FAILED STIMULUS:

Minimum Wage Increases and Their Failure to Boost Gross Domestic Product

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December 2010

Employment Policies
INSTITUTE

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*The author thanks William Even and Daniel Rees for comments and suggestions on previous drafts of this paper. Thanks are also due to Andres Araoz, Deborah Maresko, and Claudia Sandoval for excellent research assistance. The views expressed herein are those of the author and do not reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

Executive Summary

A comprehensive review of two decades of economic research on the minimum wage by economists David Neumark (University of California—Irvine) and William Wascher (Federal Reserve Board) concludes that increases in the minimum wage reduce job opportunities for the least-skilled workers.

As a consequence of this inconvenient truth, advocates of a higher minimum wage have increasingly leaned on alternate arguments to make the case for additional employer mandates. Increases in the minimum wage have been sold as a stimulus or a "shot in the arm" for both state economies and the U.S. economy as a whole.

These claims have rhetorical appeal, especially in a troubled economic environment where policymakers are desperate for a quick fix. The problem for those taking that line of argument is that no hard evidence exists to confirm whether or not a higher minimum wage really helps the economy.

Existing research tends to take a bird's-eye view of business growth. Comparing industry-specific employment growth in states with a lower federal minimum against those states with a higher statutory wage, these studies are problematic and unreliable because they don't control for state-specific demographic or economic trends.

In this new study, Dr. Joseph J. Sabia (United States Military Academy at West Point) uses data from the Census Bureau and the Bureau of Economic Analysis to measure the Gross Domestic Product (GDP) and employment response associated with an increase in the minimum wage. Sabia shows that increases in the minimum wage can actually have a negative effect on GDP—specifically, GDP generated by lower-skilled industries.

Sabia first examines whether increases in State and Federal minimum wages between 1997 and 2007 have decreased low-skilled employment (defined here as the employment-to-population ratio for 16-to-19 year-olds). Controlling for economic performance and other unmeasured state employment trends, Sabia finds that each 10 percent increase in a state's minimum wage decreased employment for the group by 3.6 percent. And because these employment losses were not accompanied by an increase in school enrollment, they suggest that job loss caused by wage hikes is not offset by long-term productivity gains.

After determining that increases in states minimum wages did decrease employment, Sabia looks at data on economic growth to determine whether job loss associated with a higher minimum wage has had a negative impact on GDP; he focuses specifically on GDP generated by those industries affected most by minimum wage increases. This includes low-skilled industries like wholesale trade, manufacturing of durables, warehousing and storage, rental and leasing services, and administrative and waste services. Sabia finds that each 10 percent increase in the minimum wage is associated with a two to four percent decline in state GDP generated by these lower-skilled industries.

Broadening the analysis to examine national GDP, Sabia finds that increases in the minimum wage between 1997 and 2007 had a small, insignificant negative effect on the national economy overall. This means mandated wage increases are far from the economic "shot in the arm" advocates claim them to be.

This research is relevant for two reasons. Each year, states across the country increase their minimum wages, or consider legislation to do so. Sabia's findings suggest that these policies are unwise both in good and bad economic times, because of the negative employment consequences for states' low-skilled workforce and the negative economic consequences for states' low-skilled industries.

Additionally, the research suggests that exuberant claims about the positive economic benefit of a minimum wage increase are not based on economic reality. Far from stimulating an economy, an increase in the minimum wage has no discernible impact on overall GDP and could actually hinder growth in certain low-wage sectors.

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Introduction

While there is a wide body of literature examining the effects of minimum wage increases on employment (Neumark and Wascher, 2007; 2008), income (Neumark and Wascher 2004 a,b), poverty (Sabia and Burkhauser, 2010; 2007; Neumark and Wascher, 2002; Card and Krueger, 1995), schooling (Neumark and Wascher, 1995; Warren and Hamrock, 2010), and output prices (Aaronson et al., 2007; 2008), there is little work exploring the effect of minimum wage increases on gross domestic product (GDP). Theoretically, the effect is ambiguous. Increases in the minimum wage may increase labor costs, reduce employment and income, and reduce output in lower-skilled industries. However, adverse employment effects among younger, less-experienced workers could induce greater human capital accumulation or shifts to high-skilled employment, leading to longer-run increases in macroeconomic growth (Cahuc and Michel, 1996; Nickell and Layard, 1999; Askenazy, 2003). To date, little work has been done to estimate the effect of minimum wage increases on GDP.

Using data drawn from the Current Population Survey (CPS) and the Bureau of Economic Analysis (BEA), this study estimates the effects of minimum wage increases between 1997 and 2007 on low-skilled employment, school enrollment rates, and gross domestic product. Consistent with consensus estimates reported in Neumark and Wascher (2008), minimum wage increases are found to reduce employment among 16-to-19 year-olds, with estimated elasticities of -0.2 to -0.4. However, there is little evidence that minimum wage increases during this period affected school enrollment rates for 16-to-19 year-olds, either in the short- or long-term.

Turning to GDP effects, the results suggest that minimum wage increases are associated with small, often statistically insignificant declines in overall and private sector GDP; however, there is some evidence of larger adverse GDP effects in a number of industries that employ relatively larger shares of lower-wage workers, including wholesale trade, manufacturing of durables, warehousing and storage, rental and leasing services, and administrative and waste services. Falsification tests suggest that minimum wage increases are unrelated to contemporaneous output in industries that employ more highly skilled workers. Difference-in-difference-in-difference models that control for unmeasured state-specific time trends common across industries suggest that a 10 percent increase in the minimum wage is associated with a 2 to 4 percent decrease in state GDP generated by lower-skilled industries.

Background and Relevant Literature

Employment Effects of the Minimum Wage

Through the late 1980s, there was a strong consensus among labor economists that minimum wage increases reduce employment among low-skilled workers (see, for example, Brown et al., 1982). However, the iconoclastic work of Card and Krueger (1994; 1995) forged a "new economics of the minimum wage" literature that caused many to reconsider the employment consequences of minimum wage increases. Since the work of Card and Krueger (1994; 1995), a substantial number of new studies on the effect of state and federal minimum wage laws have tried to improve upon Card and Krueger's research design, paying careful attention to unmeasured state-specific time

trends and the availability of sufficient within-state variation in minimum wages. Neumark and Wascher (2007; 2008) reviewed over 90 studies conducted since the Card and Krueger work. They conclude that the evidence is "overwhelming" that low-skilled workers experience the strongest disemployment effects, and place employment elasticities in this new literature from –0.1 to –0.3.

Recently, however, the debate in the literature has been stirred anew by studies questioning the credibility of the estimation strategy used in many national panel studies (see, for example, Dube, Lester, and Reich, Forthcoming; Addison et al., 2009). These authors argue that the usual panel data techniques of controlling for state and year effects, and identifying minimum wage effects from within-state variation in the minimum wage may be flawed due to unobserved state-specific labor market trends[1]. Thus, while the employment literature generally points to modest negative employment effects for workers who are less skilled, less educated, and less experienced, these studies make clear that care should be taken to control for unmeasured state-specific time trends.

Income and Spending Effects of the Minimum Wage

While there is a fair amount of evidence pointing to adverse employment effects, recent studies provide little evidence that minimum wage hikes result in net income gains for low-income workers. Neumark and Wascher (2002) and Neumark et al. (2005 a,b) use matched Current Population Survey data to examine the effects of minimum wage increases on family income. They find that some low-skilled workers living in poor families who remain employed see their incomes rise and move out of poverty when the minimum wage increases. However, other low-skilled workers appear to lose their jobs or have their hours substantially reduced as a result of minimum wage hikes, causing income losses and increased poverty. On net, Neumark and Wascher (2002) find that the families of low-skilled workers are no better off (and may be made worse off) by minimum wage hikes. The authors conclude that the effects of minimum wage increases resemble income redistribution among low-skilled workers. Sabia (2008) finds a similar result for less-educated single mothers. In a study examining single mothers aged 15 to 55 without a high school diploma, he finds, on net, a statistically insignificant *negative* relationship between minimum wage increases and income. However, Aaaronson et al. (2009) find that among households with minimum wage workers, minimum wage increases are associated with increases in consumer spending, particularly on durables such as vehicles, but that spending increases more than income, leading to greater household debt.

Schooling Effects of the Minimum Wage

The effect of minimum wage increases on school enrollment is theoretically ambiguous. Minimum wages could reduce non-school employment opportunities for teenagers, thus increasing the cost of dropping out. At the same time, minimum wage increases could induce employers to substitute away from lower-skilled teenagers and toward higher-skilled teenagers, leading to increased demand for higher-skilled teenagers who drop out of school and join the labor market.

The empirical evidence on the schooling effects of minimum wage increases is mixed. Mattila (1978) finds that minimum wages are positively associated with school attainment. On the other hand, Neumark and Wascher (1995, 1996 a,b) find that minimum wage hikes between 1977 and 1989 reduced school enrollment, and Pacheco and Cruichshak (2007) find similar evidence for some specific-subgroups in later years[2]. Ehrenberg and Marcus (1980, 1982) find no net effects on state-level school enrollment, and also find that minimum wages reduce enrollment for low-income teenagers, and raise it among high-income teenagers. But other work (Warren and Hamrock, 2010; Campolieti et al., 2005; Neumark and Wascher, 2003; Card, 1992) has found no effect. Taken together, the evidence to date provides little evidence that minimum wage increases have increased school enrollment and mixed evidence on whether their effects are negative[3].

Output Price Effects of the Minimum Wage

Two early case studies of California (Card, 1992) and Texas (Katz and Krueger, 1992) found little evidence that minimum wages affect fast food prices. These findings—in conjunction

[1]To better control for differences in trends that could exist across heterogeneous states, Dube et al. (Forthcoming) instead rely on variation in minimum wages in contiguous counties across state borders and Addison et al. (2009) control for state-specific linear time trends. Sabia et al. (2010) use more highly educated individuals as an additional control group for a third difference.

[2]This result is consistent with Card (1992) and Cunningham (1981).

[3]They find some modest evidence that large hikes in the minimum wage might have small negative effects on the high school completion rate, but only in states in which students are permitted to drop out before age 17.

with Card and Krueger's (1994) evidence of positive employment effects from minimum wage increases—suggest that low-skilled labor markets affected by the minimum wage might be characterized by monopsony power.

However, a series of recent studies by Aaronson (2001) and Aaronson et al. (2007, 2008) find consistent evidence that minimum wage increases are associated with increased output prices in lower-skilled sectors and in low-wage regions of the country. Consistent with the results of Card and Krueger (1995), their study lends support to the competitive model prediction of full pass-through of minimum wage costs in prices (Lemos, 2004).

Profit Effects of the Minimum Wage

To the author's knowledge, only one study to date has explored the effects of minimum wage increases on firms' profitability. While Card and Krueger (1995) provide evidence that minimum wages reduce shareholders' expectations of future firms' value, Draca et al. (2008) are the first to present direct estimates of minimum wage effects on firms' profitability. Using panel data from the United Kingdom (UK), these authors estimate the impact of the imposition of a national minimum wage on the low-wage UK residential home care sector and on firms across all sectors. They find consistent evidence that the UK minimum wage reduced low-skilled firm profitability. While they did not find any evidence that the minimum wage increased firm exit rates, they did find some evidence of small reductions in entry rates.

GDP Effects of the Minimum Wage

Taken together, the empirical evidence on the effects of minimum wages on employment, income, schooling, output prices, and profits suggest that minimum wages may reduce output. However, there are very few studies that explore the effect of minimum wage increases on output or economic growth. Nickell and Layard (1999) note that the effect of minimum wages on growth is ambiguous because they eliminate low-productivity jobs, and also decrease employment among low-skilled workers. Cahuc and Michel (1996) argue that if minimum wages induce enough human capital accumulation among unemployed low-skilled workers, they may have long-run productivity benefits. Askenazy (2003) presents the first estimates of the "direct impact of a minimum wage on growth." Using data on 15 countries over four time periods, he finds a statistically insignificant (p-value = 0.43) positive relationship between the minimum wage and overall GDP growth[4].

While the finding of Askenazy (2003) is suggestive, it is clear that greater attention should be paid to (i) the role of unmeasured time trends, (ii) whether there is sufficient policy variation to identify minimum wage effects with some precision, and (iii) parameter heterogeneity across lower- and higher-skilled industries. The current study contributes to the literature by presenting the first estimates of U.S. state and federal minimum wage increases on overall and industry-specific gross domestic product.

Data and Methods

Data

The empirical analysis below uses state-year panel data from 1997-2007. Data for the dependent and independent variables were drawn from the Bureau of Economic Analysis (BEA) and the Current Population Survey (CPS)[5].

I begin the empirical analysis by asking whether minimum wage increases over this period were binding for lower-skilled, less-experienced workers. I focus on teenagers for this portion of the analysis because they are the most commonly studied group of low-skilled workers in the minimum wage literature (see Neumark and Wascher, 2008; Burkhauser et al., 2000). Next, I explore two potential mechanisms through which the minimum wage could affect gross domestic product: employment and schooling. Lastly, I turn to the key outcome of interest in this study—the natural log of state GDP in millions of constant dollars. State-, year-, and industry-specific GDP were collected from the Bureau of Economic Analysis for the years 1997-2007 using the North American Industry Classification System.

[4]The focus of the study by Askenazy (2003) is on whether the growth effects of the minimum wage differ by the level of a nation's exports; he finds that the interaction of the volume of the nation's exports and the minimum wage is positively and significantly related to overall GDP growth.

[5]GDP data are downloadable at http://www.bea.gov/ through the year 2007 at the time of this writing; minimum wage data are available at the Bureau of Labor Statistics at http://www.bls.gov/; and Outgoing Rotation Group data from the Current Population Survey is downloadable at http://www.nber.org/data/morg.html.

The central independent variable of interest is the natural log of the federal or state minimum wage (whichever is higher), collected from the Bureau of Labor Statistics. For years in which the state minimum wage changed mid-year, the average minimum wage that existed over the twelve month period was used. Between 1997 and 2007, there was substantial state-level variation in minimum wages. During this time there were two changes in the federal minimum wage and 28 changes in state minimum wages (see Sabia, 2009 for a discussion of the effects of this new minimum wage variation on precision of behavioral estimates)[6]. Other measures of socioeconomic controls, described below, are generated using the CPS' MORG files. The means of the dependent and independent variables are listed in Appendix Table 1.

Estimation

Following Card and Krueger (1995) and many of the studies reviewed by Neumark and Wascher (2008), the analysis begins by conditioning the sample on working low-skilled workers (teenagers) and estimating the effect of state and federal minimum wage increases between 1997 and 2007 on their wages:

$$wage_{st} = \psi + \beta_1 MW_{st} + X_{st}\delta_1 + \alpha_s + \tau_t + \varepsilon_{st} \quad (1)$$

Here, $wage_{st}$ is the natural log of the average wage rate of working 16 to 19 year-olds in state *s* at time *t*, MW_{st} is the natural log of the higher of the state or federal minimum wage in state *s* at time *t*, and X_{st} is a vector of the following state and year-specific socioeconomic controls: the prime-age (aged 25–54) average adult wage rate[7], the natural log of the prime-age male unemployment rate, the share of the population aged 16–19, the share of the population that are U.S. citizens, the share of population that is non-white, high school completion rates for those aged 25–64, the poverty rate, and the population aged 16–64. In addition, α_s, a time-invariant state effect, is included to capture fixed state-level characteristics, and τ_t, a state-invariant year effect, is included to capture unmeasured time trends common across states. In alternate specifications, a lagged value of *MW* is included on the right hand-side. If the key parameter of interest, β_1, is positive, then this would be evidence in support of the hypothesis that minimum wage increases were binding over this period for low-skilled workers.

Next, the employment and schooling effects of minimum wage increases are estimated using the following regression equations:

$$employ_{st} = \psi + \beta_2 MW_{st} + X_{st}\delta_2 + \alpha_s + \tau_t + \varepsilon_{st} \quad (2)$$

$$hs_{st} = \psi + \beta_3 MW_{st} + X_{st}\delta_3 + \alpha_s + \tau_t + \varepsilon_{st} \quad (3)$$

Here, $employ_{st}$ is the natural log of the ratio of employment to population of individuals aged 16–19 in state *s* at time *t* and where hs_{st} measures the natural log of the school enrollment rate for 16-to-19 year-olds in state *s* at time *t*. To control for differential trends in state-specific employment and high school graduation trends that are not expected to be affected by the minimum wage, the prime-age male unemployment rate and the high school completion rate of older individuals aged 25–64 are included in the vector X_{st}. Moreover, in alternate specifications of equations (2) and (3), state-specific linear time trends are included on the right-hand side to capture unmeasured state employment trends (Addison et al. 2009).

After exploring employment and schooling effects, the analysis turns to the estimation of the effect of minimum wage increases on GDP:

$$GDP_{st} = \psi + \beta_4 MW_{st} + X_{st}\delta_4 + \alpha_s + \tau_t + \varepsilon_{st} \quad (4)$$

As above, an important concern with the identification strategy pursued in (4) is that unmeasured state-specific time trends could be correlated with both state minimum wage changes and state GDP, leading to biased estimates of β_4. For example, if state legislatures tended to enact minimum wage increases when state economies were growing rapidly and avoided them at the onset of recessions, then difference-in-difference estimates may understate the magnitude of any adverse effect of the minimum wage on state output.

Moreover, there is likely to be substantial parameter heterogeneity in β_4. Industries that employed a larger share of low-skilled workers or produced goods and services are expected to be impacted by minimum wage increases to a greater degree than industries that employed more high-skilled workers. To identify low-skilled and high-skilled industries, I examine the

[6]The states that raised their minimum wages were AZ, AR, CA, CO, CT, DE, DC, FL, HI, IL, ME, MD, MA, MI, MN, MO, NV, NH, NJ, NY, NC, OH, OR, PA, RI, VT, WA, and WI.

[7]This measure is included to control for differential wage trends across states that should not be influenced by minimum wage policy.

Table 1. Share of Workers Earning Less than Half of the Average Private Sector Wage, by Industry, 2000		
Industry	Share of Workers Earning Less Than Half of the Average Private Sector Wage (all)	Share of Workers Earning Less Than Half of the Average Private Sector Wage (hourly)
Panel A: Relatively Lower-Skilled Industries		
Wholesale Trade	0.133***	0.196***
Retail Trade	0.341***	0.426***
Rental and Leasing Services	0.229***	0.291***
Manufacturing	0.112**	0.140*
Administrative/Waste Services	0.253***	0.293***
Food/Accommodations	0.592***	0.669***
Warehousing and Storage	0.170***	0.184***
Mean Across Lower-Skilled Industries	0.268***	0.338***
Panel B: Relatively Higher-Skilled Industries		
Finance and Insurance	0.067	0.116
Finance	0.068	0.124
Insurance	0.065	0.102
Transportation (Air/Rail/Water/Pipeline)	0.066	0.084
Air	0.067	0.089
Rail	0.063	0.075
Water	0.075	0.059
Pipeline	0.046	0.089
Telecommunications	0.051	0.070
Professional/Scientific/Technical	0.058	0.109
Mean Across Higher-Skilled Industries	**0.062**	**0.104**

***Statistically different from mean share of low-wage workers in higher-skilled industries (in Panel B) at 1% level.
**Statistically different at 5% level
*Statistically different at 10% level
Source: Current Population Survey Merged Outgoing Rotation Group, 2000

share of workers in each industry earning less than half of the average non-agricultural private sector wage[8]. This definition of low-wage workers was adopted from Burkhauser and Sabia (2007).

Table 1 reports the share of all workers in each industry earning less than half of the average non-agricultural private sector wage in 2000, $7.38. It is based on data drawn from the Current Population Survey's Merged Outgoing Rotation Groups. Seven lower-skilled industries are identified that map to the industries for which state-by-year GDP measures are provided by the BEA: wholesale trade, retail trade, rental and leasing services, manufacturing, administrative and waste services, food and accommodations, and warehousing and storage (Panel A). The share of workers earning a "low wage" among all workers is reported in column 1 and the share of hourly workers who report being paid less than $7.38 per hour is reported in column 2[9]. The retail trade, rental and leasing, administrative and waste

services, and food/accommodations industries have the largest shares of low-wage, low-skilled workers among the sample of relatively lower-skilled industries. On average, 26.8 percent of all workers and 33.8 percent of hourly workers in lower-skilled industries are "low-wage."

Using the same criteria, six high-skilled industries are identified: finance and insurance, transportation (air/rail/water/pipeline), telecommunications, data processing, and professional, technical, and scientific services (Panel B). On average, only 6.2 percent of all workers in these higher-skilled industries are low-wage workers, 332 percent lower than the percentage in the seven low-skilled industries. The share of low-wage workers in each relatively lower-skilled industry is statistically significantly higher than the average share of low-wage workers in the more highly-skilled comparison group (Panel B).

Thus, one way to test whether unmeasured state time trends are leading to biased estimates of β_4 is to estimate GDP effects for lower-skilled industries, where we might expect an effect, and then conduct falsification tests using the higher-skilled industries in Panel B, which are less likely to be affected by changes in minimum wages, particularly in the short-run. Data can then be pooled from each lower-skilled industry and the more highly-skilled industries to estimate a difference-in-difference-in-difference (DDD) model of the following form:

$$GDP_{ist} = \psi + \theta_i + \beta_i MW_{st} + \delta_i' X_{st} + \alpha_{is} + \tau_{it} + \omega_{st} + \varepsilon_{ist} \quad (5)$$

Here, i indexes industry (for instance, rental and leasing services versus telecommunications), and ω_{st} represents the interaction of the state and year fixed effects. In this framework, the source of the identifying variation is differences in GDP between the low-skilled industry and the comparison higher-skilled industries, controlling in the most flexible fashion possible for state-specific trends in GDP common to both the affected industry and the comparison group. Thus, the estimate of β_i in equation (5) will measure the effect of minimum wages on the differential trend in GDP growth between each lower-skilled industry and the higher-skilled industry.

An advantage of the triple-difference (DDD) approach is that it better controls for unmeasured state time trends. However, a limitation of this strategy is the lack of a "clean" distinction between treatment and comparison industries. There are two reasons for this. First, state-, year-, and industry-specific GDP data from the BLS are not available for narrower industries, so we cannot identify greater disparities in the share of low-wage workers across industries that might allow for a sharper distinction between affected and unaffected industries[10].

Second, in a general equilibrium framework, minimum wage increases could affect GDP in higher-skill industries. For example, adverse employment effects of minimum wage increases could lead to greater human capital accumulation among lower-skilled workers, leading to a longer-run GDP boost in higher-skilled industries. Thus, I explore whether there is evidence of spillover effects of the minimum wage on higher-skilled industries, particularly in the longer-run.

All regressions are weighted by state population aged 16–64, and standard errors are corrected for clustering on the state (Bertrand et al., 2004).

Results

Wage and Employment Effects

The first three columns of Table 2 show estimates of the effect of minimum wage increases on the wages of low-skilled workers. Column (1) shows that minimum wage increases are positively related to the wages of low-skilled workers, with an estimated wage elasticity of 0.108. The effect persists (but is

[8]Data for all GDP, private GDP, and government GDP were provided by the Bureau of Economic Analysis (BEA). Within the private GDP category, seventeen major industry categories are provided: manufacturing (durables and non-durables), wholesale trade, transportation, information, finance and securities, real estate and rental/leasing services, professional services, administrative services, agriculture, mining, utilities, construction, health care, education, accommodations, and arts/entertainment.

[9]Recent work by Bollinger and Chandra (2005) suggests that imputing hourly wages from reported earnings may introduce substantial measurement error. Thus, as in Sabia et al. (2010), results in Table 1 are presented for all workers and hourly workers.

[10]The BEA offers the following explanation for this: "The Bureau of Economic Analysis (BEA) does not include statistics for some of the detailed components of value added in the published tables because their quality is significantly less than that of the higher level aggregates in which they are included. Compared to these aggregates, the more detailed statistics are more likely to be either based on judgmental trends, on trends in the higher level aggregate, or on less reliable source data."

Table 2. Estimates of the Effect of Minimum Wage on Low-Skilled Workers' Wages and Employment							
	Wages			Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (Minimum Wage)	0.108**		0.119*	-0.215***		-0.192***	-0.185**
	(0.051)		(0.067)	(0.078)		(0.063)	(0.075)
Log (Minimum Wage) in t-1		0.090	0.070		-0.205**	-0.073	-0.175
		(0.054)	(0.079)		(0.094)	(0.088)	(0.154)
Long-Run Elasticity			0.189**			-0.265**	-0.360*
p-value			p = 0.04			p = 0.01	p = 0.06
Average Adult Wage Rate	0.018***	0.018**	0.016**	0.019*	0.018*	0.020*	0.018
	(0.006)	(0.006)	(0.007)	(0.010)	(0.010)	(0.010)	(0.012)
Log (Prime-Age Male Unemployment Rate)	-0.035***	-0.036***	-0.037***	-0.050**	-0.041*	-0.039*	-0.016
	(0.009)	(0.011)	(0.012)	(0.021)	(0.023)	(0.023)	(0.021)
Share of Population Ages 16-to-19	-1.20	-1.50	-1.81*	3.09*	1.60	2.10	3.18
	(0.879)	(0.977)	(0.985)	(1.68)	(1.82)	(1.87)	(3.43)
Share of Population U.S. Citizens	0.251	0.113	0.078	1.72***	1.33***	1.29**	-0.179
	(0.208)	(0.255)	(0.260)	(0.471)	(0.499)	(0.502)	(0.424)
Share of Population Non-Whites	-0.284	-0.266	-0.286	-0.279	-0.055	-0.146	-0.475
	(0.289)	(0.371(	(0.331)	(0.343)	(0.367)	(0.394)	(0.386)
High School Completion Rate for Ages 25-to-64	-0.723**	-0.734**	-0.751**	-1.57**	-1.49***	-1.56*	-0.553
	(0.282)	(0.323)	(0.310)	(0.573)	(0.557)	(0.564)	(0.553)
Poverty Rate	0.000	-0.001	-0.001	-0.012***	-0.008**	-0.009**	-0.005
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.005)
Log (Population)	0.088	0.111	0.130*	-0.204	-0.163	-0.146	-0.267
	(0.060)	(0.074)	(0.071)	(0.137)	(0.162)	(0.163)	(0.286)
State Effects?	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y
State-Specific Linear Time Trend?	N	N	N	N	N	N	Y
N	561	510	510	561	510	510	510

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. The dependent variable in models (1)-(3) is the natural log of the wage rate of working individuals ages 16-to-19. The dependent variable in models (4)-(7) is the natural log of the ratio of employment to population for individuals ages 16-to-19.

not statistically different from zero) when the lagged value of the minimum wage is used alone (Column 2), but is significant and larger in magnitude (elasticity = 0.127) in the longer-run when both the contemporaneous and lagged effects are included together (Column 3). Thus, there is strong evidence that minimum wage increases between 1997 and 2007 were binding for lower-skilled workers.

The remaining four columns of Table 2 (columns 4–7) show the employment effects of increases in the minimum wage. A

Table 3. Estimates of the Effect of Minimum Wage on School Enrollment of 16-to-19 Year-Olds				
	(1)	(2)	(3)	(4)
Log (Minimum Wage)	0.018		0.089**	0.065
	(0.038)		(0.043)	(0.054)
Log (Minimum Wage) in t-1		-0.0003	-0.062	-0.061
		(0.052)	(0.055)	(0.063)
Long-Run Elasticity			0.028	0.004
p-value			p = 0.63	p = 0.96
Average Adult Wage Rate	-0.008	-0.006	-0.007	-0.007
	(0.006)	(0.006)	(0.006)	(0.008)
Log (Prime-Age Male Unemployment Rate)	-0.005	-0.008	-0.009	-0.021
	(0.011)	(0.013)	(0.013)	(0.015)
Share of Population Ages 16-to-19	0.004	0.128	0.061	0.102
	(0.424)	(0.486)	(0.424)	(0.492)
Share of Population U.S. Citizens	-0.170	0.079	0.051	0.032
	(0.204)	(0.190)	(0.187)	(0.299)
Share of Population Non-Whites	-0.262	-0.255	-0.269	-0.140
	(0.261)	(0.248)	(0.245)	(0.336)
High School Completion Rate for Ages 25-to-64	0.117	-0.102	-0.115	0.007
	(0.282)	(0.248)	(0.248)	(0.302)
Poverty Rate	0.005***	0.004**	0.004**	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Log (Population)	0.094	0.166**	0.178**	0.261
	(0.072)	(0.082)	(0.081)	(0.193)
State Effects?	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y
State-Specific Linear Time Trend?	N	N	N	Y
N	561	510	510	510

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. The dependent variable in all models is the natural log of the share of the population ages 16-to-19 that was enrolled in school in the last week.

10 percent increase in the minimum wage is associated with a 2.2 percent decline in low-skilled employment, consistent with the consensus estimates of Neumark and Wascher (2008). The result persists when using the lagged minimum wage alone (Column 5) and is a bit larger in magnitude (elasticity = -0.265) in the longer-run (Column 6).

As discussed above, one critique of the "difference-in-difference" approach is that there may be unmeasured state employment trends that lead to biased estimates (Dube et al., Forthcoming; Addison et al., 2009; Sabia et al., 2010). Thus, in Column (7), controls for state-specific linear time trends are added. In this specification, the longer-run employment elasticity increases to -0.360.

Table 4. Estimates of the Effect of Minimum Wage Increases on GDP												
	Overall GDP				Private Sector GDP				Government GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log (Minimum Wage)	-0.065	-0.122*	-0.141**	-0.068*	-0.071	-0.135*	-0.155**	-0.076*	-0.004	-0.019	-0.029	-0.018
	(0.056)	(0.063)	(0.063)	(0.037)	(0.060)	(0.069)	(0.070)	(0.042)	(0.050)	(0.041)	(0.053)	(0.054)
Log (Minimum Wage) in t-1		0.065	0.102	-0.021		0.075	0.113	-0.017		-0.008	0.016	-0.063
		(0.057)	(0.066)	(0.064)		(0.060)	(0.078)	(0.078)		(0.060)	(0.055)	(0.051)
Log (Minimum Wage) in t-2			-0.071	0.053			-0.056	0.068			-0.183	-0.068
			(0.082)	(0.061)			(0.091)	(0.071)			(0.113)	(0.071)
Log (Minimum Wage) in t-3			-0.005	-0.045			-0.025	-0.052			0.156	-0.036
			(0.094)	(0.052)			(0.094)	(0.054)			(0.120)	(0.094)
Long-Run Elasticity		-0.057	-0.115	-0.081		-0.060	-0.123	-0.077		-0.027	-0.040	-0.185
p-value		p = 0.41	p = 0.19	p = 0.41		p = 0.43	p = 0.20	p = 0.47		p = 0.68	p = 0.56	p = 0.20
State Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State-Specific Time-Varying Controls?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State-Specific Linear Time Trend?	N	N	N	Y	N	N	N	Y	N	N	N	Y
N	561	510	408	408	561	510	408	408	561	510	408	408

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. All models include the full list of controls listed in Table 2. The dependent variable in each model is the natural log of state GDP.

School Enrollment Effects

Cahuc and Michel (1996) hypothesize that minimum wage increases could increase economic growth, especially in the longer-run, if the adverse employment effects among younger lower-skilled workers lead to greater schooling. This possibility is explored in Table 3. The baseline model (Column 1) shows evidence of a positive but statistically insignificant relationship between minimum wage increases and contemporaneous school enrollment rates, with an estimated elasticity of 0.018. The estimated effect becomes negative and smaller in absolute magnitude and remains statistically indistinguishable from zero when the lagged minimum wage measure is included alone (Column 2). When the contemporaneous and lagged minimum wage measures are included on the right-hand side of the estimating equation, the contemporaneous effect is positive and statistically different from zero, but the lagged effect is negative and of comparable magnitude; the long-run elasticity remains small and is not statistically significant (Column 3). Finally, when a state-specific time trend is included as a control (Column 4), the long-run school enrollment effect falls to 0.004. Thus, while there is robust evidence of a negative employment effect from minimum wage increases, there is little evidence that minimum wage hikes during this period affected teenage school enrollment rates, consistent with the findings of Warren and Hamrock (2010), Campolieti et al. (2005), Neumark and Wascher (2003), and Card (1992).

Overall GDP Effects

Table 4 presents estimates of the effect of minimum wage increases on aggregate GDP. The first three columns of Table 4 show estimates of β_4 from equation (4). The results suggest that a 10 percent increase in the minimum wage is associated with a small and statistically insignificant 0.65 percent decline in overall GDP (Column 1). When the lagged minimum wage (Column 2) is also included as a regressor, the longer-run elasticity remains small and statistically insignificant (-0.057), though the contemporaneous effect is now negative and marginally significant. In Column (3), three lags of the minimum wage are also included on the right-hand side of equation (1); the long-run elasticity (sum of elasticities for the contemporaneous and three lagged minimum wage effects) in this specification is around -0.12, driven by a significant contemporaneous minimum wage effect. The inclusion of a state-specific linear time trend (Column 4) reduces the magnitude of the

Table 5. Short- and Longer-Run Estimates of the Effect of Minimum Wage Increases on Lower-Skilled Industries									
	All Lower-Skilled Industries	Wholesale Trade	Retail	Rental and Leasing Services	Manufacturing Durables	Manufacturing Non-Durables	Administrative & Waste Services	Accomoda-tions & Food Service	Warehousing and Storage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel I: Short-Run Contemporaneous Effect									
Log (Minimum Wage)	-0.140**	-0.112***	0.042	-0.234**	-0.331	-0.089	-0.223***	0.110***	-0.285
	(0.065)	(0.037)	(0.035)	(0.111)	(0.205)	(0.209)	(0.061)	(0.027)	(0.219)
N	4,488	561	561	561	561	561	561	561	561
Panel II: Longer-Run Effect									
Log (Minimum Wage)	-0.185**	-0.080*	-0.043	-0.166*	-0.448**	-0.430	-0.108	0.044	-0.249
	(0.077)	(0.047)	(0.059)	(0.100)	(0.180)	(0.286)	(0.071)	(0.039)	(0.265)
Log (Minimum Wage) in t-1	-0.021	-0.030	0.079	-0.206**	-0.109	0.192	-0.112*	0.075	-0.060
	(0.065)	(0.057)	(0.071)	(0.089)	(0.248)	(0.229)	(0.063)	(0.045)	(0.322)
Log (Minimum Wage) in t-2	-0.009	-0.067	-0.067	0.089	0.121	-0.163	0.011	-0.017	0.019
	(0.065)	(0.118)	(0.090)	(0.129)	(0.209)	(0.253)	(0.108)	(0.083)	(0.333)
Log (Minimum Wage) in t-3	-0.017	0.071	0.065	-0.158	-0.546*	0.490	-0.082	0.110	-0.087
	(0.060)	(0.108)	(0.110)	(0.099)	(0.282)	(0.310)	(0.084)	(0.103)	(0.340)
Long-Run Elasticity	-0.232*	-0.106**	0.034	-0.441**	-0.982**	0.089	-0.291***	0.212***	-0.377
p-value	p = 0.08	p = 0.05	p = 0.62	p = 0.01	p = 0.03	p = 0.85	p = 0.00	p = 0.00	p = 0.40
State Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
State-Specific Time-Varying Controls?	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3,840	480	480	480	480	480	480	480	480

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. All models include the full list of controls listed in Table 2. The dependent variable in each model is the natural log of state GDP.

minimum wage effect, though the long-run estimate is generally consistent with Column (3). Thus, these findings suggest that a 10 percent increase in the minimum wage has a small (less than one percent) and generally statistically insignificant effect on overall GDP.

The remaining columns in Table 4 explore parameter heterogeneity across the private versus public sectors. The results provide only modest evidence of a negative relationship between minimum wage increases and private sector GDP (elasticity estimates of -0.06 to -0.12), and only the contemporaneous effect is significant in Columns 5–8. For the public sector (Columns 9-12), there is even less evidence of minimum wage effects on government GDP. Thus, the results in Table 4 suggest only limited evidence of small adverse effects of minimum wage hikes on private sector GDP[11].

However, given potential parameter heterogeneity in $\beta 4$ across private sector industries with varying shares of lower- and higher-skilled workers, the analysis next turns to industry-specific estimates.

Effects on GDP Generated by Lower-Skilled Industries

Table 5 presents estimates of equation (5) for the relatively lower-skilled industries described in Panel A of Table 1. Panel I shows contemporaneous difference-in-difference estimates of minimum wage increases while Panel II shows longer-run effects. The results suggest that minimum wage increases are associated with a reduction in GDP in lower-skilled industries. A 10 percent increase in the minimum wage is associated with a contemporaneous 1.4 percent decline in state GDP generated by these lower-skilled industries. Specifically, a 10 percent increase in the minimum wage is associated with

[11]Moreover, in unreported results, we include four- and five-year lags and continue to find no evidence of long-run positive growth effects.

Table 6. Short- and Longer-Run Estimates of the Effect of Minimum Wage Increases on Higher-Skilled Industries									
	All Higher-Skilled Industries	Telecom & Broadcasting	Telecom & Data Processing/ Info	Professional, Scientific, Technical	Air Transport	Rail Transport	Water Transport	Pipeline Transport	Finance and Insurance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel I: Short-Run Contemporaneous Effect									
Log (Minimum Wage)	0.095	0.103	0.200	-0.145	-0.108	-0.361	0.001	0.231	0.044
	(0.103)	(0.081)	(0.249)	(0.088)	(0.166)	(0.355)	(0.405)	(0.428)	(0.153)
N	4,395	561	561	561	561	537	504	549	561
Panel II: Longer-Run Effect									
Log (Minimum Wage)	-0.119	0.005	-0.360	-0.148**	-0.096	-0.165	-0.459	-0.124	-0.027
	(0.083)	(0.069)	(0.274)	(0.063)	(0.171)	(0.300)	(0.397)	(0.261)	(0.086)
Log (Minimum Wage) in t-1	0.284**	0.070	0.127	-0.022	0.353	-0.018	0.658	0.824	0.242
	(0.106)	(0.075)	(0.558)	(0.072)	(0.365)	(0.345)	(0.505)	(0.664)	(0.176)
Log (Minimum Wage) in t-2	-0.021	-0.150	0.143	-0.089	-0.368	0.494*	0.111	-0.196	-0.173
	(0.137)	(0.096)	(0.851)	(0.100)	(0.344)	(0.265)	(0.525)	(0.612)	(0.182)
Log Minimum Wage) in t-3	-0.030	0.088	0.034	-0.128	-0.134	-1.12**	-0.791	1.27	0.157
	(0.092)	(0.146)	(0.365)	(0.114)	(0.281)	(0.545)	(0.739)	(0.805)	(0.222)
Long-Run Elasticity	0.114	0.013	-0.056	-0.387**	-0.245	-0.809	-0.481	1.77*	0.199
p-value	p = 0.42	p = 0.92	p = 0.90	p = 0.01	p = 0.44	p = 0.23	p = 0.50	p = 0.06	p = 0.41
State Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
State-Specific Time-Varying Controls?	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3,213	480	480	480	480	392	382	399	480

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. All models include the full list of controls listed in Table 2. The dependent variable in each model is the natural log of state GDP.

GDP declines of 1.1 in wholesale trade, 2.3 percent in rental and leasing services, and a 2.2 percent decline in administrative and waste services. There were also negative (but statistically insignificant) declines in GDP in warehousing and storage and manufacturing of durables and non-durables, with respective elasticities of -0.29, -0.33, and -0.09. There is little evidence that minimum wage increases are related to GDP generated by the retail industry. While I find a small positive relationship between minimum wages and GDP generated by food and accommodations services, the evidence below suggests that this relationship is not likely causal in nature.

Relative to the short-run, the estimated effects of minimum wage increases on GDP in lower-skilled industries is approximately 69 percent larger in the longer-run (Panel II). A 10 percent increase in the minimum wage is associated with a longer-run 2.3 percent decline in lower-skilled industry GDP. The respective elasticities across the negatively affected lower-skilled industries are also larger in magnitude. Moreover, the long-run estimated effect is statistically different from zero for manufacturing of durables. Estimated elasticities range from -0.11 for wholesale trade to -0.98 for manufacturing of durable goods. However, caution should be taken in interpreting the difference-in-difference estimates in Table 4 causally. If state legislatures choose to raise minimum wages during periods of state GDP growth and are more reluctant to raise them during periods of recession, then difference-in-difference estimates would produce negative correlations biased toward zero and positive correlation (such as that found on food/accommodations) biased upward. We explore this point below[12].

Effects on GDP on Higher-Skilled Industries

While there is some evidence in Table 5 that a number of lower-skilled industries experience a decline in GDP when

Table 7. Triple-Difference Estimates of the Effect of Minimum Wage Increases on Lower-Skilled Industries									
	All Lower-Skilled Industries	Wholesale Trade	Retail	Rental and Leasing Services	Manufacturing Durables	Manufacturing Non-Durables	Administrative & Waste Services	Accomodations & Food Service	Warehousing and Storage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel I: Short-Run Contemporaneous Effect									
Log (Minimum Wage)	-0.238*	-0.210*	-0.056	-0.332*	-0.430*	-0.186	-0.321***	0.012	-0.384
	(0.133)	(0.116)	(0.093)	(0.188)	(0.250)	(0.231)	(0.115)	(0.098)	(0.268)
N	8,883	8,883	8,883	8,883	8,883	8,883	8,883	8,883	8,883
Panel II: Longer-Run Effect									
Log (Minimum Wage)	-0.068	0.036	0.074	-0.050	-0.332	-0.314	0.008	0.160*	-0.133
	(0.116)	(0.102)	(0.069)	(0.150)	(0.205)	(0.284)	(0.091)	(0.082)	(0.291)
Log (Minimum Wage) in t-1	-0.305**	-0.314**	-0.205**	-0.489***	-0.392	-0.091	-0.396***	-0.209**	-0.343
	(0.117)	(0.129)	(0.096)	(0.120)	(0.239)	(0.223)	(0.106)	(0.099)	(0.369)
Log (Minimum Wage) in t-2	0.010	-0.047	-0.047	0.190	0.141	-0.143	0.031	0.004	0.039
	(0.152)	(0.125)	(0.144)	(0.161)	(0.239)	(0.261)	(0.181)	(0.154)	(0.394)
Log (Minimum Wage) in t-3	0.011	0.096	0.090	-0.133	-0.522*	0.516*	-0.057	0.135	-0.062
	(0.111)	(0.137)	(0.108)	(0.126)	(0.304)	(0.255)	(0.130)	(0.122)	(0.388)
Long-Run Elasticity	-0.352*	-0.229	-0.088	-0.482**	-1.11**	-0.032	-0.414**	0.090	-0.499
p-value	p = 0.10	P = 0.15	p = 0.48	p = 0.03	p = 0.02	p = 0.95	p = 0.01	p = 0.49	p = 0.33
State Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
State-Specific Time-Varying Controls?	Y	Y	Y	Y	Y	Y	Y	Y	Y
State* Year Dummies?	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	6,477	3,621	3,621	3,621	3,621	3,621	3,621	3,621	3,621

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. All models include the full list of controls listed in Table 2. The dependent variable in each model is the natural log of state GDP.

minimum wage increases are enacted, these estimates may not represent a causal relationship, but rather a correlation due to unmeasured state-specific time trends. Thus, Table 6 presents estimates of the effect of minimum wage increases on GDP in the more highly-skilled industries. A 10 percent increase in the minimum wage is associated with a statistically insignificant 0.95 percent increase in average GDP generated by higher-skilled industries (Column 1). When each industry is considered separately, there is no evidence that minimum wage increases are associated with contemporaneous changes in GDP in telecommunications, professional/scientific/technical services, air transport, rail transport, water transport, pipeline transport, or finance and insurance (Columns 2-9).

Panel II explores whether there are longer-run increases in GDP in the more highly-skilled sector due perhaps to greater human capital investment by disemployed, low-skilled workers or employer substitution toward higher-skilled labor. In the longer-run (Panel II), there is little consistent evidence that minimum wage increases significantly affect GDP in these higher-skilled industries. A 10 percent increase in the minimum wage is associated with a statistically insignificant 1.1 percent increase in GDP in more highly skilled industries. Approximately half of the identified higher-skilled industries have negative long-run elasticities and half have positive elasticities, most not statistically different from zero. Only for pipeline transport (Column 8) is there some evidence of a long-run positive relationship between minimum wages and

[12]In unreported results, lagged minimum wages of up to five years continue to show little evidence of positive growth effects across industries, except in the accommodations/food service industry.

GDP. In summary, GDP generated by more highly skilled industries appears largely unaffected by minimum wage increases, lending little support for the hypothesis that minimum wage increases lead to greater economic growth in the longer-run due to (1) firms substituting toward higher-skilled workers or (2) lower-skilled workers investing more in education[13].

Triple-Difference Estimates

Table 7 presents difference-in-difference-in-difference estimates of the effect of minimum wage increases on lower-skilled industries (relative to higher-skilled industries) controlling for fully interacted state and year effects, which capture any unmeasured state time trends common to industries. The findings reflect that increases in the minimum wage reduce GDP across a number of lower-skilled industries. A 10 percent increase in the minimum wage is associated with a contemporaneous 2.4 percent decline in lower-skilled industry GDP relative to higher-skilled industry GDP (Column 1, Panel I). Across individual lower-skilled industries, the pattern is similar with a contemporaneous GDP elasticity of -0.21 for wholesale trade, -0.33 for rental and leasing services, -0.43 for manufacturing of durables, and -0.32 for administrative and waste services. Moreover, the estimated elasticities for retail, manufacturing of non-durables, and warehousing and storage, while statistically insignificant, are all negative: -0.06, -0.19, and -0.38, respectively. Notably, the effect of the minimum wage on GDP in accommodations/food services is now much smaller and statistically indistinguishable from zero, suggesting that the positive difference-in-difference correlation seen in Table 5 may have been due to differential unmeasured time trends in state GDP, and is not likely causal in nature.

As in Table 5, the long-run GDP effects for lower-skilled industries are, in general, larger in magnitude than the short-run effects (Panel II). Across all lower-skilled industries (Column 1), the sum of the contemporaneous and three-year lagged effects of the minimum wage is 48 percent larger than the short-run effect. This pattern persists across each of the lower-skilled industries.

Conclusions

While policymakers' calls for minimum wage increases are usually accompanied by appeals to social justice (see Sabia, 2008 for a discussion), recent calls for hikes have focused on the potential for minimum wage increases to stimulate economic growth:

> Raising the minimum wage is the first step toward a stronger economy for all Americans, not just for the privileged few. (Representative Christopher Carney, D-PA, 2007)

> [T]he last time Congress raised the minimum wage, our country experienced the strongest economic growth in decades. (Senator John F. Kerry, D-MA, 2007)

> The main effect of a minimum wage increase is simple: it takes money from an employer who could pay more and still earn a profit and puts it into the pockets of the lowest wage workers. This additional income will have an uplifting effect by helping to sustain economic growth. (State Representative Joseph Egan, D-NJ, 2005)

> Research also shows that raising the minimum wage not only aids minimum wage workers and their families but it also helps to stimulate the American economy. (Illinois Department of Labor, 2009)

> Millions of workers are going to get a raise [from the minimum wage] that they otherwise would not have gotten, and that will increase their purchasing power…

> [The] wage hike will increase U.S. GDP, serving as a small engine of growth as the U.S. economy inches back toward health. (Joseph Lazzaro, AOL Financial Watch, 2009)

Moreover, an economist at the Economic Policy Institute recently made the case that raising the minimum wage could be "a shot in the arm" for the economy:

> Some [supporters of the minimum wage increase] regard it as a stimulus that could help reduce the growing savings rate and increase consumer spending, which represents

[13]Several state-, year-, and industry-specific GDP categories did not fall as easily into the "lower-skilled" or "higher-skilled" industries. However, in the interests of completeness, Appendix Table 2 presents difference-in-difference estimates for seven industry categories not explored in the main body of the paper: agriculture, mining, construction, utilities, education, healthcare, and arts & entertainment.

two-thirds of the gross domestic product. The increase "could not have come at a better time," said Heidi Shierholz, an economist at the Economic Policy Institute..."

This will put $5.5 billion of spending into the economy," she added. "That's not going to solve our problems," but it is "a shot in the arm." (Shierholz, Washington Post, July 24, 2009)

While a number of studies have examined the effect of minimum wage increases on wages, employment, income, schooling, and output prices, little work has been done examining the GDP effects of minimum wage increases. Drawing on state-year panel data from 1997-2007, this study presents estimates of the effects of minimum wage increases on overall, private sector, and industry-specific GDP. Consistent with prior literature, the results show that minimum wage increases are associated with modest adverse employment effects among low-skilled workers, with estimated elasticities of -0.2 to -0.4 for teenagers ages 16-to-19. However, during the sample period analyzed, we find no evidence that minimum wage increases affect school enrollment rates for 16-to-19 year-olds in the short- or longer-run. Taken together, this evidence suggests that there may be adverse GDP effects from minimum wage increases.

Turning to GDP effects, the results suggest that minimum wage increases are associated with small to modest declines in GDP generated by lower-skilled industries, but have no effect on GDP generated by more highly-skilled industries. Triple-difference estimates that control for state-specific time trends show that a 10 percent increase in the minimum wage is associated with a 3.5 percent long-run decline in GDP in lower-skilled industries. Thus, these findings show that while minimum wage increases are not likely to have appreciable effects on overall or private sector GDP, there may be small to modest negative effects on GDP generated by some lower-skilled industries.

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Appendix

Appendix Table 1. Means and Standard Deviations of Dependent and Independent Variables			
Dependent Variables			
Wage Rate of Employed Workers Ages 16-to-19	6.93	Natural Log of Administrative and Waste Services GDP	9.15
	(0.760)		(1.07)
Ratio of Employment to Population for Ages 16-to-19	0.401	Natural Log of Accomodations Food Services GDP	9.04
	(0.082)		(0.950)
School Enrollment Rate for Individuals Ages 16-to-19	0.713	Natural Log of Warehousing and Storage GDP	6.68
	(0.045)		(1.07)
Natural Log of Overall GDP (in millions of current dollars)	12.70	Natural Log of Higher-Skilled Industries GDP[b]	7.41
	(0.963)		(2.37)
Natural Log of Private Sector GDP	12.57	Natural Log of Telecommunications and Broadcasting GDP	8.99
	(0.977)		(1.12)
Natural Log of Government Sector GDP	10.56	Natural Log of Telecom Data Processing and Information GDP	7.06
	(0.893)		(1.38)
Natural Log of Lower-Skilled Industries GDP[a]	9.06	Natural Log of Professional, Scientific and Technical Services GDP	9.94
	(1.50)		(1.17)
National Log of Wholesale Trade GDP	9.87	Natural Log of Air Transport GDP	7.12
	(1.02)		(1.47)
Natural Log of Retail GDP	10.01	Natural Log of Rail Transport GDP[c]	6.40
	(0.943)		(0.965)
Natural Log of Rental and Leasing Services GDP	8.03	Natural Log of Water Transport GDP[d]	4.96
	(1.05)		(1.84)
Natural Log of Manufacturing of Durables GDP	10.04	Natural Log of Pipeline Transport GDP[e]	4.71
	(1.06)		(1.54)
Natural Log of Manufacturing of Non-Durables GDP	9.69	Natural Log of Finance and Insurance GDP	10.04
	(1.07)		(1.11)
Independent Variables			
Natural Log of Minimum Wage	1.70	Share of Population that is Non-White	0.186
	(0.116)		(0.087)
Prime Age (Ages 25-to-54) Male Hourly Wage Rate	14.85	High School Completion Rate for Individuals Ages 25-to-54	0.875
	(2.13)		(0.039)
Unemployment Rate for 25-to-54 year-olds	0.038	Poverty Rate	0.123
	(0.011)		(0.278)
Share of Population Ages 16-to-19	0.088	Natural Log of Population Ages Ages 16-to-64	16.6
	(0.007)		(0.899)
Share of Population that are U.S. Citizens	0.858	N	561
	(0.101)		

Note: Standard deviations are in parentheses.
[a]Sample size is 4,488
[b]Sample size is 4,395
[c]Sample size is 537
[d]Sample size is 504
[e]Sample size is 549

Appendix Table 2. Difference-in-Difference Estimates of the Effect of Minimum Wage Increases on GDP Generated by Agriculture, Mining, Construction, Utilities, Education, and Health Care							
	Agriculture	Mining	Construction	Utilities	Education	Health Care	Arts & Entertainment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (Minimum Wage)	0.180	-0.262	0.018	-0.136	0.045	-0.009	0.113
	(0.109)	(0.331)	(0.092)	(0.137)	(0.075)	(0.046)	(0.078)
State Effects?	Y	Y	Y	Y	Y	Y	Y
Year Effects?	Y	Y	Y	Y	Y	Y	Y
State-Specific Time-Varying Controls?	Y	Y	Y	Y	Y	Y	Y
N	557	560	561	561	561	561	561
Mean (Std) of Log (GDP)	7.92 (1.14)	7.21 (1.73)	9.60 (0.952)	8.76 (1.01)	7.81 (1.14)	9.97 (0.944)	7.97 (1.11)

*** Significant at 1% level ** Significant at 5% level * Significant at 10% level

Notes: Standard errors corrected for clustering on the state are in parentheses. All models include the full list of controls listed in Table 1. The dependent variable in each model is the natural log of state GDP.

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