A Replication of Abdeljawad, Panjwani, and Ramani. “Effects of Minimum Wage on Unemployment Rates Across the United States”, 2014

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Abstract

This paper replicates Abdeljawad, Panjwani, and Ramani, “Effects of Minimum Wage on Unemployment Rates Across the United States”, 2014 and finds that, while the regressions are run correctly, the interpretations of the results are problematic. This paper demonstrates the inconsistencies in these interpretations and provides an alternative model for more accurately estimating a relationship between minimum wage and employment levels. The replicated paper tests the null hypothesis that minimum wage has no effect on unemployment. The results of the regressions performed provide evidence for Abdeljawad et al. to reject the null and conclude that there is a positive relationship therein. This paper identifies the problems with this conclusion and suggests that there is a more significant relationship between the minimum wage rate and the employment of workers earning minimum wage in 2014.

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1 Introduction

This paper replicates Abdeljawad, Panjwani, and Ramani, "Effects of Minimum Wage on Unemployment Rates Across the United States", 2014[1] (Abdeljawad et al., 2014). While the regressions run by Abdeljawad et al. were performed correctly, the interpretations of the results are problematic.

This paper demonstrates the inconsistencies in the interpretations of Abdeljawad et al. and provides an alternative model for more accurately estimating a relationship between minimum wage and the employment level. The replicated paper challenges the null hypothesis that there is no causal relationship between minimum wage and unemployment with its own alternate hypothesis that "As minimum wage increases, unemployment will also increase because the demand for labor will decrease while the supply of labor increases" (Abdeljawad et al., 2014). The results of the regressions performed provide evidence for Abdeljawad et al. to reject the null hypothesis and conclude that there is indeed a positive relationship therein. This paper identifies the problems with this conclusion and suggests that a more significant relationship exists between the minimum wage rate and the employment of workers earning minimum wage in the year 2014.

The paper is organized as follows: section 2 presents the model of the replicated paper. Section 3 evaluates the possible threats to internal and external validity in the model. Section 4 discusses the data, its structure, and sources as they appear in Abdeljawad et al. (2014) and the replication. Section 5 tests the robustness of the replicated model by expanding it to more recent data. Section 6 provides an alternate model, improved from that of the replicated paper. Section 7 concludes the findings.

2 Model of Abdeljawad, Panjwani, and Ramani

Abdeljawad et al. use two main models in their paper. Both models estimate the effect of minimum wage on the unemployment rate on a state-to-state level, controlling for weekly unemployment benefits paid by the state, educational attainment, and each state's individual Consumer Price Index (CPI). The CPI is included in the regression to standardize the value of a dollar across all states. The models use the ordinary least squares (OLS) method of linear regression with homoskedastic-only standard errors.

The use of homoskedastic-only standard errors by Abdeljawad et al. is validated by a Breusch-Pagan test on the unemployment and minimum wage variables. The Breusch-Pagan test operates on the null hypothesis of homoskedastic standard errors. The test calculates a χ^2 statistic from a simple regression. If the statistic is significant on the $\alpha = 0.05$ level, then the null hypothesis is rejected and heteroskedastic standard errors are assumed. The χ^2 value calculated from unemployment and minimum wage is 1.51. The probability of χ^2

[1] All data are publicly available from individual sources but must be compiled as per this paper's instructions in section 4.

is 0.22. Therefore, the null fails to be rejected, demonstrating the presence of homoskedastic standard errors.

The first model, table 1 column 1, is a simple regression of minimum wage on the unemployment rate. The second and third models, table 1 columns 2 and 3, are the main models presented by Abdeljawad et al. to represent the relationship between minimum wage and unemployment. Models two and three both regress the unemployment rate on minimum wage, weekly benefits, the CPI, high school as highest educational attainment, college as highest educational attainment, and advanced degree as highest educational attainment. In the first two models, table 1 columns 1 and 2, Abdeljawad et al. replace any missing minimum wage observations with the federal minimum wage rate, \$7.25. In the third model, table 1 column 3, Abdeljawad et al. remove any minimum wage observation equal to the federal minimum wage rate, \$7.25.

Replacing missing minimum wage observations with the federal minimum wage rate in the first and second models is considered a judgement sample. Although Abdeljawad et al. do not explicitly state their logic for using judgement sampling, it is likely to have been done in order to increase their statistical leverage. This paper has found that only 46 states have data on minimum wage rates actively available. Using 51 observations for all 50 states and Washington D.C. — instead of using only 46 observations — increases the sample size by roughly 11% and therefore creates more leverage.

The use of a judgement sample should negate the findings of Abdeljawad et al.. Without a random sample, the OLS method is invalid and the authors lose inferential ability on the basis of classical statistics. However, Abdeljawad et al. do attempt to regain the support of classical statistics in the third model by removing all observations equal to the federal minimum wage rate. This sacrifices Abdeljawad et al.'s statistical leverage by reducing their sample size from 51 to 23, but in doing so, they balance out the bias created by their judgement sample. As long as the model that contains the judgement sample and the model that removes anything equal to the judgement sample point to the same findings, the conclusion is not biased. Therefore, if the coefficients on minimum wage in both models are in the same positive or negative direction and are of reasonably similar size, the models together can approximate the relationship between minimum wage and the unemployment rate.

Table 1 shows the results of the regressions run by Abdeljawad et al.. In table 1 column 1, the results of the first model suggest a statistically significant and strongly positive relationship between minimum wage and the unemployment rate in 2014. The regression's F-stat is 8.7 and the probability of F — the likelihood of achieving the same regression coefficients by random chance — is low, meaning that the whole regression is statistically significant. The t-stat of minimum wage is 2.95 and the probability of t is 0.01, demonstrating the statistical significance of minimum wage. This can be seen in table 2.

The first model, table 1 column 1, has the federal minimum wage rate replacing missing values and does not control for any other variables. The results imply that for every \$1.00 increase in the minimum wage rate, the unemployment rate increases by 0.83 percentage points.

Table 1: Results of Regressions of Unemployment on Minimum Wage, Education Level, Unemployment Benefit, and CPI — Replication

	(1) Unemployment[1]	(2) Unemployment[1]	(3) Unemployment[1]
Min Wage 2[2]	0.827**	0.885***	
	(0.280)	(0.242)	
Min Wage 3[3]			0.210
			(0.425)
Benefit[4]		-0.001	0.001
		(0.001)	(0.002)
CPI[5]		0.016	0.019
		(0.009)	(0.014)
High School[6]		-0.076	-0.148*
		(0.040)	(0.062)
College[7]		-0.323***	-0.345***
		(0.045)	(0.079)
Advanced[8]		0.098	0.049
		(0.053)	(0.072)
Constant	-0.453	8.486**	16.020**
	(2.165)	(2.835)	(4.876)
$R^2 - adjusted$	0.133	0.640	0.458
R^2	0.151	0.683	0.599
Observations	51	51	24
F-stat	9	16	4

Robust standard errors in parentheses. *** p < 0.01, ** p< 0.05, * p< 0.1
1. Annual unemployment rate by state (NSA).
2. Annual minimum wage rate by state - missing values set to fed wage.
3. Annual minimum wage rate by state - values equal to fed rate removed.
4. Maximum weekly unemployment benefit entitlement by state.
5. Consumer Price Index by state.
6. Percent of population with high school as highest education by state.
7. Percent of population with college as highest education by state.
8. Percent of population with post-graduate as highest education by state.
Source: Author's computations.

In table 1 column 2, the results of the second model suggest a statistically significant and similarly strong positive relationship between minimum wage and the unemployment rate in 2014. The regression's F-stat of 15.83 and the probability of F indicates that the model as a whole is statistically significant. The coefficient on minimum wage has a t-stat of 3.63 and a probability of t of 0.00, implying that there is a significant relationship between unemployment and minimum wage in this model. The control variables together report an F-stat of 14.8, indicating high statistical significance again. Each control variable also reports significant F-stats when tested with minimum wage individually. This can be seen in table 2.

Model two also has the federal minimum wage rate replacing missing values and controls for weekly unemployment benefits, the CPI, and educational attainment. The results imply that, when keeping all other variables fixed, a \$1.00 increase in the minimum wage rate results in an increase in unemployment rate of 0.89 percentage points.

In table 1 column 3, the results of the third model suggest a weaker positive relationship between minimum wage and the unemployment rate in 2014. The regression's F-stat is 4.27 and the probability of F indicates that the model as a whole is statistically significant (but less so than model two). The coefficient on minimum wage has a t-stat of 0.49 and a probability of t of 0.63, implying that there is not a significant relationship between unemployment and minimum wage in this model. The control variables together report an F-stat of 4.65, indicating statistical significance. The only control variables that report significant F-stats when tested with minimum wage individually are high school and college attainment. The rest have insignificant joint hypothesis tests. This can be seen in table 2.

Model three removes any observation where minimum wage is equal to the federal minimum wage of \$7.25. It also controls for weekly unemployment benefits, the CPI, and educational attainment. The results imply that, when keeping all other variables fixed, a \$1.00 increase in the minimum wage rate results in an increase in unemployment rate of 0.21 percentage points.

The third model causes a few problems in the conclusion of Abdeljawad et al. (that there is a positive relationship between minimum wage and unemployment). First, the model has weak significance. Of the two main models (table 1 columns 2 and 3), the third model is the only one to have an insignificant coefficient on minimum wage. Because the models are specifically meant to test the impact of minimum wage on unemployment, it is important that the minimum wage coefficient is significant. The insignificant coefficient here hurts the authors' conclusion.

Furthermore, although the coefficient on minimum wage is not significant, it could be argued that the regression as a whole is significant on account of the F-test. While it is true the F-stat is significant in the third model, it is weaker compared to that of the other models. The probability of F in the third model, 0.0087, is greater than that in the second model, 0.00.

While the probability of F does imply that the third model is wholly significant, it indicates that it is not as quite as significant as the second model.

Table 2: Significance Results of Regressions of Unemployment on Minimum Wage, Education Level, Unemployment Benefit, and CPI — Replication 2014

Test	Model 1	Model 2	Model 3
F-stat	8.7	15.82	4.34
	(0.005)	(0.000)	(0.009)
t-stat of lead regressor	2.95	3.65	0.49
	(0.005)	(0.001)	(0.627)
Joint: Control Regressors		14.81	4.65
		(0.000)	(0.007)
Joint: Min Wage and Benefit		6.77	0.29
		(0.003)	(0.75)
Joint: Min Wage and CPI		10.52	1.19
		(0.000)	(0.328)
Joint: Min Wage and High School		11.91	4.48
		(0.000)	(0.027)
Joint: Min Wage and College		36.16	9.53
		(0.000)	(0.002)
Joint: Min Wage and Advanced		10.83	0.39
		(0.000)	(0.68)

Probability of each statistic noted in parentheses beneath.
Source: Author's computations.

Additionally, the model is meant to estimate the relationship between minimum wage and unemployment when controlling for the other variables; it is not meant to estimate the relationship between all the variables together against minimum wage. Therefore, the significance of the F-stat in the third model neither compensates for the insignificant coefficient on minimum wage nor implies a significant causal relationship between minimum wage and unemployment.

Another problem with the findings of Abdeljawad et al. is that the main models have appreciably different coefficients on the lead regressors. The coefficient is 0.89 in the second model (table 1 column 2) and 0.21 in the third model (table 1 column 3). Although they both point in the positive direction, they are different by 0.68 percentage points. Because the coefficients in both models are so different and because the third model is weakly significant, it is likely that judgement sampling bias is not counteracted in the two main models.

Even if the above problems with the models were resolved, a large problem would still exist in the conclusion of Abdeljawad et al.. The authors assert that the minimum wage rate has a positive effect on the unemployment rate, but such a statement is an over-generalization. Ignoring any judgement sampling that may have occurred, the data do not have enough statistical leverage to make such a broad statement on the relationship between minimum wage and unemployment. The data used in the regression is cross-sectional rather than panel data and the observations are sampled only from one year (2014). In order to make a general estimation of the relationship between minimum wage and unemployment, a large range of cross-sectional data would be required. A more accurate conclusion that could be drawn from the regressions of Abdeljawad et al. is as follows: there is a positive relationship between minimum wage and the unemployment rate in the year 2014, but the estimate may not be representative of the relationship in general.

3 Threats to Internal and External Validity

While there are several threats to internal and external validity present in the model of Abdeljawad et al. (2014), this paper concludes that the findings are for the most part internally valid, but not externally valid. Threats to internal validity that are examined in this section are omitted variable bias (OVB), functional form, measurement error, selection bias, simultaneous causality, and inconsistent standard errors. This paper examines external validity by testing the same model with different data and comparing the results.

It is not likely that OVB threatens the internal validity of the model used by Abdeljawad et al.. This paper tests the bias of labor cost and age on the minimum wage coefficient. In table 8 columns 1 and 2, the basic model of Abdeljawad et al. (2014) is shown: employment level explained by minimum wage, weekly unemployment benefits, price level, and educational attainment. Table 8 column 3 shows the same model with the inclusion of labor compensation cost. The regression results show an extremely low coefficient on labor compensation cost as well as a negligible difference in the coefficient on minimum wage between columns 2 and 3. This implies that labor compensation cost is not determinant of the dependent variable. Furthermore, table 10 demonstrates a low correlation between labor compensation cost and minimum wage. Because labor compensation is not determinant of the dependent variable and not correlated with the independent variable being tested (minimum wage), its absence in Abdeljawad et al. (2014) does not give cause to OVB.

Table 8 column 4 shows the model used by Abdeljawad et al. with the inclusion of median age. The regression results show a considerable difference in the coefficient on minimum wage between columns 2 and 4 as well as a large enough coefficient on median age to raise the possibility of OVB. Table 10, however, demonstrates a low correlation between median age and minimum wage. Median age does seem to be somewhat determinant of the dependent variable, but it is not correlated with the independent variable being tested. It is possible that age is somewhat contained in the education variable; a state with a high level of high school educational attainment might have a younger population than a state with a low level of high school attainment and a high level of advanced degree attainment. It is likely that the absence of median age in Abdeljawad et al. (2014) does not give cause to OVB.

This paper tests the functional form of the model in Abdeljawad et al. (2014) by means of the Ramsey Regression Equation Specification Error Test. The RESET test examines the possibility that a non-linear model could better explain the relationship regressed by a linear model. It tests this possibility by including transformations of each variable into the original model. A joint hypothesis test is performed on the transformed variables, and if they are not 0, then the model's functional form has been misspecified. The RESET test run on the model of Abdeljawad et al. (2014) yielded an F-stat of 1.53 and a probability of F of 0.16. This fails to reject the null hypothesis of the test and it is assumed that the model is not misspecified. This paper finds that Abdeljawad et al. are correct in the linear functional form of their model.

Measurement error is present in the model and creates a bias in the coefficient on minimum wage. Abdeljawad et al. replace any missing values of minimum wage with the federal minimum wage. The inclusion of additional observations causes minimum wage to have a higher variance than it would if the observations were left out. This biases the minimum wage upwards. It is also possible that measurement error is present in the educational attainment variables. Because the data used for educational attainment are taken from surveys, some information could have been misreported (e.g., an individual may have failed to indicate their correct level of schooling).

Selection bias is not present in Abdeljawad et al. (2014); the authors do not intentionally leave any observations out of their data set. In fact, in order to correct for the absent minimum wage observations, Abdeljawad et al. replace the missing values with the federal minimum wage. Neither missing data nor sample selection bias threaten the internal validity of the model.

Simultaneous causality in the model is evaluated by testing the endogeneity of the lead regressor through the Hausman test. This is done by first calculating the residual values of a regression of minimum wage on weekly benefits, the

Consumer Price Index, and the three levels of educational attainment. Next, unemployment is regressed on the residual values and minimum wage. This paper finds an insignificant coefficient on the residual values in the regression. This indicates that minimum wage is exogenous and that the model is not threatened by simultaneous causality.

Bias from inconsistent standard errors is not present in the model of Abdeljawad et al. (2014). The model assumes the existence of homoskedastic standard errors. This paper tests that assumption using a Breusch-Pagan test on unemployment and minimum wage. The χ^2 value calculated is 1.51 and the probability of χ^2 is 0.22. The null fails to be rejected, demonstrating the presence of homoskedastic standard errors. Therefore, the standard errors used in the model are consistent with those present in the data.

This paper tests for external validity in the model of Abdeljawad et al. (2014) by analyzing how the regression results differ when run on new data. If the coefficients regressed from the new 2018 data are within two standard deviations of those regressed from the original 2014 data, then the model is externally valid. The coefficient on minimum wage calculated from the 2014 data (see table 1 column 2) is 0.89. Two standard deviations below that is 0.37 and two above is 1.34. The coefficient on minimum wage calculated from the 2018 data (see table 4 column 2) is 0.03 — more than two standard deviations below the original. The coefficients on high school attainment and college attainment are also more than two standard deviations away from their respective original coefficients. Because one half of the coefficients (including the coefficient on the lead regressor) calculated from the new data are not within two standard deviations of those calculated from the original data, this paper concludes that the model of Abdeljawad et al. (2014) is not externally valid.

4 Data of Abdeljawad, Panjwani, and Ramani

Abdeljawad et al. retrieved the data used in their paper from several different sources. The unemployment numbers were taken from the "Local Area Unemployment Home Page" of the Bureau of Labor Statistics, BLS (2014). The minimum wage numbers were taken from the National Conference of State Legislatures' release, "State Minimum Wages | 2014 Minimum Wage by State", NCLS (2014). The NCLS samples the data for their report from the U.S. Department of Labor.

The weekly unemployment benefit numbers used in Abdeljawad et al. (2014) are taken from an article by Alison Doyle for About.com entitled, "List of State Unemployment Compensation Benefits", Doyle (2014). This article is no longer publicly available, which means that the source of Doyle's numbers is unknown. The Consumer Price Index numbers are taken from a report entitled, "Cost of Living Second Quarter 2014" published by the Missouri Economic Research and Information Center, MERIC (2014). MERIC gets its numbers from the Council for Community and Economic Research survey. The numbers for educational attainment are taken from a report entitled, "Educational Attainment for the

Population 25 Years and Over" done by the U.S. Census Bureau, USCB (2014b). The Census Bureau gets their numbers from the American Community Survey. The education data used by Abdeljawad et al. is from the year 2013. It is likely that the authors used 2013 data instead of 2014 data because the 2014 data had not yet been released at the time of the paper's publishing.

The unemployment numbers used for replication in this paper are also taken from the U.S. Bureau of Labor Statistics, as they are in Abdeljawad et al. (2014), but from a different release. Instead of the "Local Area Unemployment Home Page", these data are taken from "Economic News Release - State Employment and Unemployment (monthly)", BLS (2019c). The data represent monthly labor statistics from January, 1976 to September, 2019. It is important to remember that Abdeljawad et al. accessed the unemployment data used in their paper in November of 2014; this means that their unemployment data only represent the unemployment rate in the first ten months of 2014. For this reason, the unemployment data used in the replication portion of this paper are calculated as the average of the unemployment rates in the months January through October of 2014. By observing the mean, standard deviation, minimum value, and maximum value reported in Abdeljawad et al. (2014), it can be seen that the unemployment data used in this paper matches exactly the unemployment data used in Abdeljawad et al. (2014).

The minimum wage numbers used for replication in this paper are not taken from the same source as in Abdeljawad et al. (2014). The release used by Abdeljawad et al. on the National Conference of State Legislatures website only offers the most recent information, so at the time this paper is written, only the 2019 release is available there. The source for NCSL's releases, the U.S. Department of Labor, does keep historical data. The Department of Labor's report, "Changes in Basic Minimum Wages in Non-Farm Employment Under State Law", DOL (2019), records the state and federal minimum wage rates going back to 1968. For observations in this report where an interval is listed instead of a single number, this paper defaults to the upper bound of the interval. This paper also examined the lower bound of the interval and the mean of the two bounds. The upper bound of the interval proved to have the most similar summary statistics to those in the original paper.

In accordance with Abdeljawad et al. (2014), the replication portion of this paper replaces any missing minimum wage value with the the federal minimum wage rate of $7.25. Upon observing the mean, standard deviation, minimum, and maximum values reported in Abdeljawad et al. (2014), it becomes apparent that any value below the federal minimum wage rate must also be replaced with $7.25. In doing so, it can be seen that the minimum wage data used in this paper is a very close approximation of the data used in Abdeljawad et al. (2014).

The weekly unemployment benefit numbers used for replication in this paper are taken from a different source than those in Abdeljawad et al. (2014). The article cited by Abdeljawad et al. from About.com is no longer publicly available. Without the article, it is impossible to know exactly where the data are taken from and it therefore can not be replicated. Data on weekly unemployment benefits in 2014 can, however, be found on the website of the Office of Unemployment Insurance of the Bureau of Labor Statistics. The Office of Unemployment Insurance releases an annual report entitled, “ETA 539: Weekly Claims and Extended Benefits Trigger Data”, OUI (2014). Tables 3-5 in the report lists the minimum and maximum weekly unemployment benefit amounts each state may transfer to a single recipient. In accordance with Abdeljawad et al. (2014), the replication portion of this paper samples the maximum weekly benefit.

In observations of the maximum benefit when an interval or two values are listed instead of a single number, this paper defaults to the lower bound value. This paper also examined the upper bound value and the mean of the two bounds. The lower bound of the interval proved to have the most similar summary statistics to those in the original paper. In examining the mean, standard deviation, minimum, and maximum values as reported in Abdeljawad et al. (2014), it is evident that the weekly benefit data used in this paper is only a near approximation of the data used by Abdeljawad et al.. It is possible that this is because more data surfaced after the close of 2014 than was available to About.com and Abdeljawad et al. in December of that year.

The CPI numbers used for replication in this paper are taken from the same source as those in Abdeljawad et al. (2014). The source, MERIC, only provides the most recent information, so at the time this paper is written, only the third quarter of 2019 release is available there. Historical data of MERIC’s cost of living index is kept by the Center’s Department of Higher Education and Workforce Development. Upon request, the MERIC Department of Higher Education and Workforce Development can provide annualized releases of their cost of living index data. The “Cost of Living Data Series - 2014 Annual Average” report (DHEWD, 2019) offers one aggregated cost of living index for the year 2014. Note that this is not the same as what is used in Abdeljawad et al. (2014). Abdeljawad et al. use the release from the second quarter of 2014. The release used in this paper is the average of all quarters in 2014. For this reason, the CPI data used in the replication portion of this paper are slightly different from those used in Abdeljawad et al. (2014).

The education numbers used for the replication portion of this paper come from the same source as in Abdeljawad et al. (2014)[2]: the U.S. Census Bureau’s American Community Survey. The report used in this paper, as in Abdeljawad et al. (2014), covers the year 2013. The report contains statistics regarding population, as well as the number of individuals with their highest levels of education equal to: kindergarten through 12th grade (with no diploma), “regular high school diploma”, “GED or alternative credential”, associate’s degree, bachelor’s degree, master’s degree, “professional school degree”, and doctorate degree.

Abdeljawad et al. aggregate each qualification into three categories: high

[2]The exact report referenced by Abdeljawad et al. is no longer available. A report similar to that used by Abdeljawad et al. is available from the U.S. Census Bureau called, “EDUCATIONAL ATTAINMENT 2013 American Community Survey 1-Year Estimates”, USCB (2019). The report comes from a collection of education statistics ranging from 2005 to 2017.

school, college, and advanced degree. "Regular high school diploma" and "GED or alternative credential" are added together then divided by population to form the high school category; associate's degree, bachelor's degree, and "professional school degree" are added together then divided by population to form the college category; master's degree and doctorate degree are added together then divided by population to form the advanced degree category.

It should be noted that the figures in this paper are not exactly the same as those in Abdeljawad et al. (2014). This is likely because the study used by the authors only looked at individuals 25 years in age or older. That data could not be perfectly replicated because USCB (2019) no longer separates its data on the basis of age. The specific demographic of "25 years or older" could not be focused on individually, so this paper looks at all ages.

Comparisons between the summary statistics for each variable in the original paper of Abdeljawad et al. and this replicated model can be seen in table 3. The table represents the expanded data sets — the sets in which missing observations of minimum wage (or those lower than the federal rate) are replaced by the federal minimum wage rate of $7.25 for a total of 51 observations — as well as the restricted data sets — the sets in which any observation equal to that of the federal minimum wage rate are removed for significantly fewer observations. It can be seen in the table that the number of observations in the restricted data set of Abdeljawad et al. is one less than the number of observations in the restricted data set of the replication. This discrepancy could not be resolved without damaging the integrity of the replicated set because without the original data set of Abdeljawad et al., it is impossible to know exactly which observation to drop in order to achieve identical sample sizes.

5 Expanded Model

This paper tests the robustness of the model used in Abdeljawad et al. (2014) by running it on the most recent available data. This paper expands the model of Abdeljawad et al. to the year 2018 using the same data sources as were used in the replication portion. Unemployment data were taken from BLS (2019c), minimum wage data were taken from DOL (2019), weekly benefits data were taken from OUI (2018), Consumer Price Index data were received from the Missouri Department of Higher Education and Workforce Development (DHEWD, 2019), and educational attainment data were taken from USCB (2019). The educational attainment information used in this section of the paper is from the year 2017. 2017 is the most recent release available from the U.S. Census Bureau. Because of this, 2018 data were used for unemployment, minimum wage, weekly benefits, and CPI. (Note that Abdeljawad et al. used 2013 educational attainment data for their 2014 analysis.)

The Breusch-Pagan test on these data calculates a χ^2 statistic of 0.05 and a probability of χ^2 of 0.83. Therefore, the null hypothesis of Breusch-Pagan fails to be rejected and homoskedastic standard errors are assumed.

The results of the 2018 regressions are displayed in table 4. The first model,

Table 3: Summary statistics for expanded and restricted data sets of replicated model and original paper

Variable	Obs.	Mean	Std.	Min	Max
		Expanded Min Wage - Replicated Model			
Unemp	51	5.91	1.31	2.72	8.07
Min Wage	51	7.69	0.62	7.25	9.5
Benefit	51	419.16	103.88	221	679
CPI	51	104.75	17.16	86.9	164
High School	51	28.77	4.14	18.59	40.23
College	51	28.57	3.77	19.44	35.13
Advanced	51	9.17	3	5.98	23.47
		Expanded Min Wage - Original Paper			
Unemp	51	5.91	1.29	2.8	8.1
Min Wage	51	7.68	0.61	7.25	9.5
Benefit	51	424.12	107.88	235	674
CPI	51	104.25	16.25	86.2	158.9
High School	51	27.42	6.34	6.71	40.23
College	51	28.19	4.43	10.82	35.13
Advanced	51	8.89	3.07	2.76	23.47
		Restricted Min Wage - Replicated Model			
Unemp	24	6.45	1.11	4	8.07
Min Wage	24	8.21	0.56	7.5	9.5
Benefit	24	440.58	114.32	240	679
CPI	24	112.07	16.72	91.8	145.2
High School	24	27.27	3.83	18.59	34.19
College	24	29.67	3.02	24.29	35.12
Advanced	24	10.45	3.46	5.98	23.47
		Restricted Min Wage - Original Paper			
Unemp	23	6.4	0.97	4.3	7.9
Min Wage	23	8.2	0.58	7.5	9.5
Benefit	23	452.57	0.97	235	674
CPI	23	110.59	16.71	86.2	141.6
High School	23	26.93	3.82	18.59	34.19
College	23	29.48	2.98	22.48	35.13
Advanced	23	3.64	3.85	23.47	23.47

Source: Author's computations and Abdeljawad et al. (2014)

table 4 column 1, is a simple regression of minimum wage on the unemployment rate. The second and third models, table 4 columns 2 and 3, are the main models, as used by Abdeljawad et al. to represent the relationship between minimum wage and unemployment. These models both regress minimum wage, weekly benefits, the CPI, high school as highest educational attainment, college as highest educational attainment, and advanced degree as highest educational attainment on the unemployment rate. In the first two models, table 4 columns 1 and 2, Abdeljawad et al. replace any missing minimum wage observations with the federal minimum wage rate, \$7.25. In the third model, table 4 column 3, Abdeljawad et al. remove any minimum wage observation equal to the federal minimum wage rate, \$7.25.

The results of the first model for 2018 are presented in table 4 column 1. The results suggest a statistically insignificant positive relationship between minimum wage and the unemployment rate in 2018. The regression's F-stat is 1.11 and the probability of F is high, meaning that the regression as a whole is statistically insignificant. The t-stat of minimum wage is 1.05 and the probability of t is 0.29, demonstrating statistical insignificance. This can be seen in table 5.

The first model has the federal minimum wage rate replacing missing values and does not control for any other variables. The results imply that for every \$1.00 increase in the minimum wage rate, the unemployment rate increases by 0.08 percentage points.

In table 4 column 2, the results of the second model suggest a statistically insignificant and positive relationship between minimum wage and the unemployment rate in 2018. The regression's F-stat is 7.08 and the low probability of F indicates that the model as a whole could be statistically significant. The coefficient on minimum wage has a t-stat of 0.42 and a probability of t of 0.67, implying that there is an insignificant relationship between unemployment and minimum wage in model two. The control variables together report an F-stat of 8.12, indicating high statistical significance. The only two control variables that report significant F-stats when tested with minimum wage individually are high school and college attainment. The rest are insignificant joint hypotheses. This can be seen in table 5.

Model two again has the federal minimum wage rate replacing missing values. Now, it controls for weekly unemployment benefits, the CPI, and educational attainment. The results imply that, keeping all other variables fixed, a \$1.00 increase in the minimum wage rate results in the unemployment rate increasing by 0.03 percentage points.

In table 4 column 3, the results of the third model are displayed. The results suggest a statistically insignificant and positive relationship between minimum wage and unemployment in 2018. The regression's F-stat is 4.29 and the low probability of F indicates that the model as a whole could be significant. The coefficient on minimum wage has a t-stat of 0.23 and a probability of t of 0.82. Together, all of the control variables report an F-stat of 5.05 and a probability of F of 0.00, suggesting statistical significance. The only two control variables that report significance when tested with minimum wage individually are CPI

Table 4: Results of Regressions of Unemployment on Minimum Wage, Education Level, Unemployment Benefit, and CPI — Expansion

	(1) Unemployment[1]	(2) Unemployment[1]	(3) Unemployment[1]
Min Wage 2[2]	0.083	0.026	
	(0.078)	(0.063)	
Min Wage 3[3]			0.024
			(0.104)
Benefit[4]		0.000	0.000
		(0.001)	(0.001)
CPI[5]		0.009	0.034**
		(0.006)	(0.012)
High School[6]		-0.080*	-0.068
		(0.034)	(0.050)
College[7]		-0.221***	-0.201**
		(0.038)	(0.061)
Advanced[8]		0.056	-0.045
		(0.041)	(0.060)
Constant	3.101***	10.836***	8.520*
	(0.686)	(2.098)	(3.326)
$R^2 - adjusted$	0.002	0.422	0.405
R^2	0.022	0.491	0.528
Observations	51	51	30
F-stat	1	7	4

Robust standard errors in parentheses. *** p < 0.01, ** p< 0.05, * p< 0.1
1. Annual unemployment rate by state (NSA).
2. Annual minimum wage rate by state - missing values set to fed wage.
3. Annual minimum wage rate by state - values equal to fed rate removed.
4. Maximum weekly unemployment benefit entitlement by state.
5. Consumer Price Index by state.
6. Percent of population with high school as highest education by state.
7. Percent of population with college as highest education by state.
8. Percent of population with post-graduate as highest education by state.
Source: Author's computations.

Table 5: Significance Results of Regressions of Unemployment on Minimum Wage, Education Level, Unemployment Benefit, and CPI — Expansion 2018

Test	Model 1	Model 2	Model 3
F-stat	1.11	7.08	4.29
	(0.005)	(0.000)	(0.009)
t-stat of lead	1.05	0.42	0.23
regressor	(0.297)	(0.677)	(0.821)
Joint: Control		8.12	5.05
Regressors		(0.000)	(0.003)
Joint: Min Wage		0.19	0.03
and Benefit		(0.827)	(0.968)
Joint: Min Wage		1.29	4.28
and CPI		(0.286)	(0.026)
Joint: Min Wage		3.39	1.09
and High School		(0..043)	(0.353)
Joint: Min Wage		18.046	5.81
and College		(0.000)	(0.009)
Joint: Min Wage		1.12	0.31
and Advanced		(0.337)	(0.738)

Probability of each statistic noted in parentheses beneath.
Source: Author's computations.

and college attainment. The rest are insignificant. This can be seen in table 5.

Model three removes any observation where minimum wage is equal to the federal minimum wage of \$7.25. It also controls for weekly unemployment benefits, the CPI, and educational attainment. The results imply that, keeping all other variables fixed, a \$1.00 increase in the minimum wage rate results in an increase in the unemployment rate of 0.02 percentage points.

The results in table 4 indicate that the models in Abdeljawad et al. (2014) are not very robust. Because of the apparent judgement sampling in the data, a strong conclusion about the relationship between minimum wage and unemployment in 2018 could only be drawn if models two and three both significantly indicate the same general relationship. While all three models do calculate similar trends, none can be seen as statistically significant.

6 Improved Model

The original model of Abdeljawad et al. (2014) arguably draws an insignificant conclusion on the relationship of minimum wage and unemployment in 2014. The same model is decisively insignificant when expanded to 2018. Because of this, a better model for estimating the relationship between minimum wage and employment levels must be composed.

This paper creates a new model operating under the assumption that the relationship between the minimum wage rate and the unemployment rate is stochastic. Such a small portion of the labor force works for the minimum wage rate that a change in the minimum wage rate would not correspond to a significant change in employment as a whole. In order to identify any relationship, the portion of the labor force working for minimum wage must be targeted. This paper devises a model that concentrates on the portion of the labor force working for minimum wage in two ways: first, by replacing the broader unemployment variable with one that represents the employment of minimum wage workers only, and second, by aggregating the educational attainment data into one variable.

The minimum wage employment variable is calculated by dividing the number of workers earning minimum wage in each state by the state's total labor force. Labor force data for this variable is taken from the same report on unemployment statistics by the Bureau of Labor Statistics that was used for the unemployment rate in the replication portion of this paper, BLS (2019c). Data for workers earning minimum wage was taken from another report by the BLS entitled, "Characteristics of Minimum Wage Workers, 2014", BLS (2015).

The number of minimum-wage-earning workers is divided by the labor force then multiplied by 100. This yields the employment rate of workers earning minimum wage (now referred to as minimum wage employment). Summary statistics for this new variable can be seen in the third row of table 6. It should be noted that this variable represents inverse information to that of the unemployment variable used by Abdeljawad et al.; a negative relationship between minimum wage and the employment of minimum wage workers has

Table 6: Summary statistics for new minimum wage employment variable

Variable	Obs.	Mean	Std.	Min	Max
Labor Force[1]	51	3057981	3057981	305970.20	18714706
Min Wage Labor[2]	51	58686.27	62054.97	3000	36100
Min Wage Empl[3]	51	2.04	0.78	221	3.64

1. Total labor force in each state.
2. Total labor force earning minimum wage in each state.
3. Minimum wage employment rate by state.

Source: Author's computations.

similar implications to a positive relationship between minimum wage and the greater unemployment rate.

The aggregated educational attainment variable is represented as binary. The educational attainment statistics for this aggregation are estimated by the same means as in Abdeljawad et al. (2014), but instead of using 2013 data as the original paper did, this paper uses 2014 data. It is likely that if Abdeljawad et al. did have educational attainment data for the same year as the rest of their variables they would have used it. Unless a model is specifically testing the effect of the prior year's educational attainment on unemployment (which is not the case in Abdeljawad et al. (2014)), it would be better for all data sampled to be from the same year. With five years of hindsight, this paper was easily able to collect 2014 educational attainment data.

The binary educational attainment variable, low education, is equal to 1 if the percent of the state's population with high school as the highest level of education is greater than the percent of the state's population with college and advanced degrees as highest education combined. Educational attainment is aggregated as such because this offers a more direct focus on the portion of the population earning minimum wage. Individuals earning minimum wage are less likely to have advanced their education past high school than salaried workers or those earning more than minimum wage. Therefore, this dummy variable turns on if the majority of the state's population has not advanced beyond high school.

In order to increase the statistical leverage of the new model presented in this paper, observations from all 51 states (including Washington D.C.) must be used in the regression. Using the minimum wage data as it is reported only allows the use of 46 states. Abdeljawad et al. (2014) tried to increase their statistical leverage by replacing missing values and values below 7.25 with the federal minimum wage of $7.25. As noted in section 2, this is a demonstration of judgement sampling, which creates bias in the results of the authors' regressions. In order to increase statistical leverage without the possibility of bias, this paper does not replace observations on such an arbitrary basis. Instead, it fills missing values with wage estimates from a separate regression.

Table 7 shows the results of the regression run to predict missing minimum wage values. The regression includes the true minimum wage value (exactly as reported by DOL (2019)) as the dependent variable, with personal consumption expenditure, production value, personal income, and the Consumer Price Index as independent variables. A Breusch-Pagan test on these data reports a χ^2 statistic of 0.002 and a probability of χ^2 of 0.97. This fails to reject the null hypothesis of Breusch-Pagan, and therefore homoskedastic-only standard errors are used in the model.

Data for personal consumption expenditure come from a report by the U.S. Bureau of Economic Analysis called, "Personal Consumption Expenditures by State, 1997-2014", BEA (2015a). The data represent the average dollar amount that an individual spends on personal consumption, by state, for the year 2014. Data for production value come from a report done by The Bureau of Labor Statistics' Productivity and Costs division called, "Productivity Data By Sector, Industry, and State", BLS (2019a). The data represent the total value of production in millions of dollars, per each state, for the year 2014. The data for personal income come from a report done by the Bureau of Economic Analysis called, "State Personal Income: Revised estimates for 2014", BEA (2015b). The data represent the average per-capita income in each state.

The regression results in table 7 show a significant relationship between minimum wage and personal consumption expenditure. More importantly, the regression has a significant F-stat of 4.89, indicating that the model as a whole is significant. The model predicts the minimum wage in each state that reported missing observations: Alabama has a predicted value of \$6.98, Louisiana has a predicted value of \$7.09, Mississippi has a predicted value of \$6.92, South Carolina has a predicted value of \$7.26, and Tennessee has a predicted value of \$7.06.

Using the data above, this paper constructs three models to test the relationship between minimum wage employment and the minimum wage rate. The results are presented in table 8. A Breusch-Pagan test on minimum wage employment and the minimum wage rate — including the predicted substitutes — reports a χ^2 statistic of 24.11 and a probability of χ^2 of 0.00. This rejects the null hypothesis of Breusch-Pagan, and therefore heteroskedastic-robust standard errors are used in the new models.

The first model, table 8 column 1, follows the same general format as used in Abdeljawad et al. (2014): minimum wage employment is regressed on the minimum wage rate, weekly benefits, the CPI, the percent of the state with high school as their highest educational attainment, the percent of the state with college as their highest educational attainment, and the percent of the state with an advanced degree as their highest level of educational attainment.

Table 8 column 1 shows a significant negative relationship between minimum wage employment and the unemployment rate, with a coefficient of -0.36. This

Table 7: Results of Regressions of Minimum Wage on Personal Consumption Expenditure, Production Value, Personal Income, and CPI in 2014 (includes estimated minimum wage values for five states with missing observations)

Statistic	Minimum Wage[1]	State	Predicted Value [6]
Personal Cons Exp[2]	0.00011*	Alabama	6.982
	(0.000)		
Production[3]	0.000	Louisiana	7.086
	(0.000)		
Personal Income[4]	-0.00005	Mississippi	6.915
	(0.000)		
CPI[5]	0.01202	South Carolina	7.262
	(0.013)		
Constant	4.422***	Tennessee	7.062
	(0.821)		
$R^2 - adjusted$	0.257		
R^2	0.323		
Observations	46		
F-stat	5		

Robust standard errors in parentheses. *** p < 0.01, ** p< 0.05, * p< 0.1
1. Annual minimum wage rate by state.
2. Per capita personal consumption expenditure by state.
3. Value of production in millions of dollars by state.
4. Per capita personal income by state.
5. Consumer Price Index by state.
6. Predicted value of minimum wage calculated for missing observations.
Source: Author's computations.

Table 8: Results of Regressions of Min Wage Employment on Minimum Wage with controls in 2014

	(1) Min Wage [1] Employment	(2) Min Wage [1] Employment	(3) Min Wage [1] Employment	(4) Min Wage [1] Employment
Min Wage[2]	-0.363**	-0.415**	-0.416**	-0.423**
	(0.159)	(0.166)	(0.167)	(0.165)
Benefit[3]	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
CPI[4]	-0.009	-0.007	-0.007	-0.008
	(0.009)	(0.007)	(0.008)	(0.008)
High School[5]	0.082***			
	(0.024)			
College[6]	-0.008			
	(0.022)			
Advanced[7]	0.026			
	(0.034)			
Low Edu[8]		0.808***	0.809***	0.787***
		(0.221)	(0.224)	(0.217)
Compen Cost[9]			0.000	
			(0.000)	
Median Age[10]				0.037
				(0.024)
Constant	3.702**	6.050***	6.055***	4.814***
	(1.771)	(1.037)	(1.049)	(1.342)
$R^2 - adjusted$	0.628	0.655	0.655	0.667
R^2	0.673	0.625	0.617	0.630
Observations	51	51	51	51
F-stat	24	22	17	19

Robust standard errors in parentheses. *** p $<$ 0.01, ** p$<$ 0.05, * p$<$ 0.1
1. Percent of labor force earning min wage or less (NSA).
2. Annual minimum wage rate by state - missing values set to estimates.
3. Maximum weekly unemployment benefit entitlement by state.
4. Consumer Price Index by state.
5. Percent of population with high school as highest education by state.
6. Percent of population with college as highest education by state.
7. Percent of population with post-graduate as highest education by state.
8. Set to 1 if high school is dominant level of educational attainment.
9. Average cost of labor compensation to employer.
10. Median age of population in each state.
Source: Author's computations.

means that for every dollar increase in the minimum wage rate, employment for minimum wage workers falls by 0.36 percentage points. The significance in this relationship is demonstrated by the t-stat of -2.28. The model as a whole has an F-stat of 24 and a probability of F of 0.00. All control variables are significant when tested together. Each control variable is significant when tested with minimum wage individually, except for the high school education variable. This is shown in table 9.

Model two, table 8 column 2, regresses minimum wage employment on the minimum wage rate, weekly benefits, the CPI, and the low education dummy variable instead of all three educational attainment variables. Table 8 column 2 again shows a significant negative relationship between minimum wage employment and the unemployment rate, with a coefficient of -0.42. The significance in this relationship is demonstrated by the t-stat of -2.5. The model as a whole has an F-stat of 21.93 and a probability of F of 0.00. The model has an adjusted-R^2 of 0.66, implying that 65.51% of the variance in minimum wage employment can be explained by the independent variables. All control variables are significant when tested together. Each control variable is significant when tested with minimum wage individually. This is shown in table 9.

Model three, table 8 column 3, regresses minimum wage employment on the minimum wage rate, weekly benefits, the CPI, the low education dummy variable, and labor compensation cost. Data for labor compensation cost is sampled from a report by the The Bureau of Labor Statistics' Productivity and Costs division called, "State Productivity", BLS (2019b). The report measures the total cost of all employers to compensate their employees in each state (in millions of dollars).

Table 8 column 3 shows a significant negative relationship between minimum wage employment and the unemployment rate, with a coefficient of -0.42. The significance in this relationship is demonstrated by the t-stat of -2.5. The model as a whole has an F-stat of 17.19 and a probability of F of 0.00. The model again reports an adjusted-R^2 of 0.66. All control variables are significant when tested together. Each control variable is significant when tested with minimum wage individually. This is shown in table 9.

Model four, table 8 column 4, regresses minimum wage employment on the minimum wage rate, the CPI, the low education variable, and median age. Data for median age come from a report by the U.S. Census Bureau called, "AGE AND SEX 2010-2014 American Community Survey 5-Year Estimates", USCB (2014a). The report summarizes the median age of the population in each state.

Table 8 column 4 once again shows a significant negative relationship between minimum wage employment and the minimum wage rate, with a coefficient of -0.42. The significance in this relationship is demonstrated by the t-stat of -2.56. The model as a whole has an F-stat of 18.95 and a probability of F of 0.00. An adjusted-R^2 of 0.67 is reported in this model. All control variables are significant when tested together. Each control variable is significant when tested with minimum wage individually. This is shown in table 9.

Table 10 displays correlations of the dependent variable with all regressors, as well as correlations of the lead regressor with the control regressors. In table

Table 9: Significance Results of Regressions of Min Wage Employment on Minimum Wage, Education Level, Unemployment Benefit, and Labor Compensation Cost in 2014

Test	Model 1	Model 2	Model 3	Model 4
F-stat	24.00	21.93	17.19	18.95
	(0.000)	(0.000)	(0.000)	(0.000)
t-stat of lead	-2.28	-2.50	-2.50	-2.56
regressor	(0.027)	(0.016)	(0.016)	(0.014)
Joint: Control	5.17	5.98	4.40	5.05
Regressors	(0.001)	(0.002)	(0.004)	(0.002)
Joint: Min Wage	5.24	3.99	3.99	4.51
and Benefit	(0.009)	(0.029)	(0.023)	(0.016)
Joint: Min Wage	4.55	6.63	6.39	7.18
and CPI	(0.016)	(0.003)	(0.004)	(0.002)
Joint: Min Wage	17.22			
and High School	(0.000)			
Joint: Min Wage	2.64			
and College	(0.083)			
Joint: Min Wage	3.48			
and Advanced	(0.039)			
Joint: Min Wage		15.28	15.11	15.36
and Low Edu		(0.000)	(0.000)	(0.000)
Joint: Min Wage			3.12	
and Compen Cost			(0.054)	
Joint: Min Wage				4.74
and Median Age				(0.014)

Probability of each statistic noted in parentheses beneath.
Source: Author's computations.

10 column “a”, it can be seen that the lead regressor, minimum wage, is strongly correlated with the dependent variable, minimum wage employment. At over 55%, this model displays much higher correlation than the original model of Abdeljawad et al. (2014), in which unemployment and minimum wage were only correlated by 0.228. Table 10 also demonstrates decently strong correlation between the dependent variable and two of the control regressors; both low education and CPI are correlated with minimum wage employment by just over 0.5. Although low, the control regressors of weekly benefits, labor compensation cost, and median age also show some correlation with minimum wage employment.

In table 10 column “b”, it can be seen that the control regressors have correlation with the lead regressor, minimum wage. CPI has the strongest correlation with the lead regressor at a value of 0.49. The other controls — low education, weekly benefits, labor compensation cost, and median age — have lower correlations with minimum wage, ranging from 0.31 to 0.13. The presence of correlation among the variables strengthens the argument for their estimated relationship.

This paper finds evidence for a significant negative relationship between minimum wage employment and the minimum wage rate in the year 2014. For every $1.00 increase in the minimum wage rate, minimum wage employment decreases by roughly 0.41 percentage points. This value is calculated by taking the average of the minimum wage coefficients in the three new models (see table 8 columns 2, 3, and 4).

7 Conclusion

There is sufficient evidence to conclude that the models suggested by Abdeljawad et al. (2014) do not provide a strong estimation of the relationship between minimum wage and employment levels. It can be argued that the judgement sampling present in their data creates bias in their estimates that is not properly corrected. Furthermore, the model suggested by Abdeljawad et al. (2014) is not sufficiently robust to suggest a significant relationship between minimum wage and unemployment given more recent data. The model, when expanded to 2018, yields even less significant results.

Another flaw in Abdeljawad et al. (2014) is that the authors fail to indicate in their conclusion that the relationship they try to identify is strictly for the year 2014. Without the use of large panel data, any conclusions drawn by Abdeljawad et al. must be limited to the year 2014.

This paper finds that the model of Abdeljawad et al. (2014) does not have its internal validity threatened by omitted variable bias, functional form, selection bias, simultaneous causality, or inconsistent standard errors. Internal validity is threatened by the measurement error present in both the minimum wage data and the educational attainment data. The model also has its external validity threatened; the regression results obtained from the 2018 data set are significantly different from those calculated from the 2014 data set.

Table 10: Correlations of minimum wage employment, minimum wage, low education, weekly benefits, labor compensation cost, and CPI

	(a) Min Wage [1] Employment	(b) Minimum Wage [2]
Min Wage[2]	-0.662	1.000
Low Edu[3]	0.619	-0.311
Benefit[4]	-0.408	0.294
Compen Cost[5]	-0.196	0.243
CPI[6]	-0.554	0.495
Median Age[7]	0.019	0.127

1. Percent of labor force earning min wage or less (NSA).
2. Annual minimum wage rate by state - missing values set to estimates.
3. Binary set to 1 if high school attainment is greater than college and advanced attainment.
4. Maximum weekly unemployment benefit entitlement by state.
5. Average cost of labor compensation to employer.
6. Consumer Price Index by state.
7. Median age of population in each state.

Source: Author's computations.

This paper creates a model for a relationship similar to that estimated in Abdeljawad et al. (2014). Instead of looking at unemployment in general, this paper focuses on the employment of minimum wage workers. The model suggests a significant negative relationship between the minimum wage employment level and the minimum wage rate by controlling for education levels, weekly unemployment benefits, labor compensation costs, median age, and a standardized price level (CPI).

In conclusion, there is likely not a statistically significant relationship between minimum wage and the general unemployment rate. This paper estimates that a negative relationship exists between the employment level of minimum wage workers and the minimum wage rate for the year 2014. This estimate asserts that a $1.00 increase in minimum wage would correspond to a roughly 0.41 percentage point decrease in minimum wage employment. It should be noted that this estimate may not be representative of the relationship between minimum wage employment and the minimum wage rate in general.

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