are reluctant to adjust minimum wages when the perceived demand for labor is relatively low? Does the zero effect of minimum wages on the employment of teenagers reflect the procyclicality of state minimum wage policy?

To address these questions, we approximate a naïve reverse causality model by estimating the following reduced form minimum wage specification:

$$MW_{st} = \lambda_1 U_{s,t-1} + \lambda_2 F_s U_{s,t-1} + X_{st}^{'}\tau + \varphi_t + \varphi_s + \epsilon_{st}, \tag{10}$$

where the variable $U_{s,t-1}$ is the state specific aggregate unemployment rate during the previous year. The parameter λ_1 measures the association between state-specific unemployment rate and effective minimum wages in the following year in states that "typically" were not restricted by federal wage standards. The overall association between lagged state-specific unemployment rate and state effective minimum wages is allowed to vary linearly by F_s, $(\lambda_1 + \lambda_2 F_s)$.

The idea is simple: If state self-determined minimum wages are procyclical, we should find that:

$$\lambda_1 < 0.$$

Furthermore, if state effective minimum wages are only procyclical in states that are not often restricted by federal standards, then we also should find that:

$$\lambda_2 > 0.$$

Employed with these intuitive testable implications, we turn to the state-year data. Results are shown in Table 7. We approximate the excess demand for labor using (i) state overall unemployment rate and (ii) the unemployment rate among prime aged males (between 25 and 64 years of age).

We find that state effective minimum wages are procyclical. Yet, this holds only for high income per capita "liberal" states where state-specific minimum wages are traditionally higher than federal wage floors. The elasticity of state minimum wages with respect to last year unemployment rate, evaluated at $F_s = 0$, that is λ_1, ranges between -4.5 to -2.8, depending on whether we use the static or the time varying specification to approximate F_s. Yet, the procyclicality of state effective minimum wages with respect to last year unemployment rate is inversely related to F_s. We find that λ_2 ranges between 5.1 and 3.1 at same order of magnitude (in absolute terms) as λ_1. Thus the overall effect is practically zero for states that were traditionally restricted by the federal minimum wage policy.

These findings are consistent with the interpretation that self-determined minimum wages are procyclical. States adjust minimum wages in booms and are reluctant to update wage floors in busts. Therefore the use of state effective wages understates the causal impact of minimum wages on the employment of teenagers.

6 The Short-Run Effects of Minimum Wages on Employment and Wage Rates

Changes in employment and wages around the actual times of adjustments in minimum wages allow us to separate further between local time-varying factors and the impact of minimum wage on employment and wages. We utilize the adjustments in federal and in state-specific minimum wages between 1977 and 2007 to estimate short-run effects

around the timing of changes in minimum wages.

The Statistical Model

Following Card and Krueger (1995) preferred specification for the long-run effect the benchmark reduced form, the short-run employment and wage equations take the following form:

$$\begin{aligned} \Delta E_{st} &= \beta^E \Delta MW_{st} + \Delta X_{st}^{'} \gamma^E + \Delta\theta_t^E + \Delta\varepsilon_{st}^E, \\ \Delta W_{st} &= \beta^W \Delta MW_{st} + \Delta X_{st}^{'} \gamma^W + \Delta\theta_t^W + \Delta\varepsilon_{st}^W . \end{aligned} \tag{11a}$$

The parameters β^E and β^W represent the short-run effects of minimum wages on the employment and wage rates of low-wage workers, respectively. The first stage equation in this setting takes the following form:

$$\Delta MW_{st} = \alpha F_s \Delta FMW_t + \Delta X_{st}^{'} \delta + \Delta\phi_t + \Delta\epsilon_{st}, \tag{11b}$$

where α is the short-run elasticity of state effective minimum with respect to federal minimum wage influences on state effective minimum wages.[15] The reduced-form equations for the between years changes in employment and wages are:

$$\begin{aligned} \Delta E_{st} &= \beta^E \alpha F_s \Delta FMW_t + \Delta X_{st}^{'} \left(\gamma^E + \beta^E \delta\right) + \tilde{\theta}_t^E + \tilde{\varepsilon}_{st}^E, \\ \Delta W_{st} &= \beta^W \alpha F_s \Delta FMW_t + \Delta X_{st}^{'} \left(\gamma^W + \beta^W \delta\right) + \tilde{\theta}_t^W + \tilde{\varepsilon}_{st}^W , \end{aligned} \tag{11c}$$

where $\tilde{\theta}_t$ stand for the average changes in employment and wages.[16] The parameters $\alpha\beta^E$ and $\alpha\beta^W$ measure the short-run reduced form effect of changes in federal minimum wages on teenagers' employment and wages, depending on its expected effects on state effective wage floor (F_s). Practically, we also allow for geographic region-year effects, differential time effects for the 22 "F-State" and all other states as well as state fixed effects, linear state-specific trends and pre-post 1992 state effects.

[15] It is worth noticing that we obtain similar estimates using either nominal or CPI adjusted federal and state effective minimum wages. See appendix Table A.3.

[16] $\tilde{\theta}_t^E = \left(\Delta\theta_t^E + \beta^E \Delta\phi_t^E\right)$, $\tilde{\varepsilon}_{st}^E = \left(\Delta\varepsilon_{st}^E + \beta^E \Delta\epsilon_{st}^E\right)$, $\tilde{\theta}_t^W = \left(\Delta\theta_t^W + \beta^W \Delta\phi_t^W\right)$ and $\tilde{\varepsilon}_{st}^W = \left(\Delta\varepsilon_{st}^W + \beta^W \Delta\epsilon_{st}^W\right)$.

State Effective Minimum Wages

We preview our main analysis with a set of estimates using the actual changes in state effective minimum wages as the RHS variable. Table 8 reports the employment and wage effects for a sample 50 state-year observations for the years 1978-2007 (excluding the District of Columbia).

We preview our main analysis with a set of estimates using the actual changes in state effective minimum wages as the RHS variable. Table 8 reports the employment and wage effects for a sample 50 state-year observations for the years 1978-2007 (excluding the District of Columbia). The dependent variables in the first and the second panels are the changes in (i) the employment to population ratio and (ii) the average hourly wages (in logs) of teenagers aged 16 to 19 in state s during the past year.[17] All specification include the changes in the unemployment rate of males aged 25 to 64 and changes in the proportion of teenagers, the standard set of state-year aggregates. Since the effect of adjustments in minimum wages on employment might be reflected with some lag we estimate each specification twice: first using (i) the current change in minimum wages and then using (ii) the lagged change in state effective minimum wages. Using changes in state effective minimum wages we find no evidence for wage or disemployment effects.

Federal Minimum Wages: Reduced Form Effects

Next we turn to our main analysis using the short-run setting. Table 9a and Table 9b report the reduced form differential impacts of changes in federal minimum wages on the employment and wages of teenagers, respectively. We estimate four specifications that vary by the set of latent factors we control for. Each specification has been estimated twice using the current and the lagged change in federal minimum wages.

Adjustments in federal minimum wages have a larger impact on teenage wages in states that national wage standards are traditionally binding than in low F_S states, that is $\beta^W > 0$ and corresponding disemployment effect in the following year, that is $\beta^E < 0$.

In some detail, our preferred specifications controlling for year effects, region year effects, state effects and pre-post 1992 state effects (columns vii and viii) show that the short-run reduced form effect of changes in federal minimum wages on teenagers' employment ranges between -0.457 (se. 0.162) and -0.208 (se. 0.074) whereas the

[17] The changes in minimum wages, employment to population ratios and mean hourly wages over the past year are measured using the May of each data.

corresponding contemporaneous effects range between 0.013 (se. 0.283) and -0.110 (se. 0.191). These results do not reflect heterogeneous trends in the employment of teenagers. The point estimates are in fact larger (in absolute terms), when we allow changes in the employment rates of teenagers to vary differently by year, across geographic regions and between the 22 "F-States" and all the other states. The disemployment effect cannot be either attributed to state-specific trends in the employment of teenagers. The point estimates are approximately two times larger when we allow, in addition to state-specific linear trends (column iv), for state-specific differential pre-post 1992 trends (columns vii and viii).

The estimated short-run wage effects in Table 9b are consistent with the employment effects above. That is, we find large positive contemporaneous effects on wages. In our preferred specifications the effect ranges between 0.964 (se. 0.411) to 0.666 (se. 0.356) using P1 and P2 to approximate state propensity to be restricted by federal minimum wage standards. Consistent with the structural interpretation, we find no lagged effects on wage rates.

To summarize, we find that changes in minimum wages due to federal adjustments in national wage floors have notable impacts on the employment and wages of teenagers. The effect on pays is reflected immediately, while the employment effects are noted a year later.

Short Run Effects: Instrumental Variables Estimates

Finally, we turn to estimate the effect of minimum wage on teenage employment and wages. Results are presented in Tables 10a and 10b, respectively. We employ two sources of variation in state effective minimum wages. In the first panel (i.e. OLS), we use the actual changes in state effective minimum wages. In the second panel (i.e. TSLS), we utilize only the projected influence of federal adjustments in national wage floors on state effective minimum wages. All specifications include a standard set of state year changes in the state-specific unemployment rates (males aged 25 to 64) and the proportion of teenagers.

Employment

We find no evidence for disemployment effects of minimum wages on teenagers when we use changes in state effective minimum wages. In fact we find, consistent with previous studies (Card 1992a,b), mild positive, yet statistically insignificant association between the change in the employment of teenagers and the lagged changes in state effective

wage floors (0.065, (se. 0.066)). In contrast, we find notable disemployment effects when we use changes in federal influences on state minimum wages to instrument changes in state effective wage floors. The short-run minimum wage effects range between -0.508 (se. 0.236) to -0.314 (se. 0.130) in our preferred specifications (columns v and viii). The short-run implicit elasticity of teenage employment with respect to minimum wage (evaluated at the sample mean) ranges between -0.75 and -1.20. These results cannot be attributed to state trends in the employment of teenagers or to spatial heterogeneities in employment trends that are unrelated to minimum wage policies. Point estimates are larger when we allow for year effects to vary by geographic regions and "F-States" as well as state-specific trends in the employment of teenagers. For instance, controlling for national and regional time effects, the point estimate is -0.362. Allowing for state-specific trends and differential changes in the employment of teenagers for "F-States" and all other states the point estimate is -0.508. While differences are not statistically significant, these results indicate that our negative estimates are robust to latent time-varying state-specific factors.

Wages

We find a notable contemporaneous impact of minimum wages on the wage rate of teenage workers. The elasticity of mean wages with respect to minimum wages is approximately 0.9, somewhat higher than the long-run estimates reported in Card, Katz and Krueger (1994). These results cannot be attributed to state trends in teenage wages or to spatial heterogeneities in pay that are unrelated to minimum wage policies. Point estimates are robust to differential time effects between geographic regions, "F-States" year effects and state-specific trends in the wages of teenage workers.

7 Alternative Treatments: Card's (1992) Fraction of Affected Workers

A rise in the federal minimum wage should have a larger impact on effective minimum wages in states with traditionally lower income per capita and perhaps less of a taste for re-distribution, where federal wage standards are more likely to be binding. A common adjustment in minimum wages might also affect larger fraction of workers in some states than other states depending on the distribution of wages. Card (1992a) utilized the later "treatment" to identify, indirectly, the impact of minimum wages on teenage employment and wages. Using the federal minimum wage increase in April 1990

and the cross states variation in the proportion of teenagers reporting hourly wages between 1989's federal minimum wage ($3.35) and April 1990's federal minimum wage ($3.79) in 1989 - the "fraction affected" - Card estimated, indirectly, the impact of minimum wages on teenagers' employment and earnings. Card found that the uniform rise in federal minimum wage had a larger impact on teenagers' wages in states where the fraction of teenage workers initially earning less than the new federal wage floor was higher. Nevertheless, Card found no evidence for any corresponding losses in teenage employment.

While both designs treat changes in federal minimum wages as exogenous to state-specific shocks in the demand (and supply) for low-wage workers, these settings differ conceptually as for the source of variation across-states. The conflicting findings, at least as for the impact of minimum wages on the employment of teenagers, require a closer look at the implicit identifying assumptions, in both methods, and the potential biases. We begin this section by estimating the impact of fraction affected on employment and wage rates in our 1977-2007 May sample.

The Fraction Affected

Following Card (1992a), we approximate the proportion of teenage workers earning less than the new federal minimum wage standard using the distribution of actual wage rates in the previous year.[18] We calculate both the fraction affected using both the nominal and the CPI adjusted federal minimum wages.

We start by estimating the impact of the fraction of workers earning less than the new, due to adjustments in federal minimum wages, on the employment and wage rates of teenagers. We follow Card (1992a) and use nominal terms.[19] Results are found in Table 11. We find that a 1 percentage point increase in the fraction of teenage workers affected is associated with approximately a 20 percentage points increase in teenage workers' mean hourly wages, which is in the order of the magnitude reported by Card (1992a). Furthermore, similar to Card (1992a), we find no evidence of corresponding losses in teenage employment.[20] These results hold controlling for regional time effects, state linear trends, and pre-post 1992 state-specific effects in the changes of teenagers'

[18] The correlation between the fraction of affected workers measured using the May data and the 9 months averages as used in Card(1992) for the year 1989, is 0.69.

[19] Estimates are robust to the use of CPI adjusted minimum wages and the corresponding fraction of workers affected.

[20] In fact we find the contemporaneous association between the change in fraction affected and the change in teenagers' employment rate to be positive.

employment and wage rates, in addition to national time effects and state effects. Thus, the within states variation in the fraction affected reveals similar findings as those obtained from the cross-section variation employed by Card (1992a).

Why do the same adjustments in federal minimum wages generate conflicting reduced form employment effects? The key conceptual difference between Card's (1992a) approach and our setting, in this context, is with respect to the use of recent labor market outcomes to instrument treatment. The choice of a state to impose state-specific wage floors above federal standards is not exogenous to state-specific shocks in the demand (and supply) for less skilled workers. We address this concern by using pre-existing cross-state disparities in measures of income per capita and political preferences, which are not subject to local shocks in latent labor demand or supply factors to approximate differential impacts of a uniform adjustment in federal minimum wages.

Card (1992a) takes advantage of the most recent distribution of wages to approximate the fraction of workers affected, which is subject to a similar concern. The fraction of affected workers is exogenous fluctuations in local labor markets and state-specific adjustments in minimum wage policy.

To assess the empirical relevancy of this concern we regress the treatment variables - the fraction affected and the projected influences of the adjustments in federal minimum wages on state effective wage floors - on lagged labor market outcomes. Findings are found in Table 12.

Two main facts emerge. First, we find no evidence that adjustments in state-specific minimum wage policy or local labor market conditions are correlated with the projected influences of the adjustments in federal minimum wages on state effective wage floors. Second, it does not hold with respect to the proportion of teenage workers who earn less than the new federal minimum wage (and more than the old standard). We find that the proportion of teenage workers affected is procyclical. The fraction affected increases following a drop in state-specific unemployment rate. As expected the proportion affected is smaller when states impose specific wage floors higher than federal standards and the proportion drops following a rise in mean wages. These results hold controlling for regional time effects and state effects. These also hold when we allow for state-specific time trends.

Hence, while the adjustments in federal minimum wages are apparently exogenous to recent developments in local labor markets, the fraction affected is not. The evidence above indicate that the proportion of workers who earn less than the new federal wage standard is also affected by state-specific shocks to the demand (and supply) for labor

which might affect the employment and wage rates of teenagers via other channels.

A Naive Horse Race

Finally, we re-estimate the reduced form impacts of fraction affected and federal influences on state minimum wages on the employment and wage rates of teenagers. Since recent outcomes seem to matter, we control for lagged outcomes and extend the reduced form statistical models to include a dynamic structure of employment and wage rates changes. The first column in each outcome panel reports the regression coefficient of employment (or mean hourly wage, in logs) on the proportion of teenage workers who earn between the old and the new federal minimum wage according to the wage distribution in the previous year. The second specification includes the corresponding lagged outcomes. In the third column we introduce the federal influences on state effective minimum wage change. Results are found in Table 13. Controlling for lagged dependent variables, there is no evidence of a significant wage effect of adjustment in federal minimum wage, approximated indirectly, by the fraction of teenage workers affected. In contrast, we find that federal influences on state effective matter. A 10 percent increase in federal minimum wages raises hourly wages of teenage workers by a similar magnitude in states that federal standards are traditionally biding and reduces the employment of teenagers by approximately 5 percentage points in the following year. These results cannot be attributed to contemporaneous aggregate employment changes neither to region-year latent shock nor to state-specific trends in the employment and wage rates changes.

8 Conclusions

The idea of administered wages is ancient. Yet, the controversy is fresh. Following the influential work of Card and Krueger (summarized in their 1995 book *Myth and Measurement: The New Economics of the Minimum Wage*), a large body of empirical studies report conflicting evidence regarding the disemployment effects of increases in minimum wages.

The modern minimum-wage literature uses state-effective minimum wages to evaluate employment and earnings effects. Card's and Krueger's (1994) influential case study of the fast-food industry in New Jersey and Pennsylvania offered a novel setting to account for latent shocks in local labor markets. State borders that cut across labor markets were employed to account for latent local shocks, where they limited their

analyses to particular low-wage service industries (fast-food industry; Dube, Lester, and Reich, 2010).

Rather than focusing on a particular industry, we offer a new approach to identify the employment and wage effects of minimum wages in a cross-state setting. We use adjustments in federal minimum wages - that affect effective nominal wage floors in some states more than others - to identify the impact of minimum wages on employment and uncover biases in past research. We are not the first to build on Stigler's (1946) observation that a uniform national minimum wage floor is implicitly more restrictive in states with lower average wages. Yet, we are the first to recognize that a uniform adjustment in federal minimum wages impacts differentially state effective minimum wages, which we exploit to identify an external source of variation in state effective wage floors. Furthermore, we do not take the pre-existing state minimum wage rate as exogenous when the federal government changes the federal minimum. Rather we use persistent cross-state disparities in standards of living and political preferences, that accounts for much of the cross state variation in state minimum wage policy, to instrument the impact of federal adjustments in national wage floors on state effective minimum wages and assess its impact on earnings and employment. From the evaluation perspective, accounting for the endogenous determination of effective minimum wages at the state level turns out to be materially important for drawing accurate inferences about the impact of labor floor prices on the employment prospects of low-paid workers.

Using federal and state minimum wage data from 1968 and labor market outcomes at the state-year level from 1977 we estimate the causal impact of minimum wage on teenagers' employment and wage rates. Consistent with previous studies we find mild wage effects and no evidence for corresponding disemployment effects using the actual state effective minimum wages. This holds in the long-run and the short-run. In contrast, we find notable wage effects and corresponding disemployment effects when we use the differential impacts of adjustments in federal minimum wages as the external source of variation in state effective minimum wages floors. The long-run elasticity of employment with respect to minimum wages is approximately -1. Estimates are robust to regional-year effects and state long-run trends and most importunately differential time effects for states that were always restricted by federal minimum wages (in addition to national time effects and state fixed effects). The difference between OLS and IV estimates reflects the procyclicality of state effective minimum wages in traditional liberal states with high income per capita that typically were not restricted by federal

wage standards. Using the exact timing around adjustments in minimum wages, we estimate short-run effects.

Consistent with the long-run estimates we find no evidence for employment effects in response to changes in state effective minimum wages. Yet, we find that a rise in minimum wage have an instantaneous impact on wage rates and a corresponding negative impact on employment. Thus, minimum wages matter. Minimum wage increases boost teenage wage rates and reduce teenage employment. But, evaluating the welfare implications is beyond the scope of this paper.

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Figure 1:
Number of Years Between In Which State-Specific Minimum Wage Was Higher then Federal Minimum Wage
(May of Each Year, 1968-2007 Period)

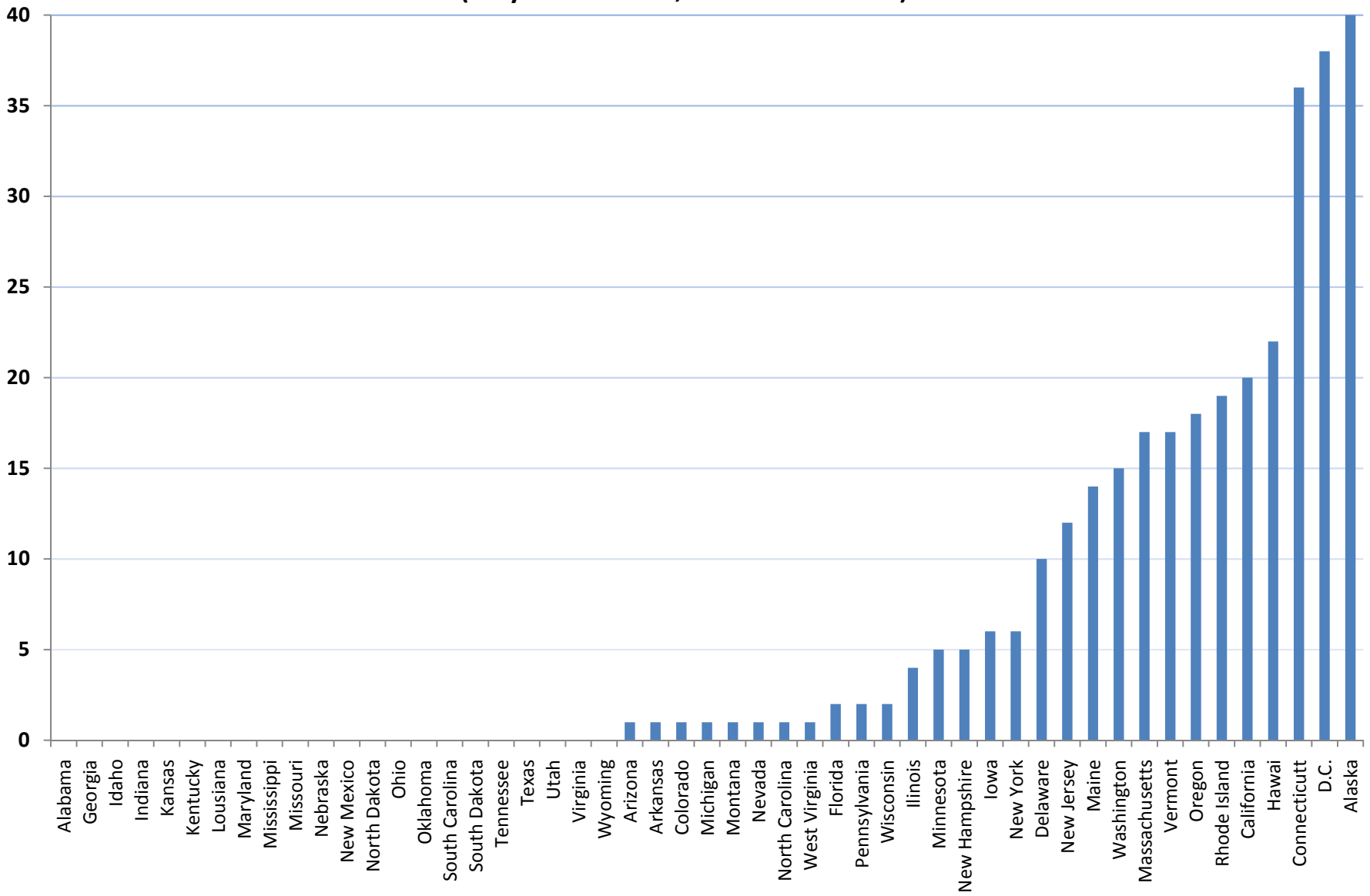
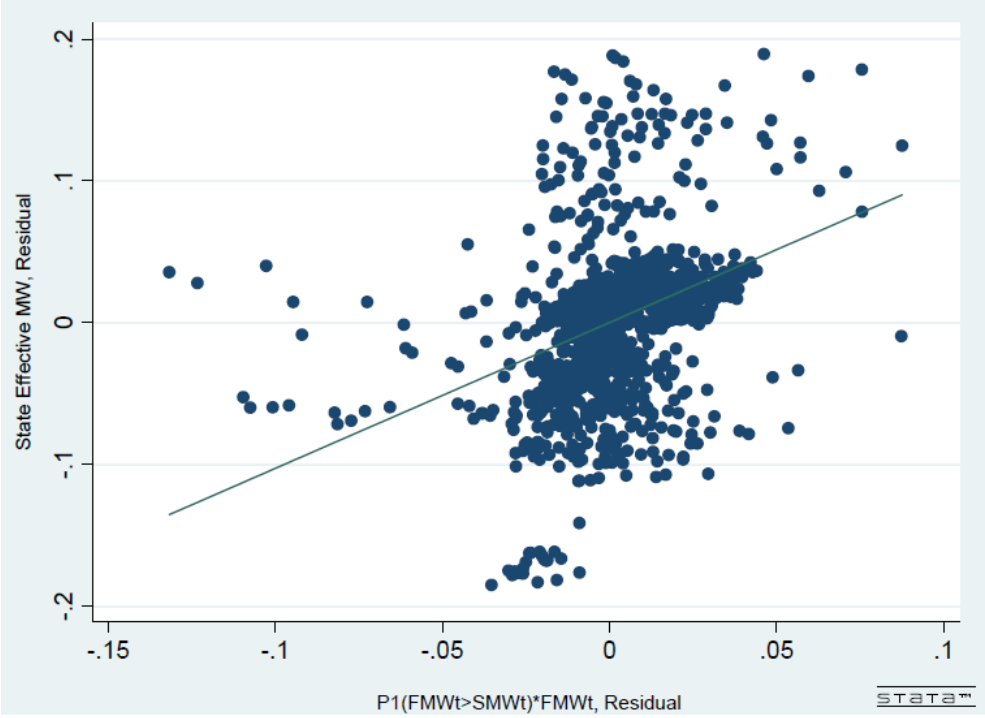


Figure 2: State Effective Minimum Wages Depending on Federal Minimum Wages, 1977-2007

2.1: Levels



2.2: Changes

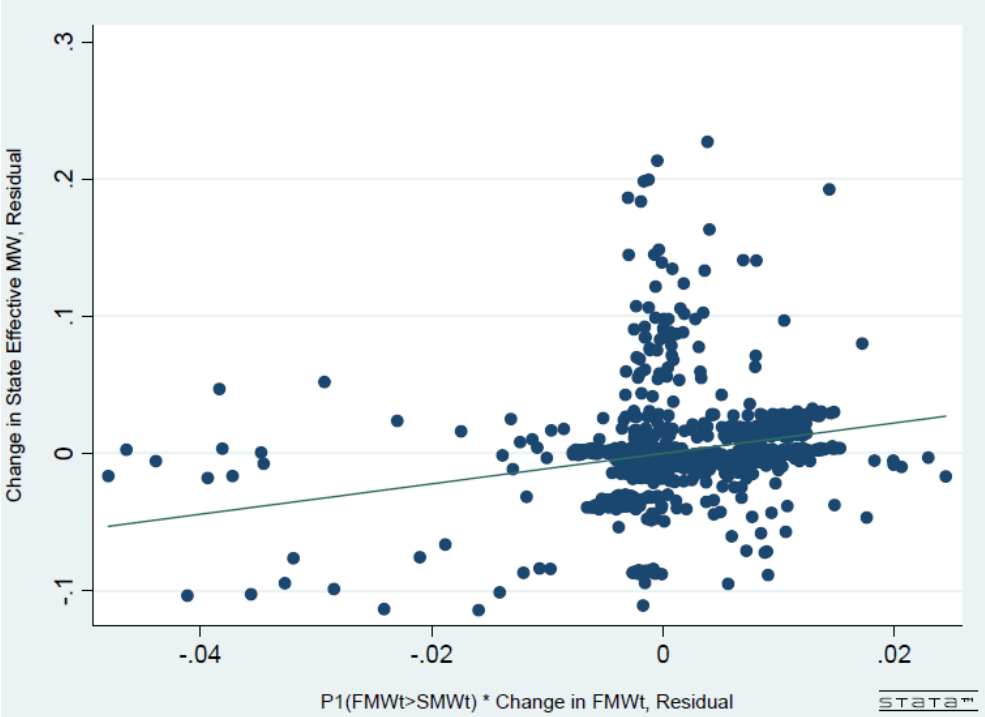


Table 1

The Propensity of Federal Minimum Wage to be Equal or Higher than the State Specific Minimum Wage, 1968-2007

OLS and Probit (dF/dX) Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)
	1968-07	1977-07			
Panel A: Proportion of Years between 1968-07 and 1977-07 with Federal MW >= State MW					
Government Liberalism Index for the Years 1960-68 (Berry et al., 1998)	-0.425*** (0.121)	-0.446*** (0.128)		-0.297** (0.118)	--
Income per Capita, 1969 (BLS, 1970, Census)	-0.174*** (0.057)	-0.156** (0.060)		-0.057 (0.058)	--
Proportion of Years with Federal MW>= State MW between 1968 and 1976			0.642*** (0.086)	0.425*** (0.106)	--
R-square	0.536	0.497	0.539	0.626	--
Observations	50	50	50	50	--
Panel B: The Probability that Federal MW >= State MW, Yearly, 1968-07 and 1977-07					
Government Liberalism Index for the Years 1960-68 (Berry et al., 1998)	-0.321*** (0.107)	-0.407*** (0.150)		-0.389*** (0.129)	-0.240*** (0.093)
Income per Capita, 1969 (BLS, 1970, Census)	-0.158*** (0.048)	-0.165*** (0.059)		-0.079 (0.062)	-0.028 (0.039)
Proportion of Years with Federal MW>= State MW between 1968 and 1976			0.454*** (0.075)	0.334** (0.155)	
Proportion of Years with Federal MW>= State MW between 1968 and t-2					0.871*** (0.289)
R-square	0.251	0.254	0.179	0.298	0.425
Observations	2000	1550	1550	1550	1550

Notes:
Sample consists of 50 state level observations in Panel A and 50-state-year observations for the years 1968-2007 (excluding the District of Columbia).
The dependent variable in Column 1 (Columns 2-4) of Panel A is the proportion of years between 1968 and 2007 (1977 and 2007) the state minimum wage was equal to federal minimum wage. The dependent variable in Panel B is the binary variable, equal to 1 if the Federal MW is above the state MW and zero otherwise.
The data on the income per capita in 1969 is taken from U.S. Census Bureau, Historical Income Tables for States.
"1960-68 Average of the Government Ideology index by Berry et al (1998)" refers to average degree of states' liberalism using annual data for 1960-68 period provided by Berry et al (1998). It ranges between 0 and 1 with higher values indicating a higher degree of liberalism in a state. The index is available for 50 states, and is not available for District of Columbia.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 2

Regression Models for State Effective Minimum Wages Depending on Federal Minimum Wages, 1977-2007

OLS Estimates;

Variables of Interest	The Probability that Federal MW is Equal or Higher than State Specific MW, Projected by:							
	P1:Income per Capita 1969, Berry et al. GI Index 1960-68 and the Proportion of Years that FMW>=SMW between 1968 and 1976				P2: Income per Capita 1969, GI Index 1960-68 and the Proportion of Years that FMW>=SMW since 1968 to Two Years Ago			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: Minimum Wage Levels (in logs)								
State Propensity to be Restricted by Federal MW * Federal Minimum Wage (in logs)	1.028*** (0.092)	0.706*** (0.189)	0.485*** (0.111)	0.399*** (0.123)	0.697*** (0.061)	0.533*** (0.089)	0.336*** (0.076)	0.283*** (0.079)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	No	No	Yes	No	No	No	Yes
Observations	1550	1550	1550	1550	1550	1550	1550	1550
Panel B: Changes in Minimum Wage								
State Propensity to be Restricted by Federal MW * Change in Federal Minimum Wage (in logs)	1.108*** (0.093)	0.856*** (0.173)	0.857*** (0.176)	0.799*** (0.190)	0.749*** (0.071)	0.706*** (0.115)	0.729*** (0.119)	0.702*** (0.122)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	No	No	Yes	No	No	No	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500

Notes:
Sample consists of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).
The dependent variable in Panels A and B are the level of state effective minimum wages (in logs) and the change in state effective minimum wage, respectively.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs). We use national CPI to 2000$ to deflate federal and state effective minimum wages.
All specification control for unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 3
Regression Models for State-Level Teenage Employment Rates, 1977-2007

OLS Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)
State Effective Minimum Wage (in logs)	-0.106***	-0.071**	-0.008	-0.006
	(0.037)	(0.029)	(0.028)	(0.031)
Unemployment Rates of Males Aged 25 to 64	-0.930***	-0.809***	-0.648***	-0.655***
	(0.136)	(0.130)	(0.114)	(0.126)
Proportion of Individuals Aged 16 to 19 in State's Population	-0.315	-0.132	-0.080	-0.069
	(0.315)	(0.236)	(0.207)	(0.217)
Controlling for:				
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By	No	No	No	Yes
Observations	1550	1550	1550	1550
R-Squared	0.716	0.754	0.784	0.789

Notes:
Sample consists of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).
The dependent variable is the employment-to-population ratio for teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and the federal minimum wages for the state and year (in logs). We use national CPI to 2000$ to deflate federal and state effective minimum wages.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 4

Reduced Form Regression Models for the Differential Effect of Federal Minimum Wage on State-Level Teenage Employment Rates, 1977-2007

OLS Estimates;

Variables of Interest	(i)	(ii)	(iii)	(iv)
Panel A: Using P1 to approximate state propensity that FMWt>=SMWt				
Ps1 * Federal Minimum Wage (in logs)	**-0.526*** **	**-0.463*** **	**-0.165** **	**-0.165** **
	(0.132)	(0.073)	(0.064)	(0.064)
Unemployment Rates of Males Aged 25 to 64	-0.949***	-0.799***	-0.660***	-0.660***
	(0.134)	(0.125)	(0.114)	(0.114)
Proportion of Individuals Aged 16 to 19 in State's Population	-0.203	-0.063	-0.058	-0.058
	(0.223)	(0.236)	(0.208)	(0.208)
Panel B: Using P2 to approximate state propensity that FMWt>=SMWt				
Ps2 * Federal Minimum Wage (in logs)	**-0.299*** **	**-0.271*** **	**-0.114** **	**-0.113** **
	(0.052)	(0.051)	(0.055)	(0.055)
Unemployment Rates of Males Aged 25 to 64	-0.952***	-0.794***	-0.671***	-0.676***
	(0.134)	(0.124)	(0.114)	(0.125)
Proportion of Individuals Aged 16 to 19 in State's Population	-0.138	-0.018	-0.036	-0.018
	(0.214)	(0.234)	(0.207)	(0.217)
Ps2	0.477***	0.436***	0.152	0.147
	(0.090)	(0.112)	(0.126)	(0.128)
Controlling for:				
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	No	No	Yes
Observations	1550	1550	1550	1550
R-Squared	0.716	0.754	0.784	0.789

Notes:
Sample consists of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).
The dependent variable is the employment-to-population ratio for teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 5
Instrumental Variables Regression Models for State-Level Teenage Employment Rates, 1977-2007

TSLS Estimates;

	P1: Income per Capita 1969, Berry et al. GI Index 1960-68 and the Proportion of Years that FMW>=SMW between 1968 and 1976				P2: Income per Capita 1969, GI Index 1960-68 and the Proportion of Years that FMW>=SMW since 1968 to Two Years Ago			
Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: 2nd stage								
State Effective Minimum Wage (in logs)	**-0.512*** (0.148)**	**-0.656*** (0.175)**	**-0.339** (0.134)**	**-0.410** (0.195)**	**-0.429*** (0.083)**	**-0.507*** (0.127)**	**-0.341** (0.165)**	**-0.400* (0.219)**
Unemployment Rates of Males Aged 25 to 64	-0.932*** (0.175)	-0.763*** (0.148)	-0.675*** (0.112)	-0.687*** (0.125)	-0.950*** (0.146)	-0.792*** (0.135)	-0.696*** (0.116)	-0.707*** (0.127)
Proportion of Individuals Aged 16 to 19 in State's Population	-0.012 (0.235)	-0.085 (0.226)	-0.021 (0.189)	-0.079 (0.214)	-0.019 (0.228)	-0.056 (0.218)	-0.016 (0.186)	-0.068 (0.213)
P(FMWt>=SMWt)	--	--	--	--	-0.119 (0.074)	-0.100** (0.041)	-0.078** (0.037)	-0.076** (0.038)
Weak identification test (Kleibergen-Paap rk Wald F statistic)	123.9	14.0	19.0	10.5	132.2	36.2	19.3	12.6
Panel B: 1st stage								
P(FMWt>=SMWt) * Federal Minimum Wage (in logs)	1.028*** (0.092)	0.706*** (0.189)	0.485*** (0.111)	0.399*** (0.123)	0.697*** (0.061)	0.533*** (0.089)	0.336*** (0.076)	0.283*** (0.079)
P(FMWt>=SMWt)					-1.389*** (0.164)	-1.055*** (0.187)	-0.675*** (0.205)	-0.557** (0.209)
Controlling for:								
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	No	No	Yes	No	No	No	Yes
Observations	1550	1550	1550	1550	1550	1550	1550	1550
R-Squared	0.651	0.670	0.763	0.763	0.684	0.712	0.764	0.766

Notes:
Sample consists of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).
The dependent variable is the employment-to-population ratio for teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 6

Federal Minimum Wage Vs. Aggregate Time Effects, 1977-2007

Dependent Variable: Teenage (16-19) Employment to Population Ratio

OLS and TSLS Estimates;

Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
State Effective Minimum Wage (in logs) Instrumented by P1s*θt	**-0.192*** ** (0.049)	**--**	**-0.001** (0.044)	**-0.201** ** (0.081)	**--**	**0.016** (0.075)	**0.073** (0.079)	**--**	**0.139** (0.085)	**0.081** (0.091)	**--**	**0.138** (0.099)
P1s * Federal Minimum Wage (in logs)	**--**	**-0.526*** ** (0.127)	**-0.525*** ** (0.137)	**--**	**-0.463*** ** (0.069)	**-0.474*** ** (0.068)	**--**	**-0.165*** ** (0.059)	**-0.232*** ** (0.057)	**--**	**-0.164*** ** (0.059)	**-0.219*** ** (0.059)
Unemployment Rates of Males Aged 25 to 64	-0.931*** (0.138)	-0.949*** (0.129)	-0.949*** (0.129)	-0.799*** (0.125)	-0.799*** (0.117)	-0.800*** (0.118)	-0.642*** (0.106)	-0.660*** (0.104)	-0.654*** (0.108)	-0.648*** (0.116)	-0.663*** (0.114)	-0.655*** (0.117)
Proportion of Individuals Aged 16 to 19 in State's Population	-0.251 (0.284)	-0.203 (0.214)	-0.203 (0.218)	-0.121 (0.217)	-0.063 (0.220)	-0.062 (0.221)	-0.094 (0.194)	-0.058 (0.191)	-0.074 (0.198)	-0.067 (0.196)	-0.043 (0.198)	-0.032 (0.197)
Weak identification test (Kleibergen-Paap rk Wald F statistic):												
	187.6	--	182.4	218.2	--	115.1	74.2	--	62.8	81.9	--	56.3
Controlling for:												
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Effects	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post 1992 State Effects	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Differential Year Effects For F-States and All Others	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
R-Squared	0.713	0.727	0.727	0.750	0.760	0.760	0.783	0.785	0.781	0.788	0.790	0.787

Notes:
Sample consists of 50 state-year observations for the years 1977-2007 (excluding the District of Columbia).
The dependent variable is the employment-to-population ratio for teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 7
Regression Models of Last Year Unemployment Rate on Current Year State Effective Minimum Wages Over the Years 1978-2007

OLS Estimates; Dependent Variable, State Effective Minimum Wage (in logs)

Variables of Interest	P1: Income per Capita in 1969, Berry et al. GI Index 1960-68, and Proportion of Years between 1968 to 1976 FMW>=SMW		P2: Income per Capita in 1969, Berry et al. GI Index 1960-68, and Lagged (2) Proportion of Years FMW>=SMW	
	(i)	(ii)	(iii)	(iv)
Panel A: Using Unemployment Rate for Males in 25-64 Age Group				
Unemployment Rate in the **Previous Year**	-0.045**	--	-0.028***	--
	(0.019)		(0.010)	
Unemployment Rate in the **Previous Year** * Probability (Projected) that FMW>=SMW in the **Previous Year**	0.051**	--	0.031***	--
	(0.021)		(0.011)	
Panel B: Using State Unemployment Rate				
Unemployment Rate in the **Previous Year**	--	-0.067***	--	-0.045***
		(0.014)		(0.007)
Unemployment Rate in the **Previous Year** * Probability (Projected) that FMW>=SMW in the **Previous Year**	--	0.074***	--	0.049***
		(0.015)		(0.008)
Combined Effect	0.005	0.007	0.003	0.004
	(0.002)**	(0.002)***	(0.002)	(0.002)*
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	1500	1500	1500	1500
R-Squared	0.810	0.816	0.813	0.825

Notes:
Sample consists of 50 state-year observations for the years 1978-2007 (excluding the District of Columbia). The dependent variable is state effective (actual) minimum wage, the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
The unemployment rate measure used in Panel A is 1-year lagged value of the unemployment rate of males aged 25 to 64 is calculated using in May CPS survey week. The unemployment rate measure used in Panel B is 1-year lagged value of state's unemployment rate by May, taken from BLS.
The probability of a state to be restricted by federal minimum wages is projected from the corresponding model in Table 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 8

Regression Models for State Changes in Average Teenage Employment Rates and Earnings, 1978-2007

OLS Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Panel A: Change in Employment-Population Rates						
Change in State Effective Minimum Wage	**-0.018** (0.033)	**--**	**-0.018** (0.034)	**--**	**-0.033** (0.048)	**--**
Change in State Effective Minimum Wage Last Year	**--**	**-0.019** (0.040)	**--**	**-0.018** (0.041)	**--**	**0.064** (0.060)
Change in Unemployment Rates of Males Aged 25 to 64	-0.539*** (0.084)	-0.519*** (0.078)	-0.540*** (0.086)	-0.521*** (0.079)	0.031 (0.103)	0.030 (0.101)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	0.535*** (0.191)	0.531*** (0.193)	0.539*** (0.195)	0.535*** (0.198)	0.301 (0.216)	0.305 (0.213)
Panel B: Change in Log Average Hourly Wages						
Change in State Effective Minimum Wage	**0.368*** ** (0.113)	**--**	**0.368*** ** (0.115)	**--**	**0.119** (0.128)	**--**
Change in State Effective Minimum Wage Last Year	**--**	**0.037** (0.075)	**--**	**0.034** (0.078)	**--**	**0.037** (0.123)
Change in Unemployment Rates of Males Aged 25 to 64	-0.657*** (0.222)	-0.789*** (0.249)	-0.657*** (0.226)	-0.787*** (0.255)	-0.287 (0.366)	-0.288 (0.366)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	0.073 (0.551)	0.073 (0.571)	0.072 (0.560)	0.069 (0.579)	-0.464 (0.473)	-0.474 (0.477)
Year Fixed Effects	No	No	No	No	Yes	Yes
Region-Year Fixed Effects	No	No	No	No	Yes	Yes
State Fixed Effects	No	No	Yes	Yes	No	No
R-Squared	0.031	0.031	0.109	0.110	0.176	0.176
Observations	1500	1500	1500	1500	1500	1500

Notes:
Sample consists of 50 state observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variables are the between years changes in the employment-to-population ratio in Panel A and mean wages for teenagers aged 16-19 in the May survey week in Panel B.
The change in state effective (actual) minimum wage, the maximum of the state and federal minimum wages for the state and year (in logs), is deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 9a

Regression Models for Changes in Federal Minimum Wage and Changes in State Teenage Employment Rates, 1978-2007

OLS Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: Using P1								
P1s * Change in Federal Minimum Wage	**-0.027** (0.207)		**-0.027** (0.211)		**0.015** (0.261)		**0.013** (0.283)	
P1s * Lagged Change in Federal Minimum Wage		**-0.212**** (0.099)		**-0.213**** (0.101)		**-0.336**** (0.135)		**-0.457***** (0.162)
Change in Unemployment Rates of Males Aged 25 to 64	0.069 (0.100)	0.074 (0.103)	0.070 (0.102)	0.074 (0.105)	0.031 (0.102)	0.032 (0.103)	0.033 (0.111)	0.036 (0.111)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	0.340* (0.186)	0.337* (0.187)	0.340* (0.189)	0.337* (0.190)	0.304 (0.217)	0.299 (0.216)	0.300 (0.235)	0.294 (0.234)
R-Squared	0.110	0.111	0.111	0.112	0.175	0.177	0.201	0.203
Panel B: Using P2								
P2s * Change in Federal Minimum Wage	**-0.067** (0.114)		**-0.065** (0.117)		**-0.099** (0.181)		**-0.110** (0.191)	
P2s * Lagged Change in Federal Minimum Wage		**-0.101**** (0.050)		**-0.103**** (0.051)		**-0.156**** (0.064)		**-0.208***** (0.074)
Change in Unemployment Rates of Males Aged 25 to 64	0.065 (0.100)	0.074 (0.103)	0.065 (0.102)	0.074 (0.104)	0.026 (0.103)	0.034 (0.103)	0.029 (0.111)	0.039 (0.112)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	0.340* (0.185)	0.340* (0.187)	0.340* (0.189)	0.340* (0.190)	0.303 (0.216)	0.302 (0.216)	0.296 (0.234)	0.296 (0.234)
R-Squared	0.110	0.110	0.111	0.112	0.176	0.176	0.201	0.202
Year Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Region-Year Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
State Effects for Post 1992	No	No	No	No	No	No	Yes	Yes
Year Effects for F-States	No	No	No	No	No	No	Yes	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500

Notes:
Sample consists of 50 state observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable is the change in the employment-to-population ratio between two consecutive years for teenagers aged 16-19 in the May survey week.
State effective (actual) minimum wage, the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 9b
Regression Models for Changes in Federal Minimum Wage and Changes in State Average Earnings, 1978-2007

OLS Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: Using P1								
P1s * Change in Federal Minimum Wage	**0.895** (0.570)		**0.895** (0.580)		**1.004**** (0.379)		**0.964**** (0.411)	
P1s * Lagged Change in Federal Minimum Wage		**-0.163** (0.321)		**-0.162** (0.326)		**-0.157** (0.334)		**-0.282** (0.349)
Change in Unemployment Rates of Males Aged 25 to 64	-0.308 (0.345)	-0.336 (0.341)	-0.309 (0.352)	-0.337 (0.348)	-0.271 (0.366)	-0.287 (0.366)	-0.307 (0.363)	-0.320 (0.364)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	-0.450 (0.535)	-0.475 (0.532)	-0.449 (0.545)	-0.474 (0.542)	-0.452 (0.476)	-0.477 (0.476)	-0.558 (0.490)	-0.588 (0.485)
R-Squared	0.065	0.062	0.066	0.063	0.187	0.185	0.203	0.202
Panel B: Using P2								
P2s * Change in Federal Minimum Wage	**0.594** (0.375)		**0.608** (0.390)		**0.681*** (0.339)		**0.666*** (0.356)	
P2s * Lagged Change in Federal Minimum Wage		**-0.080** (0.158)		**-0.083** (0.160)		**-0.080** (0.129)		**-0.112** (0.146)
Change in Unemployment Rates of Males Aged 25 to 64	-0.300 (0.346)	-0.333 (0.343)	-0.303 (0.353)	-0.336 (0.350)	-0.264 (0.367)	-0.287 (0.367)	-0.303 (0.366)	-0.323 (0.366)
Change in the Proportion of Individuals Aged 16 to 19 in State's Population	-0.456 (0.533)	-0.476 (0.532)	-0.452 (0.543)	-0.474 (0.542)	-0.451 (0.475)	-0.472 (0.475)	-0.558 (0.488)	-0.583 (0.485)
R-Squared	0.065	0.062	0.066	0.063	0.187	0.185	0.204	0.202
Year Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Region-Year Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
State Effects for Post 1992	No	No	No	No	No	No	Yes	Yes
Year Effects for F-States	No	No	No	No	No	No	Yes	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500

Notes:
Sample consists of 50 state observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable is the change in the average hourly wages for teenagers aged 16-19 in the May survey week between two consecutive years.
State effective (actual) minimum wage, the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 10a
OLS and Instrumental Variables Regression Models for Changes in State-Level Teenage Employment Rates, 1978-2007

OLS and TSLS Estimates;

	OLS		TSLS					
			P1: Income per Capita 1969, Berry et al. GI Index 1960-68 and the Proportion of Years that FMW>=SMW between 1968 and 1976			P2: Income per Capita 1969, GI Index 1960-68 and the Proportion of Years that FMW>=SMW since 1968 to Two Years Ago		
Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: 2nd stage								
Lagged Change in State Effective Minimum Wage (in	**0.062** (0.059)	**0.065** (0.066)	**-0.362**** (0.176)	**-0.365**** (0.180)	**-0.508**** (0.236)	**-0.215**** (0.099)	**-0.230**** (0.104)	**-0.314**** (0.130)
Change in Unemployment Rates of Males Aged 25 to 64	0.029 (0.099)	0.033 (0.111)	0.032 (0.108)	0.035 (0.111)	0.033 (0.114)	0.031 (0.105)	0.032 (0.108)	0.027 (0.113)
Change in Proportion of Individuals Aged 16 to 19 in State's Population	0.302 (0.210)	0.303 (0.230)	0.302 (0.230)	0.299 (0.235)	0.274 (0.266)	0.304 (0.221)	0.305 (0.226)	0.288 (0.250)
P(FMWt>=SMWt)	--	--	--	--	--	0.003* (0.002)	0.022** (0.010)	0.039 (0.030)
Weak identification test (Kleibergen-Paap rk Wald F statistic)	--	--	37.7	36.7	28.5	73.8	70.5	59.0
Panel B: 1st stage								
P(FMWt>=SMWt) * Change in Federal Minimum Wage (in	--	--	0.924*** (0.150)	0.922*** (0.152)	0.900*** (0.169)	0.702*** (0.082)	0.678*** (0.081)	0.662*** (0.086)
P(FMWt>=SMWt)			--	--	--	-0.024*** (0.003)	0.020 (0.021)	0.096** (0.037)
Controlling for:								
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes	Yes	No	Yes	Yes
Region-Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post 1992 State Effects	No	Yes	No	No	Yes	No	No	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	Yes	No	No	Yes	No	No	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500
R-Squared	0.175	0.202	0.137	0.139	0.139	0.159	0.159	0.175

Notes:
Sample consists of 50 state-year observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable is the between years changes in the employment-to-population ratios for teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 10b
OLS and Instrumental Variables Regression Models for Changes in State-Level Teenage Average Wages, 1978-2007

OLS and TSLS Estimates;

	OLS		TSLS					
			P1: Income per Capita 1969, Berry et al. GI Index 1960-68 and the Proportion of Years that FMW>=SMW between 1968 and 1976			P2: Income per Capita 1969, GI Index 1960-68 and the Proprtion of Years that FMW>=SMW since 1968 to Two Years Ago		
Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: 2nd stage								
Lagged Change in State Effective Minimum Wage (in	**0.120**	**0.108**	**1.172****	**1.172****	**1.206****	**0.991****	**0.964****	**0.950****
	(0.124)	(0.142)	(0.495)	(0.504)	(0.593)	(0.466)	(0.445)	(0.465)
Change in Unemployment Rates of Males Aged 25 to 64	-0.285	-0.318	-0.279	-0.282	-0.279	-0.279	-0.280	-0.278
	(0.359)	(0.364)	(0.368)	(0.374)	(0.382)	(0.366)	(0.373)	(0.381)
Change in Proportion of Individuals Aged 16 to 19 in State's Population	-0.464	-0.568	-0.381	-0.378	-0.404	-0.398	-0.402	-0.450
	(0.464)	(0.485)	(0.451)	(0.460)	(0.503)	(0.453)	(0.459)	(0.488)
P(FMWt>=SMWt)	--	--	--	--	--	-0.003	-0.033	-0.077
						(0.004)	(0.036)	(0.082)
Weak identification test (Kleibergen-Paap rk Wald F statistic)	--	--	25.4	24.5	17.7	38.6	37.9	33.1
Panel B: 1st stage								
P(FMWt>=SMWt) * Change in Federal Minimum Wage (in	--	--	0.857***	0.856***	0.799***	0.669***	0.706***	0.702***
			(0.170)	(0.173)	(0.190)	(0.108)	(0.115)	(0.122)
P(FMWt>=SMWt)			--	--	--	0.011***	0.072***	0.144***
						(0.004)	(0.018)	(0.028)
Controlling for:								
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes	Yes	No	Yes	Yes
Region-Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post 1992 State Effects	No	Yes	No	No	Yes	No	No	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	Yes	No	No	Yes	No	No	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500
R-Squared	0.185	0.202	0.123	0.124	0.143	0.142	0.146	0.168

Notes:
Sample consists of 50 state-year observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable is the between years changes in the average wages of teenagers aged 16-19 in the May survey week.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs), deflated using national CPI to 2000$.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 11
Reduced Form Regression Models for State Changes in Teenage Employment Rates and Average Earnings, 1978-2007

OLS Estimates

Variables of Interest	(i)	(ii)	(iii)	(iv)
Panel A: Change in Employment-Population Rates				
Fraction Affected	**0.067***** (0.018)	--	**0.070**** (0.033)	--
Fraction Affected (last year)	--	**-0.019** (0.022)	--	**0.008** (0.031)
R-Squared	0.161	0.155	0.279	0.273
Panel B: Change in Average Hourly Wages (in logs)				
Fraction Affected	**0.194***** (0.055)	--	**0.225**** (0.091)	--
Fraction Affected (last year)	--	**-0.109**** (0.049)	--	**-0.042** (0.071)
R-Squared	0.113	0.108	0.193	0.190
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Region-Year Effects	No	No	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes
State Linear Time Trends	No	No	Yes	Yes
Observations	1500	1500	1500	1500

Notes:
Sample consists of 50 state-year observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable in Panel A is the change in the employment-to-population ratio of teenagers aged 16-19 in the May survey week.
The dependent variable in Panel B is the change in the mean wage of teenagers aged 16-19 in the May survey week.
Following Card (1992), the fraction of affected workers is equal to the proportion of teenage workers last year who report hourly wages that are equal to or higher than last year's federal minimum wage and not higher than federal minimum wage this year's federal minimum wage.
Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week. All specification control for the change in state unemployment rate (males aged 25 to 64) and the change in the proportion of teenagers in the state population.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 12

Regression Models of Last Years Changes in Unemployment Rate, Average Teenage Wages and State Minimum Wage Status on the Treatment Variables 1979-2006

OLS Estimates;

	The Treatment Variable							
Variables of Interest	The Proportion of Teenage Workers Affected				Ps1 * the Change in Federal Minimum Wage			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
The Change in the State Unemployment in the **Previous** Year	**-0.602*** ** (0.217)	**-0.339*** (0.180)	**-0.313*** (0.187)	**-0.291** (0.183)	**-0.008** (0.014)	**-0.002** (0.012)	**-0.002** (0.012)	**-0.001** (0.012)
The Change in the State Unemployment **Two** Years Ago	**-0.383** ** (0.179)	**-0.182** (0.183)	**-0.149** (0.193)	**-0.165** (0.193)	**0.005** (0.015)	**0.020** (0.016)	**0.019** (0.016)	**0.020** (0.016)
The Change in the Wage Rate of Teenagers in the P**revious** Year	**-0.116*** ** (0.023)	**-0.108*** ** (0.020)	**-0.111*** ** (0.020)	**-0.106*** ** (0.020)	**0.001** (0.002)	**0.001** (0.002)	**0.001** (0.002)	**0.001** (0.002)
The Change in the Wage Rate of Teenagers in **Two** Years Ago	**-0.075*** (0.042)	**-0.048** ** (0.022)	**-0.050** ** (0.022)	**-0.044** ** (0.022)	**-0.001** (0.003)	**0.001** (0.001)	**0.001** (0.001)	**0.001** (0.001)
Federal State in the **Previous** Year (FMWt-1 >= SMWt-1)	**0.025*** ** (0.007)	**0.020** ** (0.008)	**0.038*** ** (0.010)	**0.033*** ** (0.011)	**0.002*** (0.001)	**0.000** (0.001)	**0.003** (0.002)	**0.003** (0.002)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes	No	No	Yes	Yes
State Linear Time Trends	No	No	No	Yes	No	No	No	Yes
Observations	1400	1400	1400	1400	1400	1400	1400	1400
R-Squared	0.825	0.835	0.876	0.887	0.956	0.963	0.979	0.981

Notes:
Sample consists of 50 state-year observations for the years 1979-2006 (excluding the District of Columbia).
The dependent variable in the first panel is the fraction of workers affected that equals to the proportion of teenage workers last year who report hourly wages that are equal or higher to last year federal minimum wage and not higher than federal minimum wage this years.
The dependent variable in the second panel is the interaction between state's propensity of be restricted by federal minimum wages (Ps1) and the change in federal minimum wages.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table 13

Reduced Form Regression Models for the Differential Effect of Federal Minimum Wage and Fraction Affected on Changes in State-Level Teenage Employment Rates and Average Wags, 1980-2006

OLS Estimates

	Wages			**Employment**		
Variables of Interest	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Fraction Affected	**0.236****	**0.090**	**0.074**	--	--	--
	(0.104)	(0.088)	(0.089)			
Ps1 * the Change in Federal Minimum Wage (in logs)	--	--	**1.168***	--	--	--
			(0.666)			
Fraction Affected (last year)	--	--	--	**-0.008**	**0.010**	**0.016**
				(0.036)	(0.035)	(0.036)
Ps1 * the Lagged Change in Federal Minimum Wage (in logs)	--	--	--	--	--	**-0.452****
						(0.217)
Lagged Outcomes						
Last Year	--	**-0.683*****	**-0.685*****	--	**-0.528*****	**-0.528*****
		(0.032)	(0.032)		(0.035)	(0.035)
Two Years Ago	--	**-0.341*****	**-0.343*****	--	**-0.288*****	**-0.287*****
		(0.033)	(0.033)		(0.022)	(0.022)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Post 1992 State Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Linear Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1350	1350	1350	1350	1350	1350
R-Squared	0.230	0.487	0.489	0.189	0.383	0.384

Notes:

Sample consists of 50 state-year observations for the years 1980-2006 (excluding the District of Columbia).

The dependent variable in the first panel is the change in the mean wage of teenagers aged 16-19 in the May survey week.

The dependent variable in the second panel is the change in the employment-to-population ratio of teenagers aged 16-19 in the May survey week.

Following Card (1992), the fraction of affected workers is equal to the proportion of teenage workers last year who report hourly wages that are equal to or higher than last year's federal minimum wage and not higher than federal minimum wage this year's federal minimum wage.

Unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week. All specification control for the change in state unemployment rate (males aged 25 to 64) and the change in the proportion of teenagers in the state population.

All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.

Robust standard errors clustered by state of residence during the survey week are in parentheses.

(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.

Table A1:
Federal Minimum Wages, 1938 to 2009

Source: Bureau of Labor Statistics

Date From Which the New Federal Minimum Wage Is Effective	Value
Oct 24, 1938	$0.25
Oct 24, 1939	$0.30
Oct 24, 1945	$0.40
Jan 25, 1950	$0.75
Mar 1, 1956	$1.00
Sep 3, 1961	$1.15
Sep 3, 1963	$1.25
Feb 1, 1967	$1.40
Feb 1, 1968	$1.60
May 1, 1974	$2.00
Jan. 1, 1975	$2.10
Jan 1, 1976	$2.30
Jan 1, 1978	**$2.65**
Jan 1, 1979	**$2.90**
Jan 1, 1980	**$3.10**
Jan 1, 1981	**$3.35**
Apr 1, 1990	**$3.80**
Apr 1, 1991	**$4.25**
Oct 1, 1996	**$4.75**
Sep 1, 1997	**$5.15**
Jul 24, 2007	$5.85
Jul 24, 2008	$6.55
Jul 24, 2009	$7.25

Table A2: 1977-2007 Averages By States for Selected Key Variables

State	(i) Employment to Population Ratio for the 16-19 Age Group (percent)	(ii) Fraction of Individuals in the 16-19 Age Group in States' Population (Percent)	(iii) Unemployment Rate of Males Aged Between 25 and 64	(iv) States' Unemployment Rates Reported By Bureau of Labor Statistics	(v) Average Hourly Wages of the 16-19 Age Group (deflated to 2000$)	(vi) Average Value of State Effective MW (deflated to 2000$)
Alabama	33.46	8.51	4.12	6.57	5.98	5.26
Alaska	38.82	9.31	7.35	8.11	8.18	6.17
Arizona	42.62	8.51	3.57	5.89	6.30	5.30
Arkansas	38.29	8.64	4.03	6.46	6.21	5.29
California	36.01	8.33	4.79	6.91	7.12	5.74
Colorado	46.89	8.14	3.59	5.29	6.61	5.31
Connecticut	44.65	7.72	3.59	4.91	7.07	5.79
Delaware	44.89	7.95	3.23	4.92	6.90	5.54
D.C	20.94	6.01	5.11	7.47	7.27	6.11
Florida	40.02	7.28	3.53	5.89	6.54	5.34
Georgia	38.21	8.30	3.29	5.40	6.54	5.26
Hawaii	34.85	7.63	4.07	4.54	7.05	5.73
Idaho	49.08	9.30	4.37	5.86	6.55	5.26
Illinois	41.64	8.42	4.67	6.72	6.49	5.38
Indiana	46.04	8.79	3.84	5.82	6.50	5.26
Iowa	53.30	8.31	3.20	4.75	6.13	5.34
Kansas	49.63	8.33	3.09	4.58	6.11	5.26
Kentucky	38.22	8.39	4.23	6.67	6.49	5.26
Louisiana	29.76	9.19	4.96	7.33	6.18	5.26
Maine	44.82	8.13	4.29	5.62	6.45	5.52
Maryland	42.12	8.12	2.99	5.06	6.55	5.29
Massachusetts	46.07	7.76	3.96	5.38	6.90	5.72
Michigan	45.61	8.71	5.28	7.85	6.34	5.31
Minnesota	56.89	8.73	3.41	4.76	6.56	5.35
Mississippi	26.69	9.39	4.35	7.75	6.12	5.26
Missouri	45.82	8.07	3.76	5.67	6.30	5.30
Montana	43.90	8.23	4.32	5.83	6.15	5.29
Nebraska	54.59	8.79	2.28	3.46	6.24	5.26
Nevada	45.76	7.73	4.19	5.88	7.29	5.29
New Hampshire	52.13	7.88	2.78	4.28	6.87	5.29
New Jersey	36.85	8.11	3.82	5.98	6.74	5.52
New Mexico	35.04	9.15	5.04	6.86	6.40	5.26
New York	31.03	8.21	4.55	6.46	6.41	5.38
North Carolina	42.28	8.01	3.05	5.31	6.33	5.29
North Dakota	49.41	9.09	3.26	4.15	6.08	5.26
Ohio	45.80	8.41	4.44	6.59	6.08	5.31
Oklahoma	39.58	8.64	3.50	5.25	6.47	5.26
Oregon	42.25	7.90	5.35	6.93	6.82	5.93
Pennsylvania	41.75	7.88	4.57	6.46	6.31	5.31
Rhode Island	48.42	7.58	4.01	5.86	6.46	5.71
South Carolina	38.34	8.79	3.36	6.03	6.27	5.26
South Dakota	52.33	8.85	2.76	3.76	6.10	5.26
Tennessee	38.39	8.33	3.50	6.33	6.31	5.26
Texas	37.90	8.97	3.85	6.13	6.49	5.26
Utah	54.04	10.61	3.24	4.94	6.44	5.26
Vermont	46.10	8.17	3.49	4.66	6.36	5.68
Virginia	41.60	7.95	2.43	4.49	6.55	5.26
Washington	44.35	8.31	4.85	6.88	6.98	5.86
West Virginia	27.43	7.79	5.94	8.63	6.01	5.28
Wisconsin	51.65	8.62	4.06	5.30	6.33	5.31
Wyoming	46.98	9.08	3.50	5.03	6.22	5.26
All States	**42.42**	**8.37**	**3.98**	**5.84**	**6.51**	**5.41**

Notes:

The employment-to-population ratio, the fraction of individuals in the 16-19 age group in states' population, the unemployment rate of males aged 25-64 and the average hourly wage of teenage workers are calculated using the CPS May files. The mean state effective minimum wage (deflated to 2000$) is taken from the Bureau of Labor Statistics

Table A3:
Regression Models for The Change in State Effective Minimum Wages Depending on the Change Federal Minimum Wages, Nominal Vs. CPI Adjusted, 1978-2007

OLS Estimates;

Variables of Interest	Propensity that Federal MW is Equal or Higher than State Specific MW, Projected by:							
	P1:Income per Capita 1969, Berry et al. GI Index 1960-68 and the Proportion of Years that FMW>=SMW between 1968 and 1976				P2: Income per Capita 1969, GI Index 1960-68 and the Proportion of Years that FMW>=SMW since 1968 to Two Years Ago			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Panel A: Changes in CPI Adjusted Minimum Wage								
State Propensity to be Restricted by Federal MW * Federal Minimum Wage (in logs)	1.108***	0.856***	0.857***	0.799***	0.749***	0.706***	0.729***	0.702***
	(0.093)	(0.173)	(0.176)	(0.190)	(0.071)	(0.115)	(0.119)	(0.122)
Panel B: Changes in Nominal Minimum Wage								
State Propensity to be Restricted by Federal MW * Change in Federal Minimum Wage (in logs)	1.095***	0.839***	0.826***	0.788***	0.668***	0.540***	0.536***	0.508***
	(0.066)	(0.143)	(0.160)	(0.170)	(0.052)	(0.084)	(0.091)	(0.094)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Region-Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Post 1992 State Effects	No	No	Yes	Yes	No	No	Yes	Yes
Differential Year Effects For States Always Restricted By Federal MW	No	No	No	Yes	No	No	No	Yes
Observations	1500	1500	1500	1500	1500	1500	1500	1500

Notes:
Sample consists of 50 state-year observations for the years 1978-2007 (excluding the District of Columbia).
The dependent variable is the change in state effective minimum wages.
The state effective minimum wage is the maximum of the state and federal minimum wages for the state and year (in logs). We use national CPI to 2000$ to deflate federal and state effective minimum wages.
All specification control for unemployment rate of males aged 25 to 64 and the fraction of teenagers in the corresponding age calculated using in May CPS survey week.
There are 22 states with minimum wages equal to federal minimum wages for all years between 1968 and 2007. See Figure 1.
All specifications are weighted by the fraction of state's population in US population in each year, taken from the BLS.
Robust standard errors clustered by state of residence during the survey week are in parentheses.
(***), (**) and (*) denote significance at 1%, 5% and 10%, respectively.