

Short-Term Effect of Minimum Wage on Income and Unemployment Rate

Benjamin Ryu*

August 8, 2024

Abstract

This article estimates the effect of minimum wage increases on Income and Unemployment Rate using a difference-in-differences (DiD) approach. Using American Community Survey(ACS) panel data we were able to model the impact of the change in minimum wage from 2014 to 2015. Our model suggest that the impact of increasing the minimum wage does not affect Income or poverty level, but it does increase the unemployment rate in a statistically significant way. To what degree the unemployment rate is affected is unclear as the labor market demand and supply react to the change in the minimum wage.

Keywords: Homeless; labor market; income; low-income housing; public policy

JEL Codes:

*Department of Economics, San José State University

1 Introduction

The minimum wage law in the United States started as state law for women and children in the 1910s, but throughout the year the the minimum wage became a federal law for all.¹ Since its start as a law aimed at women and child labor, minimum wage as a policy tool has created a new debate about the role it plays in the labor market. We understand from the simple economic model that the changes in prices will have changes in the demand and setting a minimum wage is similar to a price floor on labor acting as a price control. Ergo this paper attempts to find the causal effect of minimum wage on labor market indicators.

The discussion on the impact of the minimum wage on the labor market has been ongoing. As of the beginning of 2024, the federal minimum wage in the United States is \$7.25, although other states have differing the minimum wage.² There are several debates on whether the minimum wage should be equal to a "liveable wage". There is also debate on how increasing the minimum wage affects the demand for labor, especially low-income labor. This can result in the employment rate decreasing as firms are not able to hire at an increased wage (Brown et al., 1982; Card and Krueger, 1993). Another debate seen is the claim that increasing the minimum wage may also increase wages or at least the demand for higher wages across all levels on average. We are hoping to find the impact of increasing the minimum wage on working-class Americans. Whether supporting the increase of minimum wage will increase overall wage and employment of the regular worker.

There are several prior literature that ask similar research questions as this article using a difference-in-difference analysis(Brown et al., 1982; Card and Krueger, 1993; Otterby et al., 2024; Gou et al., 2023; Taylor and West, 2023; Meer and West, 2016). All these articles focus on minimum wages and their effect on the labor market and economic factors. We similarly wanted to attempt to find how the labor market is affected by minimum wage. However, we are admittedly taking more broader approach than some past literature by looking into a

¹Fishback and Seltzer (2021)

²<https://www.dol.gov/general/topic/wages/minimumwage>

fixed-effect difference-in-differences.

Our data is derived from ACS, which is annual data that is collected in the United States. The ACS is useful for our analysis as it collects annual individual data from demographic statistics, poverty, wage, and income. We can track the wage and poverty rate through the ACS data. We also have other statistics for summary statistics but these should not affect the result when we control for the variance in state using the fixed-effect. We are looking into the Unemployment rate by taking the total unemployed divided by the total number of people in the survey by the state and year.

As we attempt to produce a causal relationship between wage and minimum wage policy, we will be using a quasi-experimental method called Difference-in-Difference (DiD). Unlike an Ordinary Least Squares regression, a DiD will be able to find a casual effect of a policy. We intend to use the difference-in-difference to find the causal effect of a general increase in minimum wage on the overall difference in the wage, unemployment rate, and poverty rate in the United States.

Our results show that the increase in the minimum wage has no statistically significant effect on the income and poverty percentage. Our model did show a statistically significant decrease in the unemployment rate by 0.077 percentage points when the minimum rate is increased for the general sample population. The difference between the fixed effect and non-fixed effect models is not too different from one another. Both models have a poor fit except for the unemployment rate. This is most likely because minimum wage doesn't have a direct effect on the wage for the general population as both these factors include all ranges of income and wealth. In terms of policy, our article suggests that the minimum wage increase hurts the labor market in the short run for those living closer to poverty. Although this may be due to the impact of shocks and may result differently in the long run. In terms of policy, we recommend a similar approach as previous literature, that there is risk in raising the minimum wage when done through a general economic increase but when it is targeted to a specific industry and sectors the the effect may be more positive.

2 Literature Review

Card and Krueger (1993) establish a model in which they use a difference-in-difference analysis on the increase of minimum wage on employment in the fast-food industry. Card and Krueger (1993) chose New Jersey and Pennsylvania as treatment and control respectively, New Jersey and Pennsylvania had the same starting minimum wage and similar economic conditions. New Jersey increased their minimum wage in 1992 from \$4.25 to \$5.05 and they collected data from 410 fast-food restaurants across both states. Card and Krueger (1993) found no evidence that an increase in the minimum wage reduces employment in the fast food industry. However, they did find that the increase in the minimum wage did increase prices of the fast-food restaurants.

Brown et al. (1982) similar talks about the effect of minimum wage on employment and unemployment in the U.S., but in a more general and theoretical effect. Brown et al. (1982) Founded that it's not easily calculable what the dead weight loss caused by the minimum wage effect on the labor market is. In addition, they found that young adults were less affected by minimum wage when compared to teenagers. They further suggest that while some will suffer unemployment due to the minimum wage increase, others may be protected from teenage competition.

Otterby et al. (2024) looks at data from 2009 when the last U.S. federal minimum wage increased from \$6.55 to \$7.25 to 2019 when a significant amount of states increased their state minimum wage. Otterby et al. (2024) seeks to find the effect minimum wage has on labor market indicators with how the job posting, labor forces, unemployment rate, and GDP are affected. They use ordinary linear squares regression with a two-way fixed effect as their model, running each indicator as a dependent variable to minimum wage. They suggest that the increase in minimum wage increases the unemployment rate due to more people being interested in being employed at a higher salary than before, ergo increasing the labor force. They continue to suggest the effect of the minimum wage has a more larger impact in rural and non-metropolitan areas. But the difference in the rural/non-metropolitan

and cities/metropolitan areas makes it hard for them to come to a definite answer. They conclude by suggesting that the effect of minimum wage is complex and regionally based, tied to industry and labor market conditions.

Guo et al. (2023) looks into how minimum wage shortens employment in China. The policy they look into is the Minimum Wage Regulation established in China in 2004 as it strengthens the minimum wage law and enforcement of it across China. The passing of the regulation saw a change in the Chinese firms' employment patterns, with a decline in permanent workers from 71% before 2004 to 56% in the post-period, and they instead saw an increase of temporary workers grow from 15% to 24%. Guo et al. (2023) used an OLS with a two-fixed effect with the minimum wage as the independent variable on the employment pattern in a given year and individual. They conclude that increasing the minimum wage increases the firm's hire of short-term employment and a decrease in permanent employment and the strength of the effect is often dependent on the regulation of the law. Guo et al. (2023) believe the theoretical function behind this is that when labor cost increases it creates production uncertainty and the firms counteract this by higher temporary employees.

Taylor and West (2023) extend the work of Card and Krueger (1993) by using a DiD with continuous treatment specification. Taylor and West (2023) examined the arts, entertainment, and recreation sector and accommodation and food service sector as they have a higher portion of minimum wage workers than non-minimum wage workers. They found that there is a negative elasticity of employment with minimum wage in urban bordering counties. They also suggest that the minimum wage effect is more significant when controlling for state sales taxes, corporate taxes, and personal taxes. Taylor and West (2023) suggests that the effect of raising the minimum wage is not a factor that is distributed equally throughout the country and should be looked at as a local policy rather federal one.

3 Data

In this section, we will discuss the sources of our data. Our data is sourced from ACS through IPUMS; ACS or American Community Survey is annually collected by the US government, with information on jobs/occupations, education, and other economic data.³ For our study, our primary variable of interest is the Income from wages and salary, poverty percentage, and unemployment rate. We have also separated the states into two groups, states that had increased minimum wage in 2015 and those that didn't.⁴ One of the reasons we chose 2014 and 2015 as the years for our DiD analysis is because we saw that there were no increases in the minimum wage from 2013 to 2014 and a decent amount of states increasing the minimum wage from 2014 to 2015. The problem does arise in that only 35 states are accounted for in our panel data which is a small sample size and may be a weak causal effect on our result. A couple of states were excluded due to the structure of their minimum wage laws. But realistically this should only be a concern for the unemployment rate as it does not account for each respondent but rather each state and run into the sample size problem.

Table 1: Summary Statistic

Statistic	N	Mean	St. Dev.	Min	Max
Sex	1,894,340	0.481	0.500	0	1
Age	1,894,340	43.159	14.360	16	97
Education	1,894,340	7.695	2.354	0	11
Employment Status	1,894,340	0.033	0.178	0	1
Income	1,894,340	50,860.710	61,220.730	4	658,000
Poverty	1,894,340	366.444	146.421	1	501
Treatment	1,894,340	0.471	0.499	0	1
Unemployment Rate	1,894,340	96.624	0.477	92.715	97.936

We divided the summary statistics in Table 1 further by the Control and treatment groups noted in Table 2 and Table 3 respectively.

Control group of 22 states: Alabama, Alaska, Arizona, Arkansas, California, Colorado,

³<https://www.census.gov/programs-surveys/acs/about.html>

⁴<https://www.dol.gov/agencies/whd/state/minimum-wage/history>

Table 2: Summary Statistic for Control

Statistic	N	Mean	St. Dev.	Min	Max
Sex	1,003,041	0.474	0.499	0	1
Age	1,003,041	42.844	14.333	16	95
Educations	1,003,041	7.537	2.380	0	11
Employment Status	1,003,041	0.033	0.178	0	1
Income in Wage	1,003,041	48,759.500	57,673.060	4	483,000
Poverty Threshold	1,003,041	357.977	147.868	1	501
Treatment	1,003,041	0.000	0.000	0	0
Unemployment Rate	1,003,041	3.289	0.482	2.011	4.482

Connecticut, Idaho, Iowa, Kansas, Kentucky, Maine, New Hampshire, New Mexico, North Carolina, North Dakota, Oklahoma, Pennsylvania, Texas, Utah, Wisconsin, and Wyoming

Table 3: Summary Statistic for Treatment

Statistic	N	Mean	St. Dev.	Min	Max
Sex	891,299	0.489	0.500	0	1
Age	891,299	43.514	14.383	16	97
Educations	891,299	7.872	2.312	0	11
Employment Status	891,299	0.033	0.178	0	1
Income in Wage	891,299	53,225.360	64,900.690	4	658,000
Poverty Threshold	891,299	375.973	144.182	1	501
Treatment	891,299	1.000	0.000	1	1
Unemployment Rate	891,299	3.269	0.501	1.936	7.600

The treatment group of 13 states: Delaware District of Columbia, Florida, Hawaii, Maryland, Massachusetts, Missouri, New Jersey, New York, Oregon, Rhode Island, South Dakota, Washington, and West Virginia

Our variable income reports on each respondent's total pre-tax wage and salary income from the previous year. The variable income takes into account wages, salaries, commissions, cash bonuses, tips, and any monetary income from an employer.

Our next variable of interest is the unemployment rate, to get this from the ACS we got employment statuses representing whether or not a respondent is employed, ACS excluded

those who are not part of the labor force. We then divided the total number of unemployed in a given year by state by the total number of respondents. This should give us a proxy for the unemployment rate, although it may not exactly match the reported number from other sources.

Our last variable of interest is the poverty percentage which ACS calculates by each family's total income as a percentage of established poverty thresholds. ACS considers other factors such as family size, the number of children, and the age of the householder. 001 represents 1 percent or less of the poverty threshold which is the minimum value while 501 percent or more of the poverty threshold is the maximum value. Anyone below 100 or 100 percent is considered living below the threshold or in poverty.

4 Empirical Methods

Our empirical method is going to use difference-in-differences analysis to find the effect of the minimum wage. We are hoping to find the policy effect on our labor market indicator using this method, much like how Card and Krueger (1993) uses the DiD to find the effect of the minimum wage policy.

Our DiD model is represented by equations (1) and (2), in which we have a treatment and control group and a time period called after. Treatment is a binary variable to indicate in which group they are in. After will be an indicator variable of 0 or 1 and it represents whether or not the year is 2014 or 2015 respectively. α is our constant variable in both our models here and represents the period before the treatment in the control group. $\beta_1 + \alpha$ is the treatment group in pre-treatment and $\beta_2 + \alpha$ is our control group in post-treatment. $\alpha + \beta_1 + \beta_2 + \beta_3$ is the treatment in the post-treatment and our $(\beta_2 + \beta_3) - \beta_2 = \beta_3$ is the causal effect of our DiD. We won't have to control for another variable if we can find a good treatment and control group. We are expecting to see a difference in our regression in the

post-treatment compared to post-control.

$$Y_j = \alpha_j + \beta_1 Treatment_j + \beta_2 After_j + \beta_3 Treatment_j * Post_j + \varepsilon_j \quad (1)$$

$$Y_j = \alpha_j + \delta_j + \beta After_j + \beta_3 Treatment_j * Post_j + \varepsilon_j \quad (2)$$

The difference between equation (1) and (2) is that equation (2) is our fixed effect model while equation (1) is a basic DiD model. δ_j fixes for the difference in States using the State FIP. Any variance between different states should be accounted for when fixed. The reason we would fix for the states is that different states have different economic prowess and industries can have different effects during the period we have chosen. In equation (2) we omit treatment as the δ_j would make it redundant.

5 Results

This section will discuss the result of our model of the effect of the minimum wage(Policy Effect). We run the same model over different poverty thresholds, as minimum wage in theory would affect the people near the poverty line and below. We have three Tables from Table 4 to 6; Table 4 is our general sample population, Table 5 is those who live under the poverty line at 100 percent and below, and lastly, Table 6 is those who are living at the bottom 50 percent of the poverty line.

Table 4 has four models using equation (1) for model (1) and (2), and equation (2) for model (3) and (4). Model (1) uses a regular DiD model on Income and we see that the policy effect of increasing the minimum wage is not statically significant. Model (2) uses the same DiD model to find that the policy effect of increasing the minimum wage does decrease the unemployment rate at a significant level. Models (3) and (4) reflect similar results to our normal DiD model although there are slight changes in policy effect for unemployment going from -0.077 to -0.076 with a difference of 0.001.

Table 4: Difference in Difference

	<i>Dependent variable:</i>			
	Income <i>normal</i>	Unemployment Rate <i>normal</i>	Income: Fixed Effect <i>panel linear</i>	Unemployment Rate: Fixed Effect <i>panel linear</i>
	(1)	(2)	(3)	(4)
Treat	0.081*** (0.003)	0.019*** (0.001)		
After	0.036*** (0.002)	-0.407*** (0.001)	0.036*** (0.002)	-0.407*** (0.0002)
Policy Effect	-0.004 (0.004)	-0.077*** (0.001)	-0.004 (0.004)	-0.076*** (0.0003)
Constant	10.191*** (0.002)	3.494*** (0.001)		
Observations	2,027,035	1,894,340	2,027,035	1,894,340
R ²			0.0002	0.780
Adjusted R ²			0.0002	0.780
Log Likelihood	-3,346,637.000	-1,122,361.000		
Akaike Inf. Crit.	6,693,283.000	2,244,731.000		
F Statistic			183.978*** (df = 2; 2026999)	3,354,487.000*** (df = 2; 1894304)

Note: Logged Income *p<0.1; **p<0.05; ***p<0.01

Table 5: Difference in Difference: Below the Poverty Line

	<i>Dependent variable:</i>			
	Income <i>normal</i>	Unemployment Rate <i>normal</i>	Income: Fixed Effect <i>panel linear</i>	Unemployment Rate: Fixed Effect <i>panel linear</i>
	(1)	(2)	(3)	(4)
Treat	-0.036*** (0.009)	0.786*** (0.015)		
After	-0.006 (0.009)	-1.393*** (0.014)	-0.005 (0.009)	-1.401*** (0.006)
Policy Effect	0.005 (0.013)	0.331*** (0.022)	0.004 (0.013)	0.372*** (0.009)
Constant	8.610*** (0.006)	11.308*** (0.010)		
Observations	114,356	105,778	114,356	105,778
R ²			0.00000	0.439
Adjusted R ²			-0.0003	0.439
Log Likelihood	-173,897.100	-208,632.100		
Akaike Inf. Crit.	347,802.200	417,272.300		
F Statistic			0.159 (df = 2; 114320)	41,348.770*** (df = 2; 105742)

Note: Logged Income *p<0.1; **p<0.05; ***p<0.01

Table 5 represents the sample population of those who live below the poverty line. In a similar layout as Table 4 we see four models and similarly find the effect on income is minimal and doesn't produce a statically significant result. We do see a change in models (2) and (4) from Table 4 to Table 5. This time the policy effect of increasing the minimum wage also increases the unemployment rate at a statistically significant level unlike our general population model and the magnitude is larger. Both models (2) and (3) results are similar to each other.

Table 6: Difference in Difference: Below 50% Poverty Threshold

	<i>Dependent variable:</i>			
	Income <i>normal</i>	Unemployment Rate <i>normal</i>	Income: Fixed Effect <i>panel linear</i>	Unemployment Rate: Fixed Effect <i>panel linear</i>
	(1)	(2)	(3)	(4)
Treat	−0.016 (0.015)	0.939*** (0.021)		
After	−0.016 (0.014)	−1.838*** (0.020)	−0.015 (0.014)	−1.848*** (0.009)
Policy Effect	0.019 (0.021)	0.382*** (0.031)	0.016 (0.021)	0.469*** (0.014)
Constant	7.886*** (0.010)	16.538*** (0.014)		
Observations	38,852	105,778	38,852	105,778
R ²			0.00003	0.342
Adjusted R ²			−0.001	0.342
Log Likelihood	−55,861.000	−246,093.500		
Akaike Inf. Crit.	111,730.000	492,195.000		
F Statistic			0.581 (df = 2; 38816)	27,496.960*** (df = 2; 105742)

Note: *Logged Income*

*p<0.1; **p<0.05; ***p<0.01

Lastly, Table 6 measures those who are below 50 percent of the poverty line or threshold. Table 6 did not make any changes in the significance of the policy effect on income but we do see a magnitude increase. The policy effect remains similar to Table 5, where there is an increase in the unemployment rate at a statistically significant level.

6 Discussions

Our results for Tables 5 and 6 are no surprise from what the previous literature suggests. The increase in minimum in theory and in empirical studies has been shown to increase the unemployment rate. We also see the same effect in our study where the population that is earning around minimum wage will see a higher unemployment rate. The general effect of increasing the minimum wage is only going to be felt by those who are making minimum wage and we can see this in our results which suggest that it does not affect the population higher than the bottom 50 percent of the poverty threshold at a statistically significant level.

an interesting result we did find is that the unemployment rate decreased for the general population at a statistically significant level when the minimum wage increased as seen in Table 4. We are hesitant to make any casual statement on why our results suggest this. We do see that in some theories mentioned in our literature review, an increase in the minimum wage may protect those who are making slightly more than the minimum, therefore, causing the general population to be protected by the price level of labor. The firm will in theory opt to spend its resources on higher-skilled labor when the minimum cost of labor increases. But again we are hesitant to make that statement. There are several economic factors that may cause these differences that are not accounted for in this paper. It is also crucial to mention that this paper lacks a robustness check to determine a more casual statement on any result we present.

7 Conclusion

This study investigates the causal effects of minimum wage increases on income and unemployment rates in the United States. Using difference-in-differences (DiD) with fixed effects and without, we analyze data from the American Community Survey (ACS) to discern the impact of minimum wage changes between states that raised their minimum wages in 2015 and those that did not.

Our findings suggest that increasing the minimum wage has a negligible and statistically insignificant effect on overall income levels. However, there is a statistically significant increase in the unemployment rate by 0.331 percentage points when the minimum wage is raised for those living below the poverty threshold. These results suggest that while higher minimum wages do not directly translate into higher incomes or reduced poverty, they may contribute to increased unemployment, particularly in the short term.

From a policy perspective, our research supports a cautious approach to raising the minimum wage. While the goal of improving wages for low-income workers is great, our findings indicate potential negative effects on employment. Policymakers should consider targeted increases tailored to specific industries or regions to mitigate these negative impacts as suggested by previous literature. Additionally, the long-term effects of minimum wage increases warrant further investigation, as our study primarily captures short-term outcomes.

In conclusion, our research highlights the need for policymakers to carefully weigh the potential trade-offs associated with minimum wage adjustments, taking into account factors such as regional differences, industry-specific conditions, and long-term economic impacts. A future investigation into labor contracts, unions, and labor protection may produce more robust results on the effect it has on the average American worker.

References

- Brown, C., Gilroy, C., and Kohen, A. (1982). The effect of the minimum wage on employment and unemployment. *Journal of Economic Literature*, 20(2):487–528.
- Card, D. and Krueger, A. B. (1993). Minimum wages and employment: A case study of the fast food industry in new jersey and pennsylvania. Working Paper 4509, National Bureau of Economic Research.
- Fishback, P. V. and Seltzer, A. J. (2021). The rise of american minimum wages, 1912–1968. *The Journal of Economic Perspectives*, 35(1):73–96.
- Guo, G., Hu, D., Wang, H., and Zhang, J. (2023). How minimum wage shortens employment terms? *China Economic Quarterly International*, 3(2):103–118.
- Otterby, D., Crawley, A., and Gabe, T. (2024). Effects of the minimum wage on us county labor markets. *Regional Science Policy Practice*, page 100008.
- Taylor, G. C. and West, J. E. (2023). Minimum wage effects within census based statistical areas: A matched pair cross-border analysis. *Economics Letters*, 229:111220.