An Empirical Analysis of the Effects an Increased Minimum Wage has on Poverty

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Abstract: Recently, minimum wages have been a newsworthy topic, particularly in relation to poverty. This paper examines empirical evidence across all 50 states and Washington D.C. to evaluate the impact minimum wage increases have had on poverty rates. Using 19 years (the years 2000 through 2018) individual states are analyzed to provide a broader understanding of the relationship. The Years examined provide a a large sample size while avoiding the effects of the COVID years and related fiscal policy. Panel regression analysis was utilized to determine the effects different variables have on poverty rates. The main area of focus was the effects of changes in the real minimum wage, and the results indicate that there is a negative relationship between real minimum wages and poverty rates; however, years that had increases in the nominal minimum wage did not have lower poverty rates. The combination of these two results indicate that the declining real value of minimum wages result in an increase of poverty rates. Such findings can be informative to current policy debates on the value of increasing minimum wages.

I. Introduction

In the past few years, the push for an increased federal minimum wage has been at the forefront of political debates, centering on the concept of increasing the nominal wage to $15 per hour. The debate that arises is whether this increase would lead to decreased poverty for the working poor, or if it would only lead to higher unemployment. Desmond (2019) argues that a minimum wage of $15 would dramatically increase the social wellbeing of America as a whole. The author further argues that an increased minimum wage relieves stress, increases sleep, and prevents premature deaths. In agreeance, Cooper et al (2021) report that raising the federal minimum wage to $15 by 2025 will lead to decreased poverty along with a decrease in racial and cultural injustice. In contrast, Vedder and Gallaway (2002) conclude that an increase in minimum wage does not lead to a decrease in poverty levels among full time workers. Rather, the authors argue that small transfer payments are a more effective way to reduce poverty.

A second issue that is often raised is who is affected by a minimum wage increase. According to Burkhauser and Sabia (2007), from the years 1939 through 1989 there was a weakening relationship between those who earned a low wage and those living in poverty. This occurred because more low wage earners were not the heads of households and were instead the second or third earners in non-poor families. Burkhauser and Sabia (2007) also concluded that there is not a significant relationship between minimum wage increases and poverty levels. In contrast, Card and Kruger (1995) argue that minimum wage increases do have a modestly positive impact on poverty rates, and that an increase in the minimum wage also reduces income distribution inequality. Their findings showed that poverty rates declined faster in states where the federal minimum wage increase had a more prominent impact. The debate comes down to whether the unemployment effect will outpace the rising incomes.

Herein, empirical methods are employed to assess the impact an increase in the real minimum wage could have on poverty levels, standard of livings, and wealth distribution. This paper focuses on indexing minimum wages to inflation. Previous research has focused on the lack of evidence to support raising the minimum wage, but they have not considered the decreasing real wage. The results of the analysis will be used to frame a discussion on the potential effects of a minimum wage increase in Minnesota, while contributing to this ongoing debate.

Section II reviews the current literature surrounding the minimum wage debate. Section III discusses the data and method used in this analysis. Section IV provides results from the models analyzed, and section V offers a conclusion and implications of the results.

II. Literature Review

Card and Krueger (1995) provide a seminal early and extensive theoretical report containing two important factors regarding who reaps the benefits and costs of a wage floor, and what costs are faced by a declining real value of the minimum wage. Using CPS data[1] (1989 to 1991) across states, the authors find that the increases in minimum wage led to a reversal of the increasing income distribution gap. The authors report that a "ripple" effect that extends the benefits of increased wages beyond those making minimum wage. This effect is quite small and only applies to a select group, but it still could be relevant in the minimum wage debate. Additionally, the authors surveyed 410 fast food restaurants in New Jersey and Pennsylvania before a minimum wage hike, and then again 10 months after the hike to evaluate the effects on employment. Based on this survey, the authors found that employment increased in these restaurants after the minimum wage increase. While in contrast to expectations, the effect is quite small and only applies to a select group.

Cooper *et al* (2019) state that the federal minimum wage in 2019 was worth 17% less than it was in the 10 years prior, and 31% less than in 1968. Between 2010 and 2018, 29 states saw no increase in the real value of their minimum wage. Aside from increasing the hourly wage of workers, the authors argue that minimum wage increases help shrink the gender wage gap among low wage workers. According to the authors, the 10^{th} percentile wages grew faster for women than for men in states where there were increases in the real minimum wage.

Cooper *et al* (2021) provides a recent analysis on the minimum wage, estimating the impact of a gradual increase in minimum wage through 2025. According to the results, raising the minimum wage to $15 would resulting in increased wages for nearly 1 in 3 Black workers, and 1 in 4 Hispanic workers. Furthermore, it would raise the wages of 19 million front line workers, which is especially notable in the era of Covid. Their evidence also suggests that there is little job loss due to past minimum wage increases, and that even with the loss there is a net wage gain.

[1] The CPS is a monthly survey taken by the census bureau to gage the economic status of households in the United States. Topics vary by month-to-month surveys, but the main objective is to gather data about the labor force

Related to poverty levels, the authors argue that a $15 minimum wage would not be a poverty wage, therefore decreasing the number of people living below the poverty line by 3.7 million. The authors' calculations are based on data obtained from prior studies, and on adjusting totals for inflation.

In contrast, Campolieti *et al* (2012) use regression analysis to estimate the effects poverty has on minimum wage, and then develop a simulation to predict the results of a future minimum wage increase. The data used for the model is from the Survey of Labor and Income Dynamics (*SLID*), which provides income data for Canadian families, and covers the years 1997 to 2007 across 10 provinces. The authors use log transformed variables for the minimum wage in the poverty rate, which allows for the elasticities to be measured. Also included in the model is dummy variables for both time and state. The authors estimate an individual probability of job loss, based on the work of Sabia and Burkauser (2010). Using micro data from the 2008 Labor Force Survey (*LFS*)[2], Campolieti *et al* (2012) find that there is no statistically significant relationship between minimum wage increases and poverty levels in Canada. Extending their results to include a simulation that estimates the increased earnings against potential losses due to dis-employment, Campolieti *el al* (2012) conclude that one third of the wage losses would fall onto the working poor, which would override the potential gains by those who remain employed. The idea that the working poor are who will suffer the most unemployment is what drives the argument that minimum wages hurt workers, a result demonstrated by this empirical analysis of Canada.

Burkhauaser and Sabia (2010) implement the use of an individual-specific probability of job loss equation to state the probability of job loss for each individual in the CPS survey based on their demographic characteristics. The authors note the importance of unemployment insurance, which can affect the elasticity of employment. These employment elasticities measure the percent change in unemployment that result from a percentage change in minimum wages. To measure the level of poverty, Burkhauaser and Sabia (2010) use the income-to-needs ratio. Data from the census CPS, ranging from 2003 to 2007 is used in their study, meaning they are able to apply their regression and probability results on an individual level to determine each individual's probability of either gain or loss due to the increased minimum wage. The results indicate that

[2] Labor Force Survey (*LFS*) is similar to the Current Population Survey (*CPS)* in the Unites States. The LFS is a monthly survey that measures the state of the labor market in Canada

the minimum wage increases between 2003 and 2007 had no effect on poverty rates. Furthermore, they found that low wage-skilled workers experienced net losses when employment elasticities exceeded -0.86.

Allegretto *et al* (2008) strive to find a new estimate of employment elasticities by introducing more controls for heterogeneity. Using CPS data from 1990 to 2006, focusing the analysis on teens aged 16 to 19, the analysis includes state specific and division specific time trends in the base model, to allow for heterogeneity. These divisions are, as stated by the census, "a grouping of States within a census geographic region, established by the Census Bureau for the presentation of census data" (U.S. Census Bureau). For the teen population, adding controls for within division variation reduced the elasticity of employment and made it statistically insignificant from zero. Also included in the model is a specification to measure lagged effects. Much of the research suggests there are no lag effects from changes to minimum wage, due to low wage jobs averaging only 6 months in duration. In the case of this study, lag effects are insignificant once division and state specific time controls are added.

Quinn and Cahil (2017) compare minimum wages with the Earned Income Tax Credit (EITC) to evaluate which offers the greater benefit to everyone. The main differences between these two options are when the higher payments are received and who pays for these. With a minimum wage increase, workers will see an increase in their weekly payments, allowing their weekly expenditures to increase. With the EITC, one lump sum is received in the form of a tax credit/refund. The other difference is the minimum wage increases are paid by the employer while the EITC is paid by the government and therefore the taxpayers.

III. Data and Methods

Yearly data over the period from 2000 to 2018 was obtained, leaving off the years that were significantly affected by the COVID pandemic and related fiscal policies. Data was obtained for all 50 states plus Washington D.C, providing a balanced panel data set.

The model, with a log transformed poverty rate variable, was estimated as follows:

$$\ln(Y_{i,t}) = \beta_0 + \ln(\beta_1)\text{MINWAGE}_{1i,t} + \beta_2\text{UNRATE}_{2i,t} + \beta_3\text{INCOME}_{3i,t} + \beta_4\text{GDP}_{4i,t} + \beta_5\text{WAGE\_INC}_{1i,t} + \beta_6\text{RECESSION}_{2i,t} \quad (1)$$

Poverty rates (POVRATE), collected from the U.S. Census Bureau, measures the percent of the total population that is below the poverty line. Minimum wages (MINWAGE) were collected from the Federal Reserve Economic Data (FRED). These wages were then indexed to 2012 dollars using the CPI. Using real minimum wages, rather than nominal, is what allows for the differentiation between the effects of an increasing nominal wage and a decreasing real wage. Unemployment rate (UNRATE), collected form the Bureau of Labor Statistics, measures the effects increases in unemployment have on the poverty rate. Inclusion of this variable helps capture the dis-employment effects an increase in the minimum wage may have. Obtained from the Bureau of Economic Analysis, per capita income (INCOME) is included in the model to measure the effects increasing the overall per capita income of a state has on poverty rates, if any. The GDP increase variable (GDP), obtained from the Bureau of Economic Analysis, is included to measure how actual changes in real GDP effect poverty rates, rather than just the overall level of income or GDP. The final two variables, the wage increase (WAGEINC) and recession (RECESSION) variables, are both dummy variables. The recession variable is used to control for the effects the great recession had on poverty rates in 2008 and 2009. The wage increase variable is used to examine the levels of poverty in years that had nominal minimum wage increases compared to years that saw no wage increase. A one-year minimum wage lag, based on the work of Allegretto es al (2008), is also tested in Equation (3).

Table 1 provides descriptive statistics for the variables used in the analysis. The average poverty rate across all states and time periods is 13.32%, ranging from a high of 23.9% in Mississippi in 2013 and a low of 5.6% in New Hampshire in 2000. The top 5 highest observations of poverty rate all come from Mississippi, with the 5 lowest observations coming from New Hampshire. Figure 1 depicts the average poverty rate for each date during the period of 2000-2018, again with Mississippi having the highest average and New Hampshire having the lowest. Real minimum wage averages $7.23 and ranges from $5.70 to $10.52. Unemployment rate ranged from 2.3%, which was in Virginia in 2000, to 13.7% in Michigan in 2009, with an average of 5.62% across all states and years. Per capita income ranges from $21,681 to $80,342 with an average of $40,344. The state with the highest average per capita income is Connecticut with

$59,125.77, and the state with the lowest is Mississippi with $30,768. The annual change in real GDP ranged from -9% to 22% with an average year over year increase of 2%.

IV. Empirical Results

The results for the 4 models are presented in Table 2. The Hausman test was used to determine the effects specification for both the state and year effects. With a test statistic of 0, there were no fixed effects for the state and time effects, meaning a random effects specification was selected.

In model (1), real minimum wage has a value of -0.39, which is statistically significant at the 1% level. Holding all else equal, a 1 percent increase in the real minimum wage results in a 0.39% decrease in poverty rates. The opposite is also true, a 1% decrease in real wages results in a 0.39% increase in poverty rate, assuming all else remains constant. This result indicates that minimum wages have a negative effect on poverty levels, which is consistent with economic theory, but does not follow the research of some of the previous literature including Burkhauaser and Sabia (2010). It does, however, support the conclusion of Cooper et al (2021) that increases in minimum wages are needed due to their declining real value. The differences between these results and prior studies can likely be attributed to the changing data. As can be seen in Figure 1, with states implementing their own increases in minimum wages, there is growing diversity between the low and high ends of real minimum wage, allowing for a more comprehensive estimation.

The wage increase dummy variable is the main portion of this study that differs from prior studies. The main reason for including this variable was to differentiate between the effects of increasing the nominal wage with the effects a decreasing real wage has on poverty levels. The results indicate this dummy variable has a value of positive 0.008 but is statistically insignificant. Although insignificant, it is still positive, and years with nominal minimum wage increases, on average, do not have lower poverty rates.

The unemployment rate is significant at the 1% level with a value of 0.068. This positive relationship is logical given that the more people that are unemployed, the greater the number of people living below the poverty line. The value of 0.068 indicates that increasing unemployment

rate by one percentage point, from 4 to 5 percent for example, leads to an 6.8% increase from the previous poverty rate, ceteris paribus.

Per capita income is statistically significant at the 1% level of significance. This variable is measured in $1000, meaning that increasing the per capita income by $1,000 results in a lower poverty by an average of 0.3%, assuming other variables remain constant.

GDP change is a measure of the impacts an increasing real GDP has on poverty rates. With a value of 0.18 there is a positive relationship which is opposite of the a priori expected sign, however it is statistically insignificant. This indicates that just because a state is experiencing GDP growth does not mean that their poverty will be falling.

The recession dummy variable, which indicates the years of 2008 and 2009, is statistically insignificant. With a value of -0.009 there is a negative relationship between years during the great recession and poverty rates.

The one-year lag variable that was tested for has a statistically insignificant value of -0.019. This indicates that there is a negative relationship between the real minimum wage and poverty rates, but it is not statistically different than zero. The insignificance of the lag term in consistent with other literature. Allegretto et al (2008) argued that the lack of a lag effect is due to most minimum wage jobs only being occupied by the same employee for 6 months or less.

To assess this relationship for specific states, a time series analysis was created utilizing the same variables. Several examples are shown in Table 3. The results, for Minnesota, have an adjusted R-squared value of 0.86 indicating a relatively good fit, better than the overall fit of the panel data regression. One of the reasons this could be is due to the low number of observations, and there are no cross-section differences to cause increased variation. Mississippi is an important result to consider because it is the state with the highest average poverty rates over the 19-year period. Finally, Washington and California are analyzed because they are the states that have seen the most increases in their minimum wage, and as a result have the highest minimum wages.

Similar to the panel regression, the log transformed minimum wage variable is negative, indicating an inverse relationship between minimum wages and poverty rates. With a value of -0.726, a 1% increase in minimum wages results in a 0.726% decrease in poverty rates, assuming

all else equal. This variable significant at the 5% level rather than the 1% level in the panel regression.

Unemployment is significant at the 1% level with a positive coefficient, which matches the panel results. Per capita income has a positive relationship with poverty levels in the Minnesota output, this is opposite of the panel results and is likely due to the minimal observations. The wage increase dummy variable is positive but insignificant. This indicates no significant effects of wage increases in the year studied. The change in GDP variable is statistically insignificant but negative, meaning positive increases in real GDP are weakly associated with lower

V. Conclusion

The results of this analysis offer a look into the current empirical evidence regarding minimum wages and their relation to poverty levels. With the wage increase dummy variable having a positive coefficient, the first conclusion is that years with minimum wage increases, on average, saw higher poverty rates than all other years. This is consistent with prior research and indicates that raising minimum wages do not help poverty rates, at least in the short term. This is contradictory, however, to the negative value that the real minimum wage variable has. It is the combination of this variable and the real minimum wage variable that provide the primary source of data for the conclusion of this paper and the ultimate effects minimum wages have on poverty rates. The real minimum wage variable having a negative value follows the findings of Card and Kruger (1995). It also supports the 2019 and 2021 studies by Cooper et al. This concept of indexing for inflation is a main result in the study by Cooper et al (2021). The implication of declining real values of minimum wages, is a reduction in the purchasing power of minimum wage workers and cannot keep up with the raising poverty line. This means that although years with minimum wage increases say higher poverty rates, there is still a negative relationship between minimum wages and poverty rates. With these two variables it can be concluded that indexing the minimum wage for inflation would help avoid the negative effects of a declining real wage without seeing some of the misemployment effects that come from significant wage increases. Not measured in this study, but important to consider is how these wage increases will affect fringe benefits. According to Law (1998), minimum wage increases in the 70s resulted in a decrease in fringe benefits. This is due to the fact the employers main concern is the total compensation package, which includes real wages and other benefits.

The results of this paper are not so much a solution to poverty, but a measure that should be taken to so minimum wages do not counteract other anti-poverty measures. Adjusting minimum wage for inflation is a measure that will allow other ant-poverty practices such as tax credits and transfer payments to be more efficient, and not have to compete against another factor pushing poverty rates up.

Table 1: Descriptive statistics of variables

Variable	Mean	Std. Dev.	Max	Min	A priori expected sign
POVRATE (%)	13.32	3.28	23.90	5.60	
RMINWAGE ($)	7.23	0.87	10.52	5.70	+/-
UNRATE (%)	5.62	1.98	13.70	2.30	+
PCAPINC ($)	40344.18	9707.92	80342.00	21681.00	-
GDPINC	0.02	0.03	0.22	-0.09	-

Table 2: Dependent Variable: Poverty Rate

Variable	Equation			
	(1)	(2)	(3)	(4)
Log transformed dependent variable	Yes	No	Yes	Yes
real minimum wage ($)	-0.389***	-5.2588***	-0.251	-0.0516***
	(0.07852)	(1.0324)	(0.21285)	(0.010585)
Unemployment rate (%)	0.068***	0.8875***	0.0675***	0.0672***
	(0.003993)	(0.051348)	(0.003985)	(0.003974)
per capita income ($1000)	-0.00304***	-0.0306***	-0.00292***	-0.00295***
	(8.33E-04)	(0.0108)	(8.33E-04)	(8.34E-04)
GDP change	0.178	1.4606	0.1856	0.193729
	(0.2852)	(3.73975)	(0.285938)	(0.285557)
recession (dummy)	-0.00898	-0.15492	-0.0096	-0.00694
	(0.0264)	(0.33298)	(0.026289)	(0.023211)
Wage increase (dummy)	0.008	-0.00577	-0.00235	0.007181
	(0.01807)	(0.237412)	(0.027216)	(0.018087)
1 year lag			-0.019	
			(0.0271)	
Constant	3.062***	19.920***	2.925***	2.668***
	0.1386	1.8202	0.2354	0.0679
adjusted R-squared	0.279	0.282	0.277	0.278
observations	969	969	969	969
F-statistic	63.44	64.46	54.11	63.02
F-probability	0.000	0.000	0.000	0.000
Hausman test statistic	0.000	0.000	0.000	0.000

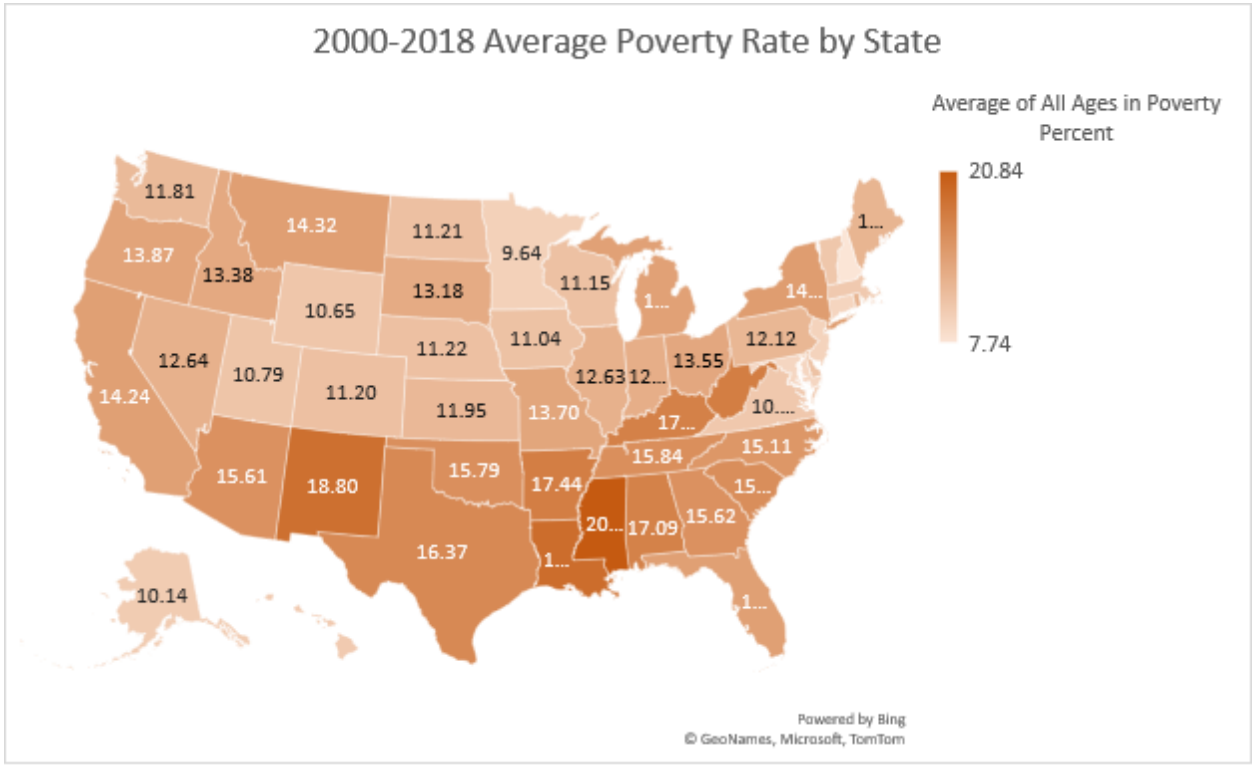
*p<0.1, **p<0.05, ***p<0.01, standard errors in parenthesis.

Table 3: Various States Output

Variable	State			
	Minnesota	Mississippi	Washington	California
Constant	2.24***	2.8896***	2.2403***	3.1842***
	(0.4052)	(0.2792)	(0.4052)	(0.5617)
Minimum Wage	-0.726**	-0.2459	-0.7265**	-0.5292*
	(0.2645)	(0.6583)	(0.2645)	(0.2933)
Wage increase (dummy)	0.059	-0.0555	0.059	0.0096
	(0.036)	(0.0428)	(0.036)	(0.0325)
Unemployment	0.0797***	0.0436***	0.0797***	0.0351***
	(0.0128)	(0.006637)	(0.1283)	(0.0072)
Income	0.0247***	0.013***	0.00247***	0.0076
	(0.00393)	(0.00177)	(0.00393)	(0.00235)
Recession (dummy)	-0.1254*	0.02244	-0.1254*	-0.0758
	(0.0621)	(0.0507)	(0.0621)	(0.0494)
Change in GDP	-0.4248	-0.14495	-0.4248	0.3949
	(0.887)	(0.6583)	(0.8872)	(0.2934)
Adjusted R squared	0.86	0.83	0.86	0.76
SER	0.061	0.034	0.061	0.052
F statistic	20.14	16.14	20.14	10.6467
F-stat probability	0.0001	0.00004	0.0001	0.0003
Observations	19	19	19	19

*p<0.1, **p<0.05, ***p<0.01, standard errors in parenthesis.

Figure 1:


2000-2018 Average Poverty Rate by State
Average of All Ages in Poverty Percent
20.84
7.74
11.81
14.32
11.21
9.64
13.87
13.38
13.18
11.15
10.65
11.22
11.04
12.64
10.79
11.20
11.95
13.70
14.24
15.61
18.80
15.79
17.44
15.84
15.11
16.37
17.09
15.62
10.14
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