Effects of Minimum Wage on Unemployment Rates Across the United States

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Abstract

In recent years, there has been widespread discussion on the effects of minimum wage on unemployment. In this paper, we have compiled extensive data on the variation of minimum wage levels across states, as well as looking at other variables that have an effect on earnings such as educational levels, weekly unemployment benefits, and the CPI. Using simple and multiple regression analysis and other statistical tests on our variables, we have come to the conclusion that there is evidence that supports a positive relationship between minimum wage and unemployment, which ultimately supports our hypothesis that raising the minimum wage, increases unemployment.

I. Introduction:

The topic of raising the minimum wage in the US has caused many policymakers to debate the merits as well as the negative impacts such that raising the minimum wage would cause an increase in unemployment. The reason why this topic has caused so much controversy is because the extent of the effect of raising the minimum wage is still unknown due to the number of factors and their effect on the labor market. After the recession of 2008, unemployment rate was continuously at a high rate of about 10%, where the job market for low-skilled workers was especially hit hard. Though the rate has since gone down, the unemployment rate for low-skilled workers has remained high and many of these workers have continued to struggle to ensure a decent living with their income (Borbely). This is where the debate for raising the minimum wage comes in. There are those that argue that raising the minimum wage helps bring low-skilled workers, a number of whom live under the poverty threshold, to a standard of living where it is possible to live off their earnings. There are also many that argue that raising the minimum wage will actually end up raising the unemployment rate and hurting those it is supposed to benefit due to employers hiring fewer employees to compensate for paying them more as well as creating greater competition in the job market (Borbely). While this debate continues, it has not stopped multiple states from passing laws that raised the minimum wage above the federal level of $7.25. Now with the variation of minimum wage levels across states, it has provided the opportunity for many to perform studies and experiments to further analyze the effects of whether raising the minimum wage helps lower/raise the unemployment rate or if there are more factors and variables that show a greater effect on the unemployment rate. This paper helps contribute to the analysis of the effect of the minimum wage on unemployment by using recent data to run simple and multiple regression analysis on a number of variables that have a possible effect on the unemployment rate across state borders.

Before we began the regression analysis, our hypothesis included that as minimum wage increases, unemployment will also increase because the demand for labor will decrease while the supply of labor increases, creating a surplus of labor. We began our analysis by first looking at the minimum wage levels across all 50 states including Washington D.C. Then we looked at the other possible variables that we believed have an effect on the unemployment rate which included the weekly unemployment benefits, the consumer price index for 2014, and three educational levels from the percent of high school graduates, percent of individuals with undergraduate degrees, and the percent of individuals with advanced degrees. Using three different models to compile our data, we found evidence supporting the notion that minimum wage has an impact on unemployment as we had originally thought and that when we include our other variables, we see a greater effect on unemployment.

The rest of the paper is broken down into sections that include literature reviews, a description of the data, the results of our simple and multiple regression analysis models as well as statistical inference, and the conclusion of our analysis.

II. Literature Review

There are numerous amounts of literature that analyze the effects of minimum wage on unemployment. While some use data analyzing the effects across states as well as looking at other variables that have an effect on unemployment, many of these studies show strong evidence supporting the notion that other variables in addition to the minimum wage, do seem to have an impact on unemployment.

II.1 Minimum Wage Effects across State Borders: Estimates Using Contiguous Counties

In Minimum Wage Effects Across State Borders: Estimates Using Contiguous Counties, authors Arindrajit Dube, T. William Lester, and Michael Reich assert that both the traditional approach and the case study approach in identifying the effect of minimum wage on unemployment and increased wages do not take local conditions or spatial heterogeneities into consideration. This in turn leads to an over-approximation of the negative effects. To counter this, the authors look at contiguous county pairs and the local policy changes in minimum wage from the years 1990 to 2006. They also focus their study on the restaurant industry because they use the highest number of minimum wage workers. The authors find that increases in minimum wage do increase the amount of money that workers take home by a significant amount. However, given the increases in minimum wage in the United States over the past years, there was no significant increase in unemployment levels.

II.2 Effects of the Minimum Wage on Employment Dynamics

The Jonathan Meer and Jeremy West article, Effects of the Minimum Wage on Employment Dynamics, focuses on the effects of minimum wage on the new employment growth than in employment levels. These effects, the study found, are generally most noticeable in teenagers and low skilled workers since they both are more likely to be at a minimum wage level. The studies found that as minimum wage rises, job growth lowers. The level of employment does not necessarily follow that same trend however. The adverse effect on job growth is due to establishments not creating new jobs; not the destruction of jobs.

II.3 The Impact of Minimum Wages on Unemployment Duration: Estimating the Effects Using the Displaced Worker Survey.

In the Impact of Minimum Wages on Unemployment Duration, Roberto Pedace and Stephanie Rohn examined the impact of minimum wages on unemployment duration among numerous groups of females and males and their results showed that higher minimum wages were more common with males who had a shorter unemployment duration as well as having received a high school diploma. In contrast, the males who did not receive a high school diploma or GED, were shown to have a longer unemployment duration. Older females who held low-skilled jobs were also shown to have longer unemployment duration compared to their male counterpart. The results, like other studies before, show evidence that there are not only concerns dealing with income distribution among males and females, but that educational levels do seem to have an effect on unemployment.

Our paper adds to the existing literature by testing the effect of minimum wage on unemployment across state borders which include the states with a minimum wage higher than the federal level of $7.25 and the states that have a minimum wage equal to the federal level that we acquired from different data sources from recent years. It also takes into effect education levels, which is not always taken into account. We use data types which include a simple and multiple regression analysis models to then test the significance of each variable and whether its impact has a strong effect on unemployment levels. In the next section, we describe the data more in depth with the reasons for including those variables as well as the three models showing the results of our testing.

III. Data

Each of our three models has the same dependent variable, the unemployment rate of the state. Using the rate instead of total unemployed persons in each state is a better measure of the labor situation accounting for the population differences from state to state. The unemployment rate is measured by dividing the number of unemployed by the total labor force. The total labor force is measured by the number of people 16 years old and over that are “either working or actively seeking work” (BLS).

One independent variable chosen was the minimum wage. This minimum wage varies state by state, with Washington D.C. included as an entry as well. If a state did not have a set minimum wage then it was set to the federal minimum wage level. Initially, we had decided to include a category for the difference between the state and federal wages but then realized that the co-linearity will be exactly one, thus rendering it useless to the point that STATA would not include it either. In the simple regression model, the only variables included are the unemployment rate as the dependent variable and the minimum wage as the independent variable.

The second independent variable is the weekly unemployment benefit. We took the upper limit of each state's maximum weekly payout for unemployment to see the full effect of the benefits on the unemployment rate. We would have liked to find the average unemployment benefits paid out because that would have accounted for the wage distributions in the state. The reason behind that is that a person's wage before being laid off or fired determines the level of unemployment benefits that he or she is eligible to receive. We wanted to test the effects of the unemployment benefits on unemployment rate because having a fall back option can allow individuals to wait and pick a job they are satisfied with instead of choosing the first available job, thus reducing the unemployment rate.

The third independent variable in the regression analysis is the Consumer Price Index (CPI) level for 2014. CPI is "a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services" (Bureau of Labor Statistics). The CPI is used to calculate inflation so we used it to see the average price level in each state. This may play an effect on minimum wage and on unemployment rate. Minimum wage is affected because some states vary their minimum wage according to the CPI and others use to calculate a minimum living wage. Unemployment rates also can be affected because as CPI rises, prices rise, forcing employers to lay off more employees in the process.

The next three independent variables are included for the same reasons: percent of high school graduates, percent of individuals with undergraduate degrees, and the percent of individual with advanced degree. The percent of individuals with high school degrees includes those with GEDs. The percent of those with undergraduate degrees takes into account bachelor's, associate's, and any vocational/trade school degrees. The advanced degree calculation includes Master's and Doctorate degrees. We believe that the high school and bachelor's degree holder percentages will decrease the unemployment rate since the individuals are more educated, thus better qualified and more capable employees. On the contrary, we believe that the advanced degree percentage will increase the unemployment rate because they are overqualified for lower tier or entry level jobs in many cases, which become more abundant due to their low pay as employers cut costs. Often, advanced degrees can lead to a phenomenon called underemployment, where individuals are in jobs below their education levels. Situations like these are not ideal for an employer due to the concern that the employee may move on as soon as possible leading to a higher turnover rate meaning more expenses training new employees over and over again. These three levels of education markers are another key part of our paper even though we believe they have different effects on the unemployment rate.

The minimum wage and unemployment data came from the Bureau of Labor Statistics of the U.S. Department of Labor Statistics. The U.S. Department of Labor collects data on a wide range of labor statistics for our nation so this was a prime resource for our purposes. The maximum weekly unemployment payout came from AboutCareers.com, which is a resource for individuals looking for a job. This resource

provides them with pertinent information to allow them to create a plan of action. The CPI statistics for each state for the second quarter of 2014 came from the Missouri Economic Research Center, part of the Missouri Department of Economic Development, which focuses on helping businesses, individuals, and communities grow and prosper economically. Lastly, the education data came from the 2013 American Community Survey, from the United States Census Bureau. The ACS surveys are conducted yearly to allow various organizations to see a general make up of our nation and its citizens.

For our analysis, we used three different models to explore the effects of minimum wage and other factors on unemployment. The first model is a simple regression model with unemployment as the dependent and the minimum wage as the independent variable. The second model, once again, contains the unemployment rate as the dependent variable, but with minimum wage, unemployment weekly benefits, CPI, percent of high school graduates, percent of undergraduate degrees, and percent of advanced degrees as the independent variables. The third model is the same as the second, but it excludes the states that have the same minimum wage as the federal minimum wage, cutting down our number of observations from 51 to 23 for the third model. Below are the equations for the 3 different models with 2 and 3 shown as one equation since it is just a difference in the number of observations.

Model 1: Simple Regression Analysis

$$unemp = \beta_0 + \beta_1 mwage$$

Models 2 and 3: Multiple Regression Analysis

$$unemp = \beta_0 + \beta_1 mwage + \beta_2 uweekly + \beta_3 cpi2q2014 + \beta_4 HS + \beta_5 UGRAD + \beta_6 ADV$$

In our analysis, we have 51 points for each category, after including Washington D.C. The following table contains a summary of the statistics for all the variables used in the regression models.

Model 1 and 2: Summary of Statistics

Variable Name	Variable Description	Observations	Mean	Standard Deviation	Minimum	Maximum
unemp (%)	Unemployment rate	51	5.91	1.29	2.8	8.1
mwage ($)	Minimum wage	51	7.68	.61	7.25	9.5
uweekly ($)	Unemployment weekly benefits	51	424.12	107.88	235	674

cpi2q2014	CPI in the 2nd quarter of 2014	51	104.25	16.25	86.2	158.9
HS (%)	Percentage of individuals with high school degrees	51	27.42	6.34	6.71	40.23
UGRAD (%)	Percentage of individuals with undergraduate degrees	51	28.19	4.43	10.82	35.13
ADV (%)	Percentage of individuals with advanced degrees	51	8.89	3.07	2.76	23.47

Model 3: Summary of Statistics

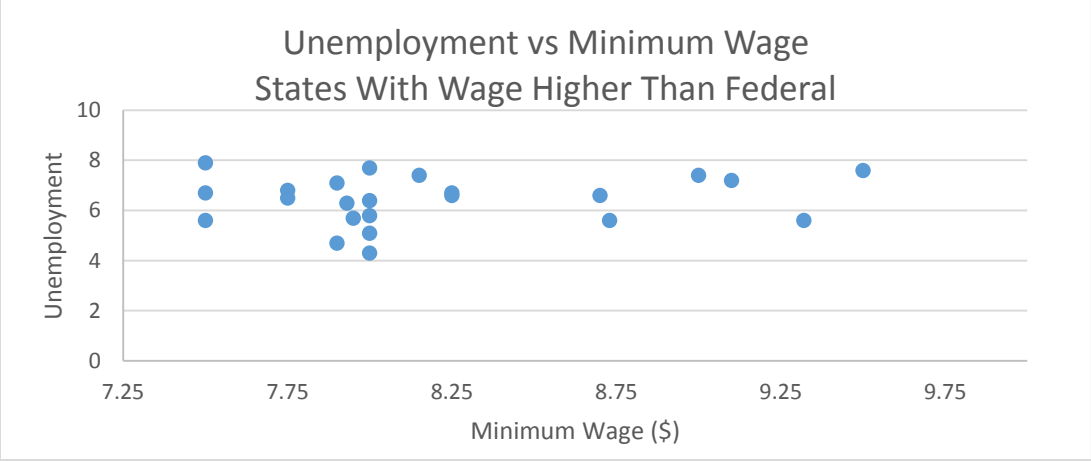
Variable Name	Variable Description	Observations	Mean	Standard Deviation	Minimum	Maximum
unemp	Unemployment rate	23	6.40	.97	4.3	7.9
mwage	Minimum wage	23	8.20	.58	7.5	9.5
uweekly	Unemployment weekly benefits	23	452.57	.97	235	674
cpi2q2014	CPI in the 2nd quarter of 2014	23	110.59	16.71	86.2	141.6
HS	Percentage of individuals with high school degrees	23	26.93	3.82	18.59	34.19
UGRAD	Percentage of individuals with undergraduate degrees	23	29.48	2.98	22.48	35.13
ADV	Percentage of individuals	23	3.64	3.85	23.47	23.47

	with advanced degrees					

In our preliminary analysis, the dependent variable does not follow any trends with any of the independent variables. They are scattered everywhere in a pseudo-linear distribution as you can see below. Using the natural log of unemployment and minimum wage or any combination of did not make the distribution any more linear. However, the non-minimum federal minimum wage distributions do make the data set seem more linear. This pseudo-linearity adequately satisfies the first Gauss-Markov assumption.

Figure 1: Model 1 and 2 Unemployment Rate vs Minimum Wage Distributions.

Figure 2: Model 3 Subset Unemployment Rate vs Minimum Wage Distribution



The second assumption deals with random sampling and our data set does have random sampling. Each state's minimum wage and weekly unemployment benefit are set by the politicians and the population of each state. This creates random sampling within the population. The CPI is affected by a whole bunch of other factors. Also, the percentage of the degree holders is random due to the population migrations that happen continuously. All in all, the second Gauss Markov assumption has been satisfied.

Thirdly, none of the model contain any sort of perfect collinearity. None of the models have any variables that are even correlated above 50% (0.5). This creates no problems including all the variables in together in our models. To show that the third Gauss Markov assumption has been met, the correlation tables have been included for the second and third models below:

Figure 3: Model 2 Correlation – Full Data

	unemp	mwage	uweekly	cpi~2014	HS	UGRAD	ADV
unemp	1.0000						
mwage	0.3257	1.0000					
uweekly	-0.2599	0.3369	1.0000				
cpi2q2014	0.0958	0.4718	0.4302	1.0000			
HS	-0.1173	-0.2282	0.0535	-0.1198	1.0000		
UGRAD	-0.4510	0.3351	0.4672	0.4409	-0.1660	1.0000	
ADV	0.1990	0.5659	0.1274	0.4937	-0.1378	0.3290	1.0000

Figure 4: Model 3 Correlation - Subset of Data

	unemp	mwage	uweekly	cpi~2014	HS	UGRAD	ADV
unemp	1.0000						
mwage	0.1585	1.0000					
uweekly	-0.4218	0.2956	1.0000				
cpi2q2014	0.2616	0.4521	0.3360	1.0000			
HS	-0.1443	-0.6957	-0.1484	-0.3908	1.0000		
UGRAD	-0.5334	0.4525	0.6229	0.4054	-0.5273	1.0000	
ADV	0.2127	0.5792	-0.0608	0.4345	-0.5127	0.2691	1.0000

The fourth assumption is the zero conditional mean, which states that error value u has an expected value of zero given any value of the independent variables. Assumption five states that error u has the same variance given any value of the independent variables. There is no way to be completely sure that both assumptions have been satisfied, which is why methods such as estimating a multivariate model, have been used to further reduce the likelihood of any biasedness in our model.

IV. Results

```
. regress unemp mwage
```

Source	SS	df	MS		
Model	8.76814092	1	8.76814092	Number of obs	51
Residual	73.8687218	49	1.50752494	F(1, 49)	5.82
				Prob > F	0.0197
Total	82.6368627	50	1.65273725	R-squared	0.1061
				Adj R-squared	0.0879
				Root MSE	1.2278

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.682877	.2831529	2.41	0.020	.11386	1.251894
_cons	.6633476	2.1814	0.30	0.762	-3.72034	5.047035

Our first model is a simple regression, seen above, with unemployment as the dependent variable and minimum wage as the independent variable. The equation obtained from this model is as follows:

Unemployment= .6633+.6829*mwage*

Unemployment is positively related to minimum wage, meaning that as the minimum wage increases, the rate of unemployment as increases. Specifically for our data, as the minimum wage increases by $1, unemployment increases by 0.6829. This supports our hypothesis.

```
. regress unemp mwage uweekly cpi2q2014 HS UGRAD ADV
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Source	SS	df	MS		
Model	43.7749048	6	7.29581747	Number of obs	51
Residual	38.8619579	44	.883226317	F(6, 44)	8.26
				Prob > F	0.0000
Total	82.6368627	50	1.65273725	R-squared	0.5297
				Adj R-squared	0.4656
				Root MSE	.9398

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.9634337	.287415	3.35	0.002	.3841868	1.542681
uweekly	-.002568	.0015425	-1.66	0.103	-.0056768	.0005407
cpi2q2014	.0167039	.0106924	1.56	0.125	-.0048453	.0382531
HS	-.0145611	.0221086	-0.66	0.514	-.059118	.0299959
UGRAD	-.1826226	.0368056	-4.96	0.000	-.2567993	-.1084458
ADV	.0247686	.0572371	0.43	0.667	-.0905852	.1401223
_cons	3.183292	2.203354	1.44	0.156	-1.257277	7.623861

Our second model was our multiple regression, again seen above, which yielded the equation

Unemp= 3.1833 + .9634*mwage* - .0026*uweekly* + .0167*cpi2q2014* -.0146*HS* - .1826*UGRAD* + .0248*ADV*

Unemployment was once again positively related to minimum wage, for this model the relationship being even stronger than the simple regression. Unemployment and uweekly were negatively related which was surprising, because we predicted that unemployment benefits would be important to unemployment, our logic being that if unemployment benefits were high, then workers who were receiving benefits would be less motivated to go and search for work immediately. CPI was positively related with unemployment, which supported our hypothesis that as the standard of living increases, unemployment will increase because as goods in the market become more expensive, workers will demand a higher wage that employers will not be able to pay, causing lay-offs and increasing unemployment. As we thought, percent of high school graduates and undergraduates were negatively related with unemployment, meaning that as the rate of education increased, unemployment decreased. . In addition, as we hypothesized, the rate of advanced graduates has a positive correlation with unemployment. This could be because as workers are more educated, their minimum salary becomes higher and since they expect higher salaries, it is harder for them to find employment.

```
. regress unemp mwage uweekly cpi2q2014 HS UGRAD ADV
```

Source	SS	df	MS		
Model	15.0054584	6	2.50090974	Number of obs	23
Residual	5.70410678	16	.356506674	F(6, 16)	7.02
				Prob > F	0.0009
				R-squared	0.7246
				Adj R-squared	0.6213
Total	20.7095652	22	.941343874	Root MSE	.59708

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.2636373	.355901	0.74	0.470	-.4908392	1.018114
uweekly	-.0008844	.0014516	-0.61	0.551	-.0039617	.0021929
cpi2q2014	.0272339	.0093695	2.91	0.010	.0073715	.0470963
HS	-.091786	.0528062	-1.74	0.101	-.2037301	.0201582
UGRAD	-.2933575	.0670684	-4.37	0.000	-.4355362	-.1511788
ADV	-.008481	.0486888	-0.17	0.864	-.1116966	.0947346
_cons	12.83581	4.351104	2.95	0.009	3.61188	22.05974

For model 3, which was the multiple regression of the subset of data, we used the same parameters as model 2 but only included data points in which the state minimum wage was different than the federal minimum wage. The relationship between unemployment and minimum wage stayed positive but became weaker, which we found surprising as we thought the subset of data would have a more linear relationship, making the coefficient larger. The only other variable that had a different relationship was the percent of advanced graduates, which showed a negative relationship. This is different than our prediction, because we believed that the percent of advanced degree holders would increase unemployment due to the phenomenon of over-qualification, as mentioned earlier.

Dependent Variable "Unemp"		*Significant at 10%, **5%, ***1%
Independent Variables	Model (1)	Model (2)
Mwage	0.6829*** (2.41)	.9634*** (3.35)
Uweekly		-0.0026 (-1.66)
Cpi2q2014		0.0167 (1.56)
HS		-0.0146 (-0.66)
UGRAD		-0.183*** (-4.96)
ADV		0.0248 (0.43)
Intercept	0.6633 (0.30)	3.1833 (1.44)
No. of obs.	51	51
R-square	0.1061	.5297

After having completed both the single regression and the multiple regression for our data set, we calculated two sided t-statistics for all variables, shown in the table above. For the single regression model, minimum wage proved to be significant at 10%, 5% and 1%. This helps prove our hypothesis that unemployment is positively related to minimum wage. In the multiple regression model, only minimum wage and undergraduates proved to be significant. Having said this, it is important to note that uweekly was very close to the 10% critical value of 1.684. Another interesting point is that once we added the other variables into the model, the t-statistic for minimum wage increased from 2.41 to 3.35. From this, we can infer that once other variables are added into the equation, the relationship between minimum wage and unemployment actually became stronger. Contrary to our predictions, the significance of education (high school graduates, bachelor graduates, advanced degree graduates) was not as strong as we thought, as undergraduate education was the only variable out of the three to be significant

```
. regress unemp mwage uweekly cpi2q2014
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Source	SS	df	MS	Number of obs =	51
Model	21.868351	3	7.28945034	F(3, 47) =	5.64
Residual	60.7685117	47	1.29294706	Prob > F =	0.0022
				R-squared =	0.2646
				Adj R-squared =	0.2177
Total	82.6368627	50	1.65273725	Root MSE =	1.1371

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.9159133	.3017175	3.04	0.004	.3089359	1.522891
uweekly	-.0052593	.0016752	-3.14	0.003	-.0086293	-.0018893
cpi2q2014	.0062945	.0118769	0.53	0.599	-.0175987	.0301878
_cons	.4480052	2.024056	0.22	0.826	-3.623869	4.51988

After looking at the t statistics for all of the variables, we decided to perform a joint- significance test on the three education variables. Since only the undergraduate variable was significant, we thought it would be interesting to look at how strong the education variables were at describing the data together. Another factor in our decision to look at this statistic was to also look at correlation between the three variables. For our unrestricted model, we included the education and for our unrestricted model, we used the above regression. The calculated f-stat from this process is 8.368. As you can see, this is a large f-statistic which shows that the education variables are indeed very good predictors for unemployment. It also shows that the three variables are highly correlated.

```
. regress unemp mwage HS UGRAD ADV
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Source	SS	df	MS	Number of obs =	51
Model	40.1863749	4	10.0465937	F(4, 46) =	10.89
Residual	42.4504878	46	.922836691	Prob > F =	0.0000
				R-squared =	0.4863
				Adj R-squared =	0.4416
Total	82.6368627	50	1.65273725	Root MSE =	.96064

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.9138047	.2774871	3.29	0.002	.355252	1.472357
HS	-.021658	.0221117	-0.98	0.332	-.0661666	.0228506
UGRAD	-.1935498	.03327	-5.82	0.000	-.2605188	-.1265808
ADV	.065666	.0545275	1.20	0.235	-.0440921	.1754242
_cons	4.355764	2.162226	2.01	0.050	.0034281	8.708099

Since both the CPI value and the unemployment weekly benefits were insignificant, we decided to do a joint significance test between the two. Our unrestricted model was again our multiple regression model, while the restricted model was the one above. The calculated f-statistic for this test was 4.274 which is much significantly higher than the one percent critical value of 3.828. Since the f-stat is bigger than the critical value, we can reject the null hypothesis that cpi and uweekly are not important. Given that we rejected the null, those two variables are jointly significant and should therefore be kept in the model.

Dependent Variable "unemp" for subset	
Independent Variables	Model (3)
Mwage	0.2636 (0.74)
Uweekly	-0.0001 (-0.61)
Cpi2q2014	0.02723*** (2.91)
HS *Significant at 10%, **5%, ***1%	-0.0918* (-1.74)
UGRAD	-0.2934*** (-4.37)
ADV	-0.0085 (0.17)
Intercept	12.8358*** (2.95)
No. of obs.	23
R-square	0.7246

Since many states did not have a minimum wage that was different than the federal minimum wage, we decided to make a subset of the data in which we analyzed only the states that had enforced a different state minimum wage. We again did a multiple regression for the subset, which is shown in model 3. As you can see in the above table, after calculating t-statistics for all variables, more of the variables were significant when compared to the full data set. However, the most surprising difference was minimum wage was no longer statistically significant in either the single regression or the multiple regression. In fact, minimum wage's correlation with unemployment reduces significantly, as the coefficient went from being almost one to being only 0.2. Our theory to explain this difference is that because states have different industries that make up their economy, the minimum wage has less impact depending on what industry makes up the main sector in the state. For example, the minimum wage would be less effective in a state whose primary industry is agricultural as opposed to a state who primary sector is industrial manufacturing. Perhaps this is why in the subset, the minimum wage is not statistically and does not explain unemployment as well as in the full data set.

```
regress unemp mwage uweekly cpi2q2014
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Source	SS	df	MS
Model	7.88512172	3	2.62837391
Residual	12.8244435	19	.674970711
Total	20.7095652	22	.941343874

Number of obs	23
F(3, 19)	3.89
Prob > F	0.0252
R-squared	0.3807
Adj R-squared	0.2830
Root MSE	.82157

unemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mwage	.2674199	.3454601	0.77	0.448	-.4556364	.9904763
uweekly	-.0044544	.0014437	-3.09	0.006	-.0074761	-.0014328
cpi2q2014	.0227231	.0120974	1.88	0.076	-.0025971	.0480432
_cons	3.713526	2.501187	1.48	0.154	-1.521519	8.94857

Similar to the full data set, we again wanted to look at the joint significance of all of the education variables to see how well they described the data set. This test also helped us check collinearity between the three education variables. For the unrestricted model, we once again used our multiple regression but this time for just the subset, and for the restricted model, we used the regression above, again for the subset. The calculated f-stat is 6.6577 which is quite large. Since the f-stat is bigger than the critical value, we can reject the null and conclude that three education variables are jointly significant, even though high school graduates are only significant at an alpha level of 10% and advanced degree graduates are not significant at all. This means, that in terms of the subset, we should include them in the model.

V. Conclusions

After conducting this study, we can conclude several things. The main conclusion is that an increase in minimum wage does indeed bring about an increase in unemployment, as we hypothesized. When looking at just unemployment and minimum wage, the coefficient is around 0.7 and after taking other variables into account, the coefficient is 0.9, meaning that there is an almost one to one relationship between the 2 variables. CPI also has a positive relationship with unemployment, which makes sense since CPI is a measure of standard of living. This also supports our hypothesis. However, the relationship between education and unemployment was not as high as we predicted. The coefficients for these variables ended up being quite small. In addition, after looking at states with a different minimum wage than the federal separately, we can conclude that difference between state minimum wages and federal minimum wages may not have as big of an impact as originally predicted.

Although we would not consider this study to take into account all variables, we do believe this provides a good beginning platform for further research. In the future, we would also like to include in this model a variable that demonstrates what political party was in power in the state, as different political parties have different policies about the minimum wage.

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