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Do State Minimum Wages Affect the Incarceration Rate?

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Because of historically unprecedented increases in the prison population since the late 1970s, the United States has the highest incarceration rate in the world. Using Becker's (1968) framework on crime, this study investigates the causal relationship between incarceration rates and state minimum wages. Our identification strategy consists of a state-level fixed effects model and Autor and Dorn's (2013) two-stage least-squares (2SLS) approach. Using the historical local industry structure, we predict the change in employment shares of manual task-intensive occupations and use those as an instrument for state minimum wages. The fixed effects and 2SLS estimates suggest that a one-dollar increase in state minimum wage leads to approximately 12–25 fewer incarcerations per 100,000 state residents. Estimates of the heterogeneous impacts by race and gender indicate that the aggregate impact of state minimum wages is entirely driven by men.

JEL Classification: I32, K40

1. Introduction

The steep increase in aggregate incarceration rate is one of the most alarming social trends because the rapid growth in the prison population over the past three decades has made the United States the global leader in incarceration (Walmsley 2018; Carson 2018).[1] One of the main reasons for the steep increase in incarceration rates is that the labor market opportunities that the prison-released population faces determine the probability that these individuals will return to prison (Raphael and Weiman 2007; Visher, Debus, and Yahne 2008; Yang 2017; Galbiati, Ouss, and Philippe 2017; Schnepel 2018). Maguire and Pastore (2000) show that low-skilled young African-American males have been involved in criminal activity at an increasing rate, despite the fact that the risk of imprisonment has increased almost threefold since the 1970s.

A vast amount of the existing literature provides evidence that incarceration potentially reduces crime by mechanically removing criminals from society and that the threat of being incarcerated deters potential criminals from offending.[2] Over the past three decades, many states have advocated the deterrent role of imprisonment as a policy to reduce crime. As a result, the incarceration rate has increased more than threefold since 1980 (Owens 2009). However, crime rates have not fallen dramatically in response to the large increase in the prison population. Therefore, many

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[1] In addition to the annual $260 billion US dollars in prison-related monetary costs (Glaze and Herberman 2013), many studies, including South and Lloyd (1992), Kelly (2000), Kling (2006), Holzer (2007), Charles and Luoh (2010), Mechoulan (2011), Aizer and Doyle (2015), and Mueller-Smith (2015), discuss various economic and social costs of incarceration.

[2] See Marvell and Moody (1994), Spelman (1994), Levitt (1996, 2004), Doob and Webster (2003), Levitt and Miles (2007).

studies, including Rogers (1989), Donohue and Singleman (1998), Zimring and Hawkins (1991), Selke (1993), Freeman (1996), and Western and Pettit (2002), debate the effectiveness of this policy as a long-term solution and recommend alternative policies, such as spending more on education, early childhood intervention, introducing more correctional programs or decriminalization of certain drug offenses.

The existing literature offers several explanations for the rapid growth in prison populations. A broad conclusion of the incarceration literature is that while no single factor is solely responsible for rising incarceration rates, the largest contributors include (i) a lack of labor market opportunities for low-skilled workers (Grogger 1998; Freeman 1999; Bruce, Kling, and Weiman 2001; Machin and Costas 2004), (ii) state policies to protect law and order (Garland 1996; Jacobs and Helms 1996; Marion 2002), (iii) citizens' attitudes towards minority groups (Greenberg 1985; Sampson and Lauritsen 1997; Smith 2004), (iv) a steady increase in income inequality (Kelly 2000; Rufrancos et al. 2013), and (v) the continuing legacy of racial and social rifts (Case and Katz 1991; Greenberg and West 2001). In this study, we investigate the role of another factor, state minimum wage, because at the margin, the employment status of low-skilled laborers may depend on moderate changes in wage policies. If low-skilled workers, including ex-offenders, cannot find a job that pays better than crime, a potential outside option is criminal activity.

A change in minimum wage policy affects the incarceration rate through two competing channels: An expected increase in income if low-skilled laborers find employment (income effect) and a decrease in the probability of finding employment in the short-run (unemployment effect). A large amount of the existing literature over the last two decades has focused on estimating the unemployment effect of a higher minimum wage.[3] In the crime literature, several studies also show that an increase in wage for low-income earners can pull less-educated individuals out of illegal activity and move them into the legal job market (Viscusi 1986; Levitt and Venkatesh 2000; Uggen and Thompson 2003). As a result, the income effect and the unemployment effect work in opposite directions. Therefore, whether an increase in state minimum wages increases or decreases a state's incarceration rate is an empirical question. Surprisingly, there is no empirical evidence on estimating the effects of the state minimum wages on the incarceration rate. To the best of our knowledge, our article represents the first empirical attempt to estimate the causal impact of changes in state minimum wages on aggregate state incarceration rates.

Indeed, we are aware of only two studies, Braun (2019) and Beauchamp and Chan (2014), that investigate the relationship between state minimum wages and crime. Hashimoto (1987) examines the impact of the federal minimum wage on youth crime. Our study is different from these existing studies because Levitt (1996) shows that, in general, incarceration and crime rates follow different time trends.[4] The underlying mechanisms of how the state minimum wage affects incarceration and crime most likely differ because state politicians can directly affect the incarceration rate via policies related to protecting law and order.[5] By contrast, the crime rate depends on how individuals

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[3] See Card and Krueger (1994), Allegretto, Dube, and Reich (2011), Neumark, Salas, and Wascher (2014), Meer and West (2016), Allegretto et al. (2017), Neumark and Wascher (2017), Jardim et al. (2018).

[4] Consistent with the findings of Levitt (1996), in Supporting Information Figure S1, we show that the crime rate and incarceration rate have different time trends during the period 2005–2014.

[5] For details, see Lott and Mustard (1997); Ludwig (1998); Grogger and Willis (2000); Duggan (2001); Kuziemko and Levitt (2004). The incarceration rate also depends on the number of police (Levitt 1997, 1998; Di Tella and Schargrodsky 2004), the existing prison population (Levitt 1996; Aebi and Kuhn 1996), conditions in prisons (Katz, Levitt, and Shustorovich 2003) and judicial bias (Sampson and Lauritsen 1997; Steffensmeier, Ulmer, and Kramer 1998; Abrams, Bertrand, and Mullainathan 2012; Depew, Eren, and Mocan 2017).

perceive those state policies. In particular, the population at risk of committing crime is myopic because they value present welfare significantly more than the future (Wilson and Herrnstein 1985; Lee and McCrary 2005). Moreover, incarceration affects the supply of crime in the economy (Freeman 1996, 1999).

The goal of this study is to establish a causal link between state minimum wages and incarceration rates. Note that when the outcome variable is the incarceration rate instead of crime, the causal relationship is difficult to establish for two main reasons: reverse causality and omitted variable bias. The incarceration rate can potentially affect state minimum wages because state politicians determine both the state minimum wage and policies related to incarceration. The other challenge is time-varying unobserved local labor market conditions, which are correlated with both incarceration and state minimum wages. These two distinct estimation issues make the state minimum wage variable potentially endogenous.

We confront these identification challenges by constructing an instrument based on the framework introduced by Autor and Dorn (2013).[6] Using the canonical product of the 1960 industry composition and the national employment share of manual task-intensive occupations, we predict the long-run quasi-fixed component of the employment share of manual task-intensive occupations. We find that this measure is highly correlated with changes in state minimum wages in our sample period of 1990–2011. Using a very similar approach, Schaller (2016) predicts employment growth rates from 1980 to 2009 by multiplying 1980 industry-level employment shares and the national industry employment growth rate.

The second component of our instrument is the national employment share of manual task-intensive occupations in 1960, which is most likely not correlated with unobserved local labor market conditions (Autor and Duggan 2003; Autor, Dorn, and Hanson 2013). Therefore, the validity of our instrument depends solely on the 1960 industry composition. Because we fix the industry composition of manual task-intensive employment at a single time point, which is three decades prior to the starting point of our sample period, the 1960 industry composition is most likely not correlated with the local unobserved labor conditions that affect a state's incarceration rate. To assess the validity of our instrument, we also use the 1950 industry composition and find that our estimation results are almost identical. We provide several other pieces of evidence that support the validity of this identifying assumption.

To estimate the impact of state minimum wages on incarceration rates, we use state-level variation in minimum wages over the period 1990–2011. The estimates from the fixed effect model that includes state-specific time trends and a rich set of state and demographic controls suggest that a one dollar increase in state minimum wages decreases the incarceration rate by approximately 0.12–0.16 per 1000 individuals. These estimates are most likely biased because fixed effects models account for the contaminating effects of latent factors, which are fixed over time, but cannot account for changes in unobserved local labor market conditions, which vary over time.

To address this time-varying omitted variable bias, we perform a series of two-stage least-squares (2SLS) regressions in which we use the regional variation in the predicted employment share of manual task-intensive occupations as an instrument and find that 2SLS point estimates vary from −0.25 to −0.28 when we include both state and demographic controls. These point estimates are larger in magnitude than the fixed effects model estimates. We also estimate the heterogeneous

[6] To predict the long-run quasi-fixed component of the employment share of routine task-intensive occupations in each commuting zone, Autor and Dorn (2013) interact the 1950 industry composition and the national employment share of routine occupations in 1950.

impacts of state minimum wages on incarceration rates by gender and race because the incarceration rate varies with sex, race, and age. The heterogeneous impacts of minimum wages by gender suggest that the impact of state minimum wages on incarceration rates is primarily driven by men.

We further estimate the heterogeneous impacts of state minimum wages by both gender and race and find that changes in state minimum wages disproportionately affect the incarceration rates of black men compared to all other subgroups of the population. These results are consistent because of the overlap between race and poverty. The existing literature has shown the unintended consequences of mass confinement of black men. Thus, this study is among the first to explicitly analyze the degree to which an increase in state minimum wages may potentially reduce mass black imprisonment.

The structure of this article is as follows. Section 2 describes the hypothesis of how state minimum wages and incarceration rates are related and discusses the data and the econometric model. Section 3 contains our main results, which include ordinary least squares (OLS) and 2SLS estimation results for both aggregate and heterogeneous impacts by gender and race. Robustness check results are reported in the Supporting Information. Finally, we conclude in section 4.

2. Empirical Approach

In this section, we first show the link between state minimum wages and incarceration rates and then discuss the data and explain the identification strategy used to estimate the causal impact of state minimum wages on incarceration rates.

Hypothesis

We follow the seminal work by Becker (1968) and Ehrlich (1973) to analyze how an increase in the state minimum wage can affect the incarceration rate. Becker's (1968) expected utility model predicts that a rational potential offender will commit a crime only if the expected benefits outweigh the expected cost. For simplicity, we assume that expected income is equivalent to expected utility. Hence, the necessary condition for committing a crime is

$$E\ (\text{net income in illegal sector}) > E\ \left(I_{\text{Legal}}\right),$$

where the expected income in the legal sector, $E(I_{\text{Legal}})$, is the sum of the expected wage income in the legal sector (I_L) and a fixed nonlabor income ($\bar{I}_{NL}$), which includes any other income other than the wage. Thus, legal sector income includes any financial assistance from government welfare programs and unemployment insurance for a fixed period.

Let p denote the probability of getting a job in the legal economy; we can rewrite the above inequality as follows:

$$E\ (\text{net income in illegal sector}) > p \times I_L + \bar{I}_{NL}.$$

Taking the partial derivative of $E(I_{\text{Legal}})$ with respect to the state minimum wage (W_m), we obtain:

$$\frac{\partial E\left(I_{\text{Legal}}\right)}{\partial W_m} = \frac{\partial}{\partial W_m}(p \times I_L + \bar{I}_{NL}) = p\left(\frac{\partial I_L}{\partial W_m}\right) + I_L\left(\frac{\partial p}{\partial W_m}\right). \quad (1)$$

Thus, Equation 1 shows that to identify the relationship between incarceration rates and state minimum wages, we need to determine the signs of $\partial I_L/\partial W_m$ and $\partial p/\partial W_m$.

As discussed earlier, an increase in minimum wage affects the expected income $E(I_{\text{Legal}})$ of low-wage workers in two ways. First, most minimum wage workers receive a higher wage that increases their household income, and some of those households surpass the federal poverty threshold. This process induces many discouraged individuals who are not in the labor market, because the new minimum wage is above their threshold wage, and low-skilled ex-offenders to search for jobs in the legal sector because income in the legal economy increases relative to income in the illegal sector.

This phenomenon is important because more than seven hundred thousand inmates are released from state and federal prisons each year, and many of them live in poverty and face hurdles to securing employment (Raphael and Stoll 2004, 2009). An existing literature, including Pager (2003), Ahmed and Lang (2017), and Agan and Starr (2017), provides strong evidence of hiring discrimination of ex-offenders and the negative consequences of past incarceration on employment and earnings.[7] Thus, in addition to minimum wage workers, changes in minimum wage policy directly affect a large number of ex-offenders.[8]

These adverse effects of incarceration and failed reentry extend beyond the ex-inmates themselves and impose a huge burden on other family members, especially spouses and children (Glaze and Maruschak 2009). An increase in the minimum wage increases the opportunity cost of illegal activity and hence creates a higher incentive for discouraged workers and ex-offenders, who have a higher probability of committing crimes, to secure a job in the legal sector, despite the hurdles and employer discrimination they face. As a result, pecuniary-motive-based crimes decrease. This channel represents the income effect of raising state minimum wages.

An increase in state minimum wages also has an opposing effect. In the short run, some jobs for less-efficient low-wage workers are eliminated because of the higher price of the final good and, hence, lower demand. Therefore, the income of those workers who become jobless falls substantially. A decline in earnings in the legal sector increases social inequality, and Merton's (1938) influential strain theory suggests that unsuccessful individuals feel frustrated when faced with relatively successful people around them. Thus, the greater the inequality, the higher the strain and the greater the likelihood that low-status individuals commit a crime.

In our simple framework, an increase in the unemployment rate decreases the probability of getting a job (p) because there are few jobs for low-skilled workers and more individuals compete for those jobs. Thus, expected income in the legal sector, $E(I_{\text{Legal}})$, decreases when p decreases. As a result, low-skilled unemployed workers who are unable to find jobs in the mainstream economy transition from the legal sector to the illegal sector, which is known as the short-run unemployment effect of an increase in state minimum wages. Therefore, the income effect and unemployment effect of a change in minimum wages work in opposite directions. We can rewrite Equation 1 as

$$\frac{\partial E\left(I_{\text{Legal}}\right)}{\partial W_m} = \underbrace{p\left(\frac{\partial I_L}{\partial W_m}\right)}_{>0} + \underbrace{I_L\left(\frac{\partial p}{\partial W_m}\right)}_{<0} \lesseqgtr 0. \tag{2}$$

[7] See Ahmed and Lang (2017), which also provides a survey of the existing literature.

[8] Lynch and Sabol (2001) show that the number of prisoners released each year has increased threefold in the past two decades. Furthermore, Yang (2017) shows that nearly one-third of the released prison population returns to prison within 3 years.

Thus, Equation 2 suggests that for a given value of net expected income in the illegal sector, the net effect of an increase in state minimum wages on the incarceration rate is an empirical question that constitutes the major motivation for this article.

Data

We use state-level data for the period 1990–2011 to analyze the impact of minimum wages on incarceration rates. The data come from three different sources. First, the state incarceration data are collected from the National Prisoner Statistics Codebook. Second, all state-level control variables are obtained from the University of Kentucky Center for Poverty Research Welfare Data. Third, the household income and all the demographic control variables are constructed from the 5% sample of the March Current Population Survey. We merge these three data sets by the state-year indicator and construct a state-level panel data set for 21 years. Annual income and state minimum wages are expressed in 2000 U.S. dollars based on the Personal Consumption Expenditures price index.

The incarceration rate is defined as the average number of state prisoners per 1000 state residents.[9] The mean and standard deviation of the incarceration rate and state control variables are reported in Table 1. The summary statistics of the demographic controls are shown in Supporting Information Table S1. To illustrate the cross-sectional variation in the data, we show descriptive statistics for four regions: Northeast, Midwest, West, and South.[10] In Figure 1, we present a scatter plot of incarceration rates and state minimum wages for the period 1990–2011. The slope of the best linear fit is −0.04, suggesting a negative association between incarceration rates and state minimum wages. The goal of this study is to infer beyond this simple correlation. Therefore, we describe our identification strategy to establish a causal relationship between state minimum wages and incarceration rates.

Econometric Model

Our empirical approach is based on the following equation:

$$\text{Incarceration rate}_{st} = \alpha + \beta \times \text{state minimum wage}_{st} + \gamma X_{st} + \eta_s + \tau_t + \tau_{st} + \varepsilon_{st}, \tag{3}$$

where s denotes the state, t indicates the time period, and ε_{st} denotes the unobserved error terms. The vector X_{st} consists of a rich set of state and demographic control variables.[11] η_s denotes the state fixed effects measuring any time-invariant differences across states. We also include the national time trend (τ_t) and state-specific linear time trends (τ_{st}) to capture dynamic effects of state minimum wages on incarceration rates.[12]

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[9] Note that we do not include any federal prisoners to calculate a state's incarceration rate.

[10] Supporting Information Figures S2, S3 show the time variation in incarceration rates and average state minimum wages from 1990 to 2011. In the right panel of Supporting Information Figure S3, we show the trend of state minimum wages for four relatively populated states: California, Florida, New York, and Texas.

[11] Lists of state and demographic control variables are given in Table 1 and Supporting Information Table S1.

[12] In addition, the state-specific time trends also control for whether there is any pretreatment deviation in the outcome variable that is correlated with the treatment; for example, if states which have high incarceration rates are also more likely to increase their minimum wage, then this confounding variation can be appropriately controlled for by adding state-specific

Table 1. Summary Statistics of State-Level Variables (Mean and Standard Deviation)

	All	Northeast	Midwest	South	West
Incarceration rate	3.995	3.120	2.958	5.360	3.813
	(2.169)	(1.376)	(1.104)	(2.813)	(1.367)
State minimum wage	5.601	5.938	5.302	5.502	5.723
	(2.187)	(2.238)	(2.171)	(2.020)	(2.332)
Log population	15.020	15.023	15.101	15.248	14.649
	(1.032)	(1.109)	(0.976)	(0.901)	(1.080)
Log state income	7.056	7.093	7.107	7.272	6.701
	(1.141)	(1.295)	(1.109)	(0.933)	(1.210)
Log per capita state income	2.165	2.165	2.161	2.119	2.229
	(0.240)	(0.271)	(0.245)	(0.189)	(0.255)
Unemployment rate	5.587	5.590	4.876	5.892	5.789
	(1.878)	(1.749)	(1.905)	(1.821)	(1.875)
Poverty rate	12.730	11.031	11.251	14.948	12.387
	(3.667)	(3.000)	(2.106)	(3.894)	(3.422)
Percentage of Supplemental Security Income (SSI) recipients	0.314	0.602	0.196	0.037	0.558
	(0.660)	(0.657)	(0.311)	(0.144)	(1.018)
Percentage of Earned Income Tax Credit (EITC) recipients	0.046	0.098	0.050	0.044	0.006
	(0.100)	(0.122)	(0.081)	(0.119)	(0.021)
Log AFDC and TANF recipients	11.078	11.238	11.141	11.324	10.577
	(1.339)	(1.252)	(1.308)	(0.972)	(1.677)
No. of observations	1122	220	242	374	286

Notes: The summary statistics table reports mean and standard deviations (in parentheses). The data are obtained for the period 1990–2011 from the Current Population Survey, National Prisoner Statistics Code book and University of Kentucky Center for Poverty Research. Each year we have 51 observations and thus total 1122 (=51 × 22) state level observations. Annual income and state minimum wages are expressed in 2000 U.S. dollars using the Personal Consumption Expenditures price index.

The coefficient β in Equation 3 captures the marginal effect of a one dollar increase in minimum wage on a state's incarceration rate. The simplest strategy to estimate β in Equation 3 is the OLS approach. However, OLS estimates of β are likely to be biased because the prison population can potentially affect states' decision to increase the minimum wage.[13] This phenomenon is known as reverse causality. In addition, the OLS estimates may have a downward bias because of potential measurement errors in state minimum wages.[14] Since state fixed effects can address only state-specific time-invariant unobserved heterogeneity, another concern is time-varying omitted variables.[15] Therefore, in addition to the OLS model, which includes state fixed effects and state time trends, we use the instrumental variable estimation method.

In the minimum wage literature, researchers estimate the employment effect of minimum wages by using fixed effects models in the state-level panel data setting, where the first difference estimator for fixed effects models reduces to a difference-in-difference estimator (Cameron and

time trends (Page, Spetz, and Millar 2005; Addison, Blackburn, and Cotti 2009; Allegretto, Dube, and Reich 2011; Meer and West 2016).

[13] Note that state politicians can encourage ex-offenders and discouraged workers to look for jobs in the legal economy by raising the state minimum wage.

[14] We have measurement errors in our main independent variable because we use yearly data and states can change the minimum wage at any time of the year. Moreover, the timing of the minimum wage change is highly correlated with each state's unobserved local economic conditions. Because of this classic measurement error, we have an attenuation bias.

[15] Examples of such time-varying omitted variables are illegal immigrants who work below the state minimum wage, racial disparity, attitude towards minorities, prison conditions, and gun and drug availability.

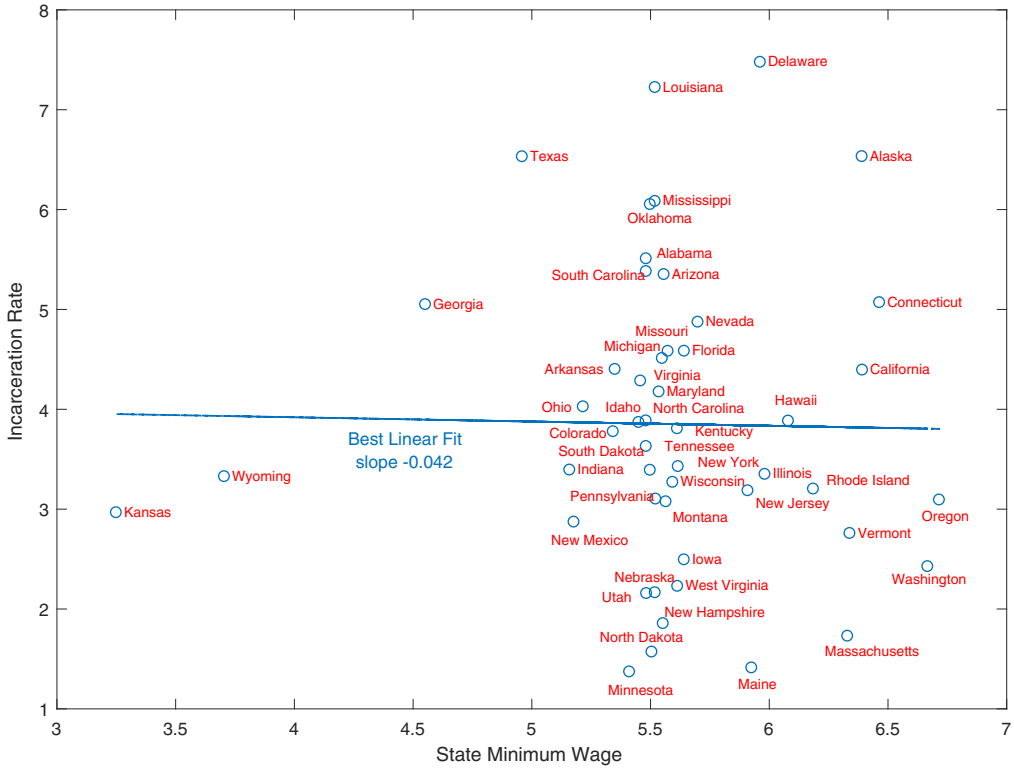

Figure 1. Scatter Plot of Incarceration Rates and State Minimum Wages, 1990–2011.
Notes: The incarceration rate is defined as the average number of state prisoners per 1000 state residents. State minimum wages are expressed in 2000 U.S. dollars based on the Personal Consumption Expenditures price index. [Color figure can be viewed at wileyonlinelibrary.com]

Tridedi 2005).[16] However, in our setup, a potential problem of the fixed effects or difference-in-difference approach is that these methods cannot address the time-varying unobserved heterogeneity related to the incarceration rate and reverse causality. We aim to address these issues via an instrumental variable approach that exploits the variation in the historical local industry structure.

Instrument

Following Autor and Dorn (2013), we assume that workers perform either routine, abstract or manual tasks. We combine these measures of tasks to create a summary measure of manual task intensity (*MTI*) by occupation. This measure is calculated as:

$$MTI_k = \ln\left(T^M_{k,1990}\right) - \ln\left(T^R_{k,1990}\right) - \ln\left(T^A_{k,1990}\right), \tag{4}$$

where T^R_k, T^M_k, and T^A_k are, respectively, the routine, manual and abstract task inputs in each occupation k in 1990. By construction, the measure MTI_k focuses on the importance of manual tasks in each occupation.

[16] For details, see section 22.6.

Following Autor and Dorn (2013), we define highly manual task-intensive occupations by identifying two sets of occupations in the top employment-weighted third of MTI_k in 1990. Thus, using the measure of MTI_k, for each state s, we calculate the employment share of manual task-intensive occupations (MSH_{st}) as follows:

$$MSH_{st} = \left(\sum_{k=1}^{K} L_{skt} \times 1(MTI_k > MTI_{P66}) \right) \left(\sum_{k=1}^{K} L_{skt} \right)^{-1}, \tag{5}$$

where L_{skt} is the employment in occupation k in state s at time t and the indicator function $1[\cdot]$ takes the value 1 if $MTI_k > MTI_{P66}$.

Let $M_{is,1960}$ be the manual task-intensive employment share of industry $i \in 1, \ldots, I$ in state s in 1960; we denote $G_{i,-s,1960}$ as the manual task-intensive occupation share in industry i in all U.S. states except the state s. Thus, the predicted value of $\tilde{MSH}_{s,1960}$ of state s can be obtained as follows:

$$\tilde{MSH}_{s,1960} = \sum_{i=1}^{I} M_{is,1960} \times G_{i,-s,1960}. \tag{6}$$

This measure is a potentially valid instrument for the state minimum wage because the regional variation in the local labor market stems from the three decades prior to 1990. Therefore, we may expect the value to be correlated with the long-run quasi-fixed component of *Manual task-intensive occupations employment share (MSH)* for each state and, hence, that state's minimum wage because a state's minimum wage is highly correlated with the industry composition of manual task-intensive workers in that local labor market. However, $\tilde{MSH}_{s,1960}$ is most likely uncorrelated with contemporaneous unobserved labor market conditions that affect a state's crime rates from 1990 to 2011.

Equation 6 suggests that the difference in the predicted change in the employment share of manual task-intensive occupations across states stems almost entirely from variation in the regional industry composition of M_{is} in 1960. Therefore, the validity of our instrument relies on the exogeneity of the location-specific industry composition of 1960, not the national manual task-intensive employment share.[17] A potential concern regarding the validity of our instrument is that the industry composition of manual task-intensive occupations (M_{is}) for the base period of 1960 is correlated with unobserved local labor market conditions ε_{st} in Equation 3. To address this concern, in a robustness exercise, we use the 1950 M_{is} so that we have a 40-year difference between the industry composition $M_{is,1950}$ and the initial sample period. This robustness exercise results also suggest that our instrument is potentially valid.

The first-stage results in Supporting Information Table S2 show that the regional variation in the long-run quasi-fixed component of the employment shares of manual task-intensive occupations is highly correlated with changes in state minimum wages. Figures 2 and 3 graphically illustrate the mechanism of the first-stage correlation. The left panel of Figure 2 shows that relatively rich states

[17] Autor and Duggan (2003) Autor, Dorn, and Hanson (2013), and Goldsmith-Pinkham, Sorkin, and Swift (2018) argue that national industry growth rates avoid correlation with local economic conditions, which implies that the role of $G_{i,-s,t}$ in our instrument stems from their relevance, not exogeneity. We provide a robustness test to empirically support this claim.

in our sample period had lower employment shares of manual task-intensive occupations in 1960.[18] Furthermore, the right panel shows that most of the rich states, such as Connecticut, California, Massachusetts, New York, New Jersey, Washington, and Colorado, also had, on average, higher state minimum wages in our sample period of 1990–2011.

In Supporting Information Figure S4, we show that the national employment share of manual task-intensive occupations (M_{US}) decreased from 0.56 to 0.30 from 1950 to 1990. Consistent with this trend of M_{US}, the left panel of Figure 3 shows that M_s in relatively rich states declined at a much slower rate than that in other states in 1990–2011. Because a higher state minimum wage improves the living conditions of low-skilled workers who belong to the left tail of the wage distribution, state legislators of those relatively richer states have a stronger political incentive to increase the state minimum wage. As a result, the right panel of Figure 3 shows that $M_{s,1960}$ and changes in the state minimum wage from 1990–2011 are negatively associated.

Note that whenever a state increases the state minimum wage, in the short-run, the profits of firms who hire minimum wage workers decrease because of a higher wage bill and lower demand for the final good that those firms sell in the market. Thus, independent of a state's economic conditions, some firms always have an incentive to lobby against an increase in the minimum wage. However, Figures 2 and 3, as well as the first-stage results in Supporting Information Table S2, show that during our sample period of 1990–2011, such lobbying did not affect increases in state minimum wages. Supporting Information Figure S5 provides further evidence.[19]

In Supporting Information Table S2, we report the first-stage results for five model specifications: (i) no control, (ii) only state fixed effects and state-specific time trends, (iii) only demographic controls, (iv) only state controls, and (v) both demographic and state controls.[20] The first-stage F-statistic for the most robust model specification is 236.88. Thus, following the criterion of Staiger and Stock (1997) and Stock and Yogo (2005), we conclude that our instruments are not weak.[21] We also obtain the predicted values of state minimum wages from column one and column five, in which we use no controls and all control variables, and plot those estimates in Figure 4 to show the correlation between predicted and observed state minimum wages. As shown in the two panels of Figure 4, our instrument has substantial predictive power to explain the upward trend of state minimum wages.

3. Results

The results from both the OLS model, which includes state fixed effects, state time trends and other controls, and the 2SLS estimation method, in which predicted employment shares of manual task-intensive occupations are used as an instrument for state minimum wages, are reported in Table 2. The numbers in the first parentheses of each column represent the state-level clustered robust standard errors. The first column specification is our baseline regression model, which

[18] Note that we categorize all tasks as manual, routine or abstract; hence, the sum of the employment shares of the three task-intensive occupations is equal to 1. Therefore, a smaller value of *MSH* implies a higher fraction of employment in abstract- and routine-task-intensive occupations, which have higher market wages.

[19] In Supporting Information Figure S5, we show that in a given year, the number of states increasing their state minimum wages and the number of states experiencing a fall in M_s are positively correlated.

[20] As shown in Supporting Information Table S2, in columns two to five, we also include linear time trends, state fixed effects, and state-specific time trends.

[21] The Staiger and Stock (1997) and Stock and Yogo (2005) criterion of a weak instrument is that the F-statistic of the first-stage regression is less than 10. Angrist and Pischke (2009) show that the finite sample bias of an IV estimator and the first-stage F-statistic value are inversely related; thus, when the F-statistic is close to zero, the bias of an IV estimator converges to the bias of the OLS estimator.

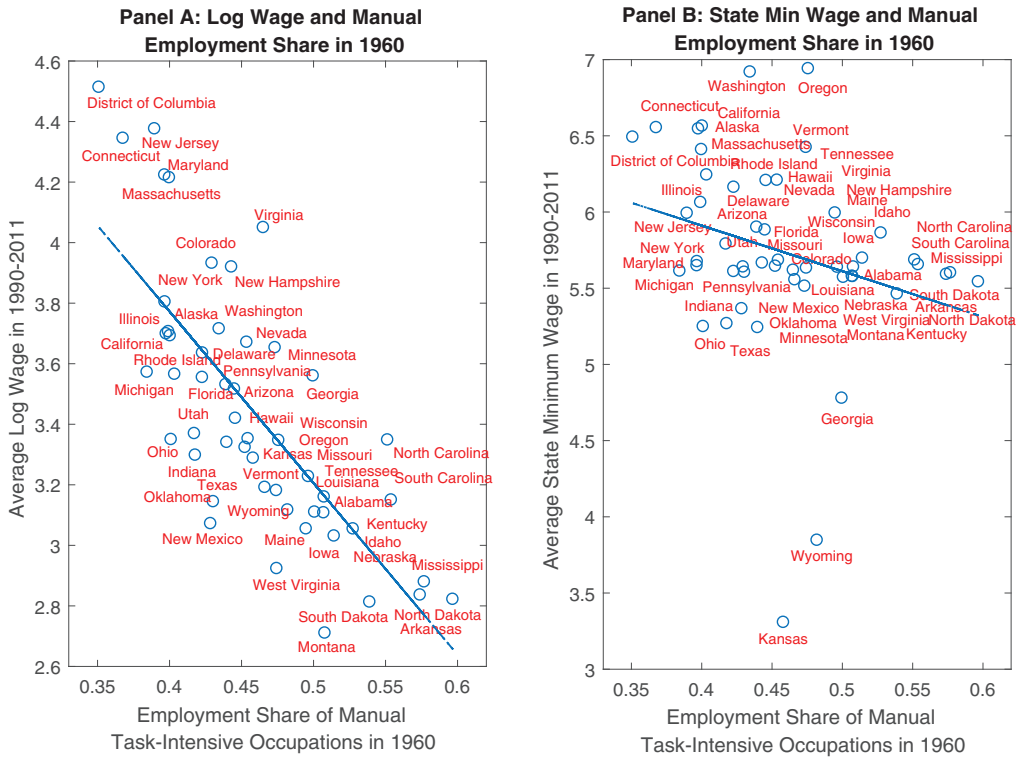

Figure 2. Relationship Between Employment Share of Manual Task-Intensive Occupations in 1960 and Wage and State Minimum Wage in 1990–2011.
Notes: To calculate the $M_{s,1960}$, we identify the set of occupations that are top employment-weighted third of manual task intensity. State minimum wages are expressed in 2000 U.S. dollars based on the Personal Consumption Expenditures price index. The dashed blue line in both the panels indicates the best linear fit. [Color figure can be viewed at wileyonlinelibrary.com]

includes only state fixed effects and state-specific time trends. The coefficients of state minimum wages are negative and significant at the 1% level in both the OLS and 2SLS specifications, suggesting a negative association between state minimum wages and incarceration rates.

Compared to the baseline regression in column 1, we add demographic control variables for the specification in column 2. The list of demographic control variables is shown in both Table 1 and Supporting Information Table S1. In column 2, OLS and 2SLS coefficients of state minimum wages are both still significant at the 1% level, but the magnitudes decrease, suggesting a weaker correlation than that in column 1. In column 3, we drop the demographic controls and add state-level economic control variables, such as per capita state income, unemployment, poverty and the fraction of individuals enrolled in different government welfare programs. Similar to columns one and two, the OLS and 2SLS point estimates in column three are both very precise. However, the magnitude of the 2SLS estimate is more than one and a half times that of the OLS coefficient, most likely due to the time-varying omitted variables we discussed in the "Econometric Model" section.

In the model specification of column 4, we include both state and demographic control variables. According to the OLS estimate, a one dollar increase in the state minimum wage is associated with a 0.12 decrease in incarcerations per 1000 state residents. The instrumental variable coefficient is larger in magnitude, indicating that a one dollar increase in state minimum wages

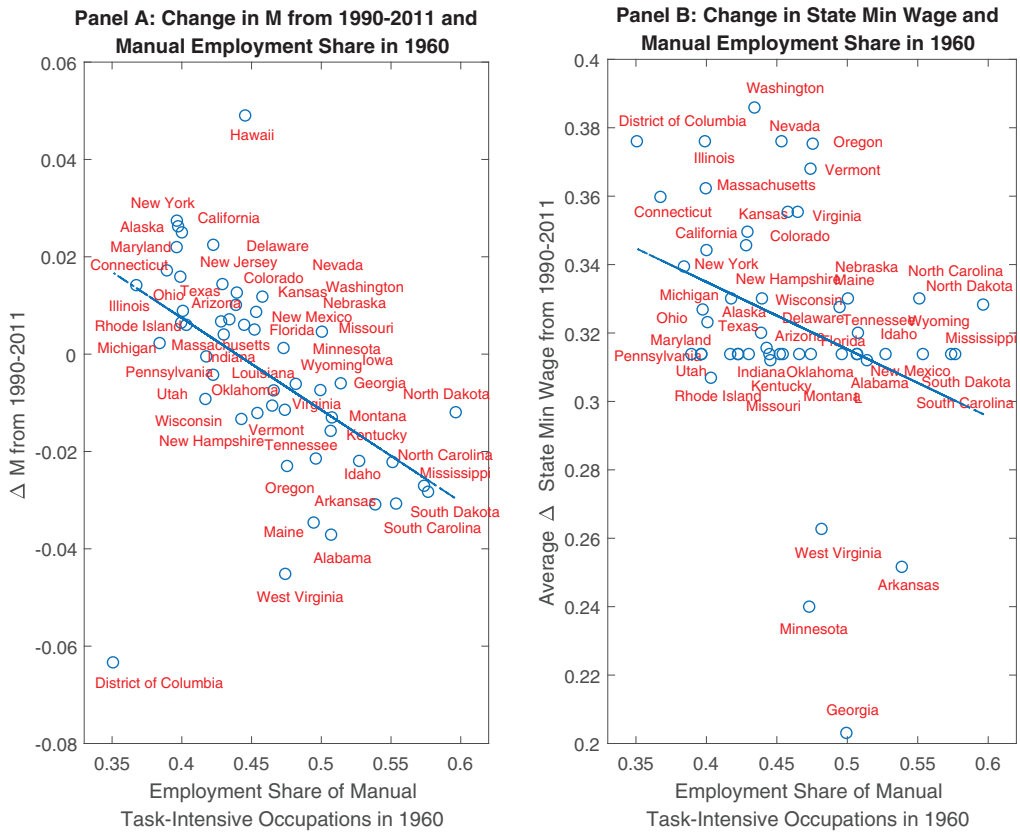

Figure 3. Relationship Between $M_{s,1960}$ and Change in $M_{s,1960}$ and Change in State Minimum Wages from 1990 to 2011.

Notes: To calculate the $M_{s,1960}$, we identify the set of occupations that are top employment-weighted third of manual task intensity. ΔM_s is the difference between $M_{s,1990}$ and $M_{s,2011}$. State minimum wages are expressed in 2000 U.S. dollars based on the Personal Consumption Expenditures price index. The dashed blue line in both the panels indicates the best linear fit. [Color figure can be viewed at wileyonlinelibrary.com]

decreases the incarceration rate by 0.25. Again, the OLS and 2SLS estimates are both precisely estimated at the 1% significance level. We note that similar to the OLS coefficients, the 2SLS estimates are stable across model specifications in columns two to four. Thus, our instrumental variable research design provides a potential convincing strategy for addressing the reverse causality and time-varying omitted variable bias.

To summarize, the results from both estimation methods in all model specifications of Table 2 unanimously suggest that an increase in state minimum wages decreases the incarceration rate. However, the magnitudes of the estimates depend on the identification strategy, and the differences between the OLS and 2SLS coefficients are most likely due to the time-varying unobserved heterogeneity related to the incarceration rate. Furthermore, both methods make it clear that changes in per capita state income and the dynamics of short-run labor market outcomes, such as labor market participation, full-time workers, and unskilled occupation, are significant determinants of state minimum wages. Therefore, including these factors changes the OLS and 2SLS coefficients of the state minimum wages. Thus, our preferred specification is column 4, which includes both demographics and state controls in addition to the baseline model specification.

Mechanism

In this section, we test the hypothesis described in "Hypothesis" section by estimating the unemployment and income effects of an increase in the state minimum wage. Since low-skilled workers constitute a considerable fraction of minimum wage workers, we proxy such workers as high school dropouts. In the upper panel of Table 3, we show the effect of an increase in state minimum wage on the unemployment rate of high school dropout men, and the lower panel shows the same results for women. Following Ghosh (2018), we also divide high school dropouts into three age categories: young (age 18–30), middle-aged (age 31–45), and relatively old (46–65). In all four columns of Table 3, we report the estimates from our core model specification that includes all state and demographic control variables, as well as state fixed effects and state-specific time trends.[22]

As shown in the upper panel of Table 3, a one dollar increase in state minimum wage causes the unemployment rate of high school dropout males to decrease by approximately 0.46. The OLS and 2SLS estimates from columns two to four suggest that state minimum wages affect the unemployment rate of unskilled young men relatively more than that of the middle-aged and relatively old groups. As shown in the lower panel, the signs of the marginal effects of state minimum wages in columns one to four for women are the same as those of men, but the magnitudes are much smaller. These results suggest that the subgroup of young men is the main driver of the effect of a change in the state minimum wage on the unemployment rates of unskilled workers.

Since an increase in minimum wage mainly affects the income of low-skilled workers who belong to the left tail of the wage distribution, we use the linear conditional quantile regression (Koenker and Bassett 1978) and the unconditional quantile regression estimation method developed by Firpo, Fortin, and Lemieux (2009). The results for the 5th, 10th, 15th, and 20th quantiles of the wage distribution are reported in Table 4.[23] The quantile regression estimates in columns one to column four suggest that a one dollar increase in state minimum wage is positively associated with an increase in the hourly wage in the 5th to the 20th quantiles of the wage distribution. Furthermore, the unconditional quantile regression estimates suggest that an increase in minimum wages does not induce workers to move down the wage ladder.

Combining the results in Tables 3 and 4, we find that although an increase in state minimum wages marginally increases the unemployment rate of unskilled young men, it also increases the wage income of workers who belong to the left tail of the wage distribution. Consistent with these findings, Agan and Makowsky (2018) show that an increase in state minimum wages encourages ex-offenders to look for jobs in the legal sector and, hence, decreases the probability of re-entry into prison. The results in Tables 3 and 4 suggest that the income effect is larger in magnitude than the unemployment effect, which is why the results in Table 2 show that an increase in the state minimum wage negatively affects the incarceration rate.

Heterogeneous Effects for Specific Groups

We also explore the differences in the effect of state minimum wages on incarceration rates by gender and race. As shown in Supporting Information Figure S2, the male incarceration rate is almost 10 times higher than that of females, and the female incarceration rate has not changed

[22] Note that because of limited space, we report only the coefficients of the state minimum wage.

[23] To obtain the unconditional quantile regression estimates, we use the Matlab code from Baltagi and Ghosh (2017), who replicate the Firpo, Fortin, and Lemieux (2009) study.

substantially since the early 2000s. There are several reasons why we might expect the responsiveness of incarceration to a change in the minimum wage to vary across subgroups. Freeman (1996) and Raphael and Stoll (2009) discuss why so many young men from low-income families commit crimes. Hoynes, Miller, and Schaller (2012) show that economic downturns disproportionately affect less-educated, younger minority male workers. Furthermore, women are outperforming men in higher education (Goldin 2006), and since a significant fraction of men works in the manufacturing industry, the steep decline in manufacturing jobs hurts men more than women (Autor, Dorn, and Hanson 2013).

The results of the stratified OLS and 2SLS regressions with group-specific incarceration rates as the dependent variables are shown in Table 5. The coefficients of the state minimum wage are negative and statistically significant in both the OLS and 2SLS specifications for all subgroups. The first column in both panels does not include any state or demographic controls, and the second column includes the control variables reported in Table 1 and Supporting Information Table S1. A couple of interesting findings emerge. First, the OLS and 2SLS estimates in column two of the left panel suggest that men account for almost the entire impact of minimum wages on aggregate incarceration rates. Second, the OLS and 2SLS results from the right panel suggest that state minimum wages have a much smaller effect on the incarceration rates of women.

The same pattern of OLS and 2SLS coefficients for both males and females is consistent with the literature discussed above. These findings suggest that the income effect of an increase in the minimum wage is larger for men than for women, conceivably because there are more discouraged males who are at risk of committing crime. Additionally, the number of prison-released males is much larger than that of females. Thus, an increase in the state minimum wage encourages more male ex-offenders to actively look for jobs in the legal sector.

A large amount of the existing literature has shown heterogeneous impacts of labor market opportunities on the incarceration rates of different racial groups.[24] The steep increase in the incarceration rate of black men is directly related to labor market discrimination (Pettit and Western 2004). Gazal-Ayal and Sulitzeanu-Kenan (2010), Abrams, Bertrand, and Mullainathan (2012) and Depew, Eren, and Mocan (2017) show that racial bias also exists in judicial decisions. The mass incarceration of black men also affects their post-prison release employability (Kling 2006) and criminal behavior (Mueller-Smith 2015). Therefore, all of these factors together create a vicious cycle of mass incarceration of black men.

In a recent study, Bayer and Charles (2018) showed that since the early 1980s, when the economy was experiencing remarkable economic growth, less-skilled black men from the left tail of the income distribution were most negatively affected by declining labor market options, which led to mass incarceration of low-skilled young black men. As a result, an increase in state minimum wages would most likely encourage these less-skilled black men to find jobs in the legal economy. Therefore, we estimate the heterogeneous impact of a change in state minimum wages on the incarceration rates by race and gender and divide men and women into two racial subgroups: white and black. Thus, we have four subgroups: white men, black men, white women, and black women.

The results for white and black men are shown in Table 6, and those for white and black women are reported in Table 7. In both tables, we follow the same four model specifications used in Table 2. Across all four specifications, the OLS and 2SLS estimates suggest that an increase in state minimum wages negatively affects the incarceration rates of black and white men, and the

[24] See Freeman (1996), Hoynes, Miller, and Schaller (2012), Freedman and Owen (2016) and Bayer and Charles (2018).

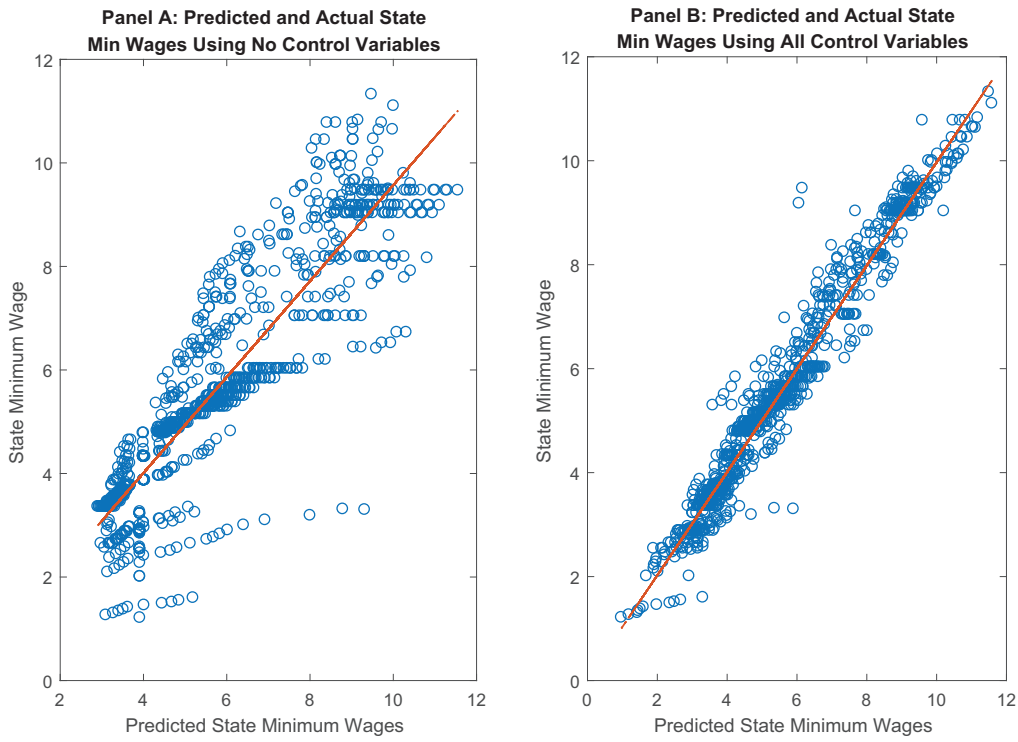

Figure 4. Relationship Between Predicted State Minimum Wages and Observed State Minimum Wages, 1990–2011. Notes: The predicted state minimum wages in the left and right panels are obtained from Supporting Information Table S1 column one and column five estimates. The red dashed lines in both the panels represent the best linear fit of the data. [Color figure can be viewed at wileyonlinelibrary.com]

coefficients are statistically significant at the 1% level. The 2SLS coefficients in columns one and four in both panels indicate that a one dollar increase in the state minimum wage decreases incarceration rates by approximately 0.11 to 0.15 per 1000 state residents for black men and approximately 0.05 to 0.11 for white men. The magnitudes of the OLS coefficients are approximately one-half of the 2SLS estimates for black and white men. Thus, the OLS and 2SLS estimates both suggest that an increase in the minimum wage most likely has a stronger income effect for black men than for white men.

The second set of heterogeneous impacts of state minimum wages by gender and race are presented in the two panels of Table 7.[25] Again, the OLS and 2SLS estimates in all four specifications are negative and statistically significant for black women, suggesting that an increase in state minimum wages leads to a decrease in the incarceration rate of black females. However, the OLS and 2SLS coefficients are close to zero and are thus economically insignificant. This finding is not surprising because the incarceration rate of black men is approximately 15 times higher than that of black women (Mechoulan 2011). Furthermore, relative to whites, black women have been bridging the educational gap (Allen et al. 2005) and racial labor market gaps (Holzer and Offner 2002; Allen et al. 2005) at a much faster rate than have black men.

[25] The left panel shows the results for black women, and the right panel shows the results for white women.

Table 2. The Impact State Minimum Wages on the Aggregate Incarceration Rate, 1990–2011 Dependent Variable: Incarceration Rate for All (Men and Women Combined)

	(1)		(2)		(3)		(4)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
State minimum wage	−0.246***	−0.333***	−0.136***	−0.265***	−0.164***	−0.285***	−0.119***	−0.246***
	(0.018)	(0.021)	(0.021)	(0.033)	(0.022)	(0.031)	(0.022)	(0.037)
Time trend			0.046***	0.088***	−0.074***	−0.007	0.016	0.079**
			(0.016)	(0.018)	(0.028)	(0.030)	(0.029)	(0.032)
Per capita state income					−5.133***	−3.635***	−0.486	0.477
					(0.951)	(0.959)	(0.924)	(0.915)
Unemployment					−0.032**	−0.026**	−0.052***	−0.046***
					(0.013)	(0.012)	(0.017)	(0.016)
Poverty					0.003	0.004	0.003	0.006
					(0.010)	(0.009)	(0.009)	(0.009)
Full time workers			−0.533	−1.262			−5.904***	−5.095***
			(1.003)	(0.977)			(1.707)	(1.648)
Unskilled Occ			−0.454	−0.415			−0.483*	−0.492*
			(0.286)	(0.275)			(0.289)	(0.277)
Demographic controls			Yes	Yes			Yes	Yes
State controls					Yes	Yes	Yes	Yes
State fixed effects and state Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.934	0.932	0.955	0.953	0.943	0.941	0.956	0.954
First stage F-stat		263.41		242.57		257.67		236.88
No. of observations	1111	1111	1111	1111	1109	1109	1109	1109

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The demographic controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.

Abbreviations: 2SLS, two-stage least-squares; OLS, ordinary least squares.

*$p < 0.10$.

**$p < 0.05$.

***$p < 0.01$.

Similar to those for black women, the OLS and 2SLS estimates in the right panel of Table 7 are close to zero, suggesting that an increase in state minimum wages also does not affect the incarceration rate of white women. Thus, according to the results of Table 7, we conclude that changes in state minimum wages do not affect the incarceration rates of women. Therefore, the impact of state minimum wages on the aggregate incarceration rate is primarily driven by men. These results are in line with a recent study by Agan and Makowsky (2018), who show that an increase in state minimum wages and EITC benefits decrease the recidivism rates of the prison released population and that the marginal impact of minimum wage is higher for males than females.[26]

Robustness

In all model specifications used in Tables 2–7, we have included state fixed effects and state-specific time trends, which account for a host of unobservable state characteristics that may be correlated with both the incarceration rate and state economic conditions. However, these fixed effects and state-specific time trends control for only time-invariant unobserved characteristics and trends that are linear within a state. Therefore, to ensure the validity of our instrument, we check whether the time-varying unobserved labor market conditions are correlated with our instrument.[27]

As discussed earlier, a potential concern with the validity of our instrument is that the 1960 industry composition of manual task-intensive employment (M_{is}) might be correlated with unobserved state economic conditions in our sample period of 1990–2011. To address this potential concern, we perform two different robustness checks. First, instead of 1960, we use the 1950 industry composition so that we have a 40-year gap between the timing of $M_{is,1950}$ and the starting point of the sample period, 1990. The 2SLS estimation results for four model specifications are reported in the left panel of Supporting Information Table S3.

Comparing the left panel estimates of the state minimum wages with the estimation results in Table 2, we find that our main findings do not depend on the initial base year 1960 employment share of manual task-intensive occupations. In addition, we also construct the instrument by using the 1970 M_{is} and present the results in the right panel of Supporting Information Table S3. Again, our 2SLS estimates in the four model specifications do not depend on the choice of base year M_{is}. To address any concern about the extent to which the historical employment shares of manual task-intensive occupations changed over time, in Supporting Information Figure S4, we show that the national employment share of manual task-intensive occupations (M_{US}) has decreased approximately 46% from 1950 to 1990. Moreover, in Supporting Information Figure S6, we show the regional variation in the changes in M_s for each decade from 1950 to 1990. As shown in both Supporting Information Figures S4 and S6, there was considerable time and cross-section variation in the industry composition of manual task-intensive employment during the period of 1950 to 1990. Therefore, the results in Supporting Information Table S3 suggest that our instrument is potentially valid.

In addition to the results in Supporting Information Table S3, to verify the exclusion restriction, we perform another sensitivity analysis in which we check whether the second part of our instrument, $G_{i,-s,1960}$, is correlated with the unobserved error terms in Equation 3.[28] Note that we

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[26] Using a 2SLS estimation strategy, Ghosh (2018) finds that during the Great Recession recovery period, one-fourth of the fall in aggregate crime rate was due to the sharp decline in the unemployment rate of young unskilled men.

[27] All the robustness check results in "Robustness" section are available in the Supporting Information.

[28] $G_{i,-s,1960}$ denotes the 1960 national manual task-intensive employment share in industry i.

Table 3. The Heterogeneous Impact of State Minimum Wages on the Unemployment Rate of Unskilled Men and Women by Age Dependent Variable: Unemployment Rate of Unskilled Men and Women

	All		Age 18–30		Age 31–45		Age 46–65	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Panel A: Unskilled Men								
State minimum wage	0.195***	0.464***	0.101***	0.182***	0.024	0.124***	0.039***	0.094***
	(0.038)	(0.064)	(0.023)	(0.038)	(0.019)	(0.032)	(0.015)	(0.025)
R^2	0.351	0.316	0.196	0.186	0.200	0.177	0.179	0.167
No. of observations	1069	1069	1069	1069	1069	1069	1069	1069
Panel B: Unskilled women								
State minimum wage	0.068**	0.161***	0.026	0.077**	0.023	0.036	0.015	0.036*
	(0.031)	(0.051)	(0.020)	(0.032)	(0.016)	(0.027)	(0.011)	(0.019)
R^2	0.204	0.197	0.093	0.086	0.135	0.135	0.123	0.120
No. of observations	1069	1069	1069	1069	1069	1069	1069	1069

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The unskilled workers are defined as high school dropouts. Each regression includes linear national time trend, state and demographic controls, state fixed effects, and state-specific time trends. The demographic controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.

Abbreviations: 2SLS, two-stage least-squares; OLS, ordinary least squares.

*$p < 0.10$.

**$p < 0.05$.

***$p < 0.01$.

Table 4. The Linear Conditional and Unconditional Quantile Regression Estimates of the State Minimum Wage on the Left-Tail of the Wage Distribution Function Dependent Variable: Log Wage

	5th Quantile		10th Quantile		15th Quantile		20th Quantile	
	QR	UQR	QR	UQR	QR	UQR	QR	UQR
State minimum wage	0.277**	0.058	0.284**	0.044	0.439**	0.267**	0.519***	0.532***
	(0.124)	(0.080)	(0.142)	(0.094)	(0.176)	(0.097)	(0.146)	(0.109)
Time trend	2.511***	0.112	2.450***	0.049	2.302***	−0.285**	2.173***	−0.544***
	(0.360)	(0.103)	(0.223)	(0.121)	(0.189)	(0.125)	(0.170)	(0.140)
Unemployment	−0.171	0.025	−0.073	−0.044	−0.020	0.006**	−0.096	−0.166***
	(0.165)	(0.056)	(0.198)	(0.065)	(0.113)	(0.068)	(0.117)	(0.075)
Poverty	0.046	−0.003	0.072	−0.011	0.017	−0.015	−0.007	−0.006
	(0.046)	(0.007)	(0.064)	(0.009)	(0.058)	(0.009)	(0.056)	(0.01)
State and demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects and state Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1120	1120	1120	1120	1120	1120	1120	1120

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The Household (HH) level controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.
Abbreviations: RQ, quantile regression; UQR, unconditional quantile regression.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table 5. The Impact of State Minimum Wages on the Incarceration Rates by Gender, 1980–2011 Dependent Variable: State Incarceration Rate of Men in the Left and Women in the Right Panel

	Men				Women			
	(1)		(2)		(1)		(2)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
State minimum wage	−0.224***	−0.304***	−0.128***	−0.284***	−0.022***	−0.029***	−0.011***	−0.025***
	(0.016)	(0.019)	(0.020)	(0.033)	(0.002)	(0.002)	(0.003)	(0.004)
Time trend			0.004	0.088***			0.002	0.008**
			(0.026)	(0.029)			(0.003)	(0.004)
Per capita state income			−1.427*	−0.029			−0.031	0.064
			(0.834)	(0.846)			(0.103)	(0.102)
Unemployment			−0.045***	−0.044***			−0.004***	−0.004**
			(0.014)	(0.014)			(0.002)	(0.002)
Poverty			0.003	0.007			0.000	0.001
			(0.008)	(0.008)			(0.001)	(0.001)
Full time workers			−4.512***	−4.343***			−0.389**	−0.251
			(1.065)	(1.036)			(0.177)	(0.173)
Unskilled Occ			−0.627**	−0.619**			0.021	0.019
			(0.257)	(0.250)			(0.031)	(0.030)
Demographic controls			Yes	Yes			Yes	Yes
State controls			Yes	Yes			Yes	Yes
State fixed effects and state Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.935	0.934	0.956	0.953	0.917	0.916	0.933	0.931
No. of observations	1111	1109	1109	1109	1111	1111	1109	1109

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The Household (HH) level controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.

Abbreviations: 2SLS, two-stage least-squares; OLS, ordinary least squares.

*$p < 0.10$.

**$p < 0.05$.

***$p < 0.01$.

Table 6. The Impact of State Minimum Wages on the Incarceration Rates of Men by Race, 1990–2011 Dependent Variable: Incarceration Rate of Black Men in the Left and White Men in the Right Panel

	Black Men								White Men							
	(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
State minimum wage	−0.113***	−0.152***	−0.074***	−0.130***	−0.069***	−0.109***	−0.060***	−0.111***	−0.057***	−0.059***	−0.070***	−0.108***	−0.052***	−0.065***	−0.061***	−0.101***
	(0.009)	(0.010)	(0.010)	(0.015)	(0.011)	(0.015)	(0.011)	(0.018)	(0.011)	(0.012)	(0.014)	(0.022)	(0.013)	(0.019)	(0.015)	(0.024)
Time trend			0.019**	0.037***	−0.059***	−0.037**	−0.018	0.007			0.039***	0.051***	−0.068***	−0.061***	−0.053***	−0.032
			(0.007)	(0.008)	(0.014)	(0.015)	(0.014)	(0.015)			(0.011)	(0.012)	(0.017)	(0.018)	(0.020)	(0.021)
Per capita state income					−2.893***	−2.403***	−1.189***	−0.780*					−3.635***	−3.471***	−3.413***	−3.081***
					(0.473)	(0.472)	(0.452)	(0.446)					(0.585)	(0.581)	(0.615)	(0.604)
Unemployment					−0.002	−0.000	−0.000	0.001					0.024***	0.025***	0.021*	0.023**
					(0.006)	(0.006)	(0.006)	(0.006)					(0.008)	(0.007)	(0.011)	(0.010)
Poverty					−0.008*	−0.008*	−0.008*	−0.006					0.011*	0.011*	0.015**	0.016***
					(0.005)	(0.005)	(0.005)	(0.004)					(0.006)	(0.006)	(0.006)	(0.006)
Demographic controls			Yes	Yes			Yes	Yes			Yes	Yes			Yes	Yes
State controls					Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes
State fixed effects and state Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.969	0.968	0.977	0.976	0.972	0.972	0.978	0.977	0.862	0.862	0.874	0.873	0.869	0.869	0.879	0.878
No. of observations	1106	1106	1106	1106	1104	1104	1104	1104	1110	1110	1110	1110	1108	1108	1108	1108

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The Household (HH) level controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.
Abbreviations: 2SLS, two-stage least-squares; OLS, ordinary least squares.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table 7. The Impact of State Minimum Wages on the Incarceration Rates Women by Race, 1990–2011 Dependent Variable: Incarceration Rate of Black Women in the Left and White Women in the Right Panel

	Black Women								White Women							
	(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
State minimum wage	−0.015***	−0.019***	−0.011***	−0.018***	−0.011***	−0.016***	−0.010***	−0.017***	−0.005***	−0.006***	−0.005***	−0.010***	−0.005***	−0.009***	−0.004***	−0.009***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Time trend			0.002***	0.004***	−0.005***	−0.003	−0.001	0.003			0.004***	0.006***	−0.001	0.001	−0.002	0.001
			(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)			(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Per capita state income					−0.267***	−0.212***	−0.085	−0.034					−0.180***	−0.129**	−0.223***	−0.182***
					(0.059)	(0.059)	(0.058)	(0.057)					(0.053)	(0.053)	(0.056)	(0.055)
Unemployment					−0.000	0.000	0.000	0.000					−0.000	−0.000	0.000	0.000
					(0.001)	(0.001)	(0.001)	(0.001)					(0.001)	(0.001)	(0.001)	(0.001)
Poverty					−0.001**	−0.001**	−0.001*	−0.001*					0.001**	0.001**	0.001**	0.001**
					(0.001)	(0.001)	(0.001)	(0.001)					(0.001)	(0.001)	(0.001)	(0.001)
Demographic controls			Yes	Yes			Yes	Yes			Yes	Yes			Yes	Yes
State controls					Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes
State fixed effects and state Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.889	0.888	0.911	0.909	0.898	0.897	0.913	0.911	0.932	0.932	0.939	0.938	0.935	0.934	0.940	0.939
No. of observations	1106	1106	1106	1106	1104	1104	1104	1104	1110	1110	1110	1110	1108	1108	1108	1108

Notes: The numbers in the first parenthesis of each column represent the state level clustered robust standard errors. The Household (HH) level controls include percentage of married couple, black, white, median and average household income, five education categories, actively looking for job, disable person, have health insurance, female-head households, also average age, family size, and number of children. The State control includes fraction of individuals get workers compensation benefits, social security and EITC recipients.
Abbreviations: 2SLS, two-stage least-squares; OLS, ordinary least squares.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

exclude the particular state s to calculate $G_{i,-s,t}$. However, the concern is whether ε_{st} in Equation 3 is correlated with unobserved labor market conditions of the neighboring states and whether the autocorrelation of the error terms persists over 30 years. In that case, our instrument defined in Equation 6 fails the exogeneity assumption.

To address this concern, we make the following modification to construct our instrument:

$$\tilde{MSH}_{s,1960} = \sum_{i=1}^{I} M_{is,1960} \times G_{i,-r,1960},$$

where $G_{i,-r,1960}$ is the specific task-intensive occupation share in industry i in all U.S. states except the region r to which state s belongs, that is, $s \in r$.[29] The 2SLS estimation results when using this modified instrument are shown in Supporting Information Table S4. The 2SLS point estimate from the most robust model specification is −0.26, which is almost identical to the 2SLS estimate in Table 2 column 4. This result is not unexpected because, earlier, we noted that in the instrument, the role of $G_{i,-s,t}$ stems from relevance, not exogeneity.

Another potential concern regarding the exclusion restriction of our instrument is the impact of the state political economy on the incarceration rate. We have mentioned that policies related to incarceration and minimum wages are likely highly correlated because these policies are high-profile political choices. Thus, a tough-on-crime state that chooses to increase incarceration is likely to be politically conservative, which may lead to the state maintaining a low minimum wage. If such political ideology does not change over our sample period, our fixed effects can address those time-invariant impacts. However, the concern is that political ideologies may change over time and may potentially be correlated with our instrument. In that case, our instrument does not satisfy the exogeneity condition.

Note that the variation in our instrument comes from the 1960 employment shares of manual task-intensive occupations by industry. Thus, our instrument will fail the exogeneity condition if changes in political ideology is correlated with the 1960 employment shares of manual task-intensive occupations. To address this potential concern, we include three state political variables: Democratic governor and the numbers of Democrats in the lower and upper houses. The results are reported in Supporting Information Table S5. The 2SLS coefficients of state minimum wages are negative, statistically significant and similar in magnitude, suggesting that our instrument is most likely not correlated with the time-varying component of state political conditions.

In our main model specification, we have included both the national time trend and state-specific time trends. Thus, a potential concern about the model specification is omitting year fixed effects. That is why, instead of using state-specific time trends, we add year fixed effects and present the results in Supporting Information Table S6. Comparing the Table 6 estimates with those in Table 2, we find that although the 2SLS point estimates are marginally higher, the results are qualitatively similar.

As additional robustness tests, we include the following additional control variables in Equation 3: (i) three-year lag terms of the state minimum wage, (ii) percentage of Aid to Families with Dependent Children (AFDC) and Temporary Assistance for Needy Families (TANF) recipients, (iii) fraction of state residents who receive food stamps and (iv) Medicaid, and (v) one-year lag of

[29] Using the Census definition of regions and divisions, we classify all states into the following 9 regions: (i) New England, (ii) Middle Atlantic, (iii) East North Central, (iv) West North Central, (v) South Atlantic, (vi) East South Central, (vii) West South Central, (viii) Mountain, and (ix) Pacific.

the incarceration rate. All of these additional robustness check results are shown in Supporting Information Tables S7–S9. We find that the results remain very similar to the previously reported main estimation results. To summarize, the results from numerous robustness exercises of our baseline estimates are reassuring.

4. Conclusion

The 2014 Congressional Budget Office report shows that over 17 million workers are affected by state minimum wages. Surprisingly, little is known empirically about the impact of state minimum wages on incarceration rates. To the best of our knowledge, this is the first study to establish a causal relationship between state minimum wages and incarceration rates in the United States. We discuss two possible channels of how a change in the state minimum wage can affect the incarceration rate: the income effect and unemployment effect. Our results suggest that in our sample period of 1990–2011 the income effect dominates the unemployment effect; hence, we observe a negative relationship between state minimum wages and incarceration rates.

To address potential endogeneity of the state minimum wage, we include state fixed effects, state-specific time trends and a rich set of control variables. In addition, we use an instrumental variable approach based on the estimation strategy proposed by Autor and Dorn (2013). The two-digit industry-level composition of manual task-intensive employment share in 1960 is used to predict the long-term quasi-fixed component of the employment growth of manual task-intensive occupations, which is then used as an instrument for state minimum wages. The first-stage results show that our instrument can explain a considerable portion of the variation in the changes in state minimum wages from 1990 to 2011. We also perform various robustness checks to examine the validity of our instrument.

According to the fixed effects model and 2SLS results, a one dollar increase in the state minimum wage is associated with a 0.12 to 0.25 decrease in incarcerations per 1000 state residents, which is an approximately 4–8% point decrease. The magnitudes of the 2SLS estimate are larger than the fixed effects estimate, most likely because of the time-varying omitted variable bias. The magnitudes of both the fixed effects and 2SLS estimates are plausible since, conditioned on all the key economic factors, we do not expect a huge direct impact of state minimum wages on incarceration rates.[30] However, given the enormous social cost and consequences of incarceration, our estimates are economically significant and meaningful since Bonczar (2003) shows that the incarceration rate of African-Americans increased from 9 to 17% from 1974 to 2001, and if that rate continues, one in three African-Americans born in 2001 will be in prison at some point during their lifetime.

Given recent changes in income inequality (Autor, Katz, and Kearney 2008; Bayer and Charles 2018), employer discrimination (Pettit and Western 2004), judicial biases towards minorities (Depew, Eren, and Mocan 2017), and the decline in male-dominated industries due to automation of routine jobs and offshoring (Autor and Dorn 2013), our findings provide valuable insight into the debate about whether states should consider increasing their minimum wages to $15. Our results suggest that such a discrete change in state minimum wages can have a significant impact on incarceration rates since Even and Macpherson (2003) show that minimum wage jobs often

[30] We are unable to directly compare our estimates with the existing literature because, to the best of our knowledge, this is the first empirical study that provides a causal estimate of the impact of state minimum wage on the incarceration rate.

result in relatively rapid transitions to higher paying jobs and, hence, may attract many discouraged workers to look for jobs in the legal sector.

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Supporting Information

Additional Supporting Information may be found in the online version of this article.