The Correlation Between Minimum Wage and Youth Unemployment: A Cross Country Analysis

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Abstract

In this paper, we are exploring the correlation of minimum wage with youth unemployment across 25 OECD countries. We chose to focus on youth unemployment as opposed to overall unemployment for multiple reasons. One reason is that the effects of economic changes are often exaggerated in the youth labor market because of the lower skillset and experience that youth tend to have, making them more easily disposable than other workers. We developed two models. The first is a simple linear regression model; however, because of low statistical significance in this model, we decided to further explore the correlation using a multiple linear regression model. With this model, we found the relationship between the minimum wage and youth unemployment is positive and has a coefficient of 0.0176.

1. Introduction

In this paper, we will explore the correlation between minimum wage regulations and youth unemployment by examining data from 25 OECD countries in the year 2008. We define youth as being between the ages of 15 and 24. Our hypothesis is that as the minimum wage increases, youth unemployment will increase as well, and therefore, a positive correlation exists between the minimum wage and the youth unemployment rate. The minimum wage acts as a price floor in the labor market meaning that it is set at a level above the market equilibrium wage. Because of this, the existence of a minimum wage skews the signals of supply and demand in the labor market to produce a situation where there is a surplus of the supply of labor. This means that there are more people willing to work for the minimum wage than there are firms willing to hire them. Theoretically, any increase in the minimum wage would exacerbate this effect and increase unemployment. Another potential consequence of the minimum wage, as noted by Partridge and Partridge (1999), is that the minimum wage can in effect isolate the segment of the work force that is willing to work for less than the minimum wage, but is unable to obtain employment because higher skilled workers are attracted by the higher minimum wage. For this reason, the minimum wage may work to simply redistribute jobs to higher skilled workers as opposed to redistributing income to less skilled workers.

Despite its effects on labor market equilibrium and the distribution of jobs among skilled and unskilled workers, many politicians find implementing a minimum wage necessary to ensure that firms do not unfairly exploit workers and to try to ensure a certain standard of living for low-skilled workers. Because of this, minimum wage laws are often a point of discussion in policy development. In researching the correlation between minimum wage and its potential impact in the labor market, we decided to focus specifically on youth unemployment for several reasons. Primarily, youth are among the most highly susceptible to minimum wage fluctuations as many of them lack the work experience, and therefore the value, that older more experienced workers have. This lack of experience means that youth would typically be among the first group to be laid off within low-skilled jobs, and therefore provide a good indication of how the minimum wage may impact the labor market. Also, there is research to suggest that youth unemployment can forecast greater unemployment in the long run as these individuals may be more likely to be unemployed in the future (Gregg 2001). Measuring the effect minimum wage has on youth unemployment levels gives a clear picture of how minimum wage laws affect the segments of the labor force most vulnerable to it.

We are conducting a cross-country analysis as opposed to looking only at one country for multiple reasons. The most prominent is that countries do not change their minimum wage rate frequently, and when they do, it is often changed because of external factors in the economy. For example, policy makers may decide to increase the minimum wage when economic growth is predicted so that any negative impacts on the unemployment rate due to the minimum wage increase may be offset by growth. By measuring a cross-section of international data, we hope to control for such situations that may skew the relationship. Also, countries simply do not change their minimum wage often, so by including multiple countries in our analysis, we can explore a variety of minimum wage data alongside varying youth employment rates.

2. Literature Review

There have been several research papers conducted on the topic of minimum wage changes versus unemployment rates and youth unemployment rates, which are summarized below. There has also been research as to the effect that youth unemployment may have on unemployment in the long run. Our paper focuses exclusively on the relationship between the current minimum wage rate and current levels of youth unemployment to determine what effect the relative level of the minimum wage, rather than the effect of a change in the minimum wage, has on youth unemployment. Unlike previous research that heavily focuses on factors that effect labor market rigidity, our regression model includes only the minimum wage as an indicator of labor market constraints.

2.1 Minimum Wage Increases and US Long Term Unemployment

This paper measures the effect of the minimum wage on long-term unemployment using data from 48 US states between 1984 and 1989. These particular dates were chosen because many states increased their minimum wage in the late 1980s above the Federal minimum wage. Unlike our paper, this one focuses on the long-term unemployment rate in general, rather than youth unemployment specifically, and only uses data from one country. Long-term unemployment rates were chosen as the dependent variable to reflect the intuition that after a minimum wage shift, it takes time for firms and individuals to respond. Besides the minimum wage, other independent variables used are the share of the labor force covered by the minimum wage, the average hourly production worker's wage, and variables to control for potential growth differences between states.

After running different regression functions, this paper concludes that there is a positive correlation between the minimum wage and long-term unemployment after a lag. Interestingly, this paper found a stronger significance for the coverage variable than the minimum wage variable meaning that changes in how many industries are covered by the minimum wage law has a more statistically significant impact on long-term unemployment than changes in the minimum wage.

2.2 Minimum Wages, Labor Market Institutions, and Youth Employment

This paper is most similar to our paper as it explores international variations in minimum wage and the effect on youth employment. It differs, however, in that it places a heavier emphasis on the role that labor market institutions and their overall effect on labor market rigidity play in youth employment. This paper mentions a few previous studies relevant to this topic, such as Abowd et al. (2000) who researched minimum wage increases in France during the 1980s and found negative effects on youth employment probabilities. An OECD study in 1998 found a similar result; they discovered that the minimum wage had a negative and statistically significant effect on the employment rate of teenagers.

This paper measures the minimum wage as the ratio of the nominal value of the minimum wage to an average wage. Because of this, we have chosen to include gross national income per capita as a control explanatory variable to help account for cross-national variations in the price of low skilled versus high skilled workers. Other variables used in this paper include the employment to population ratio for youths, the unemployment rate for adults, fixed country effects, and a lag time variable to account for the time it takes a firm to adjust factor inputs as the result of a change in minimum wage. After running the regression, this paper finds a similar result as previous studies; namely a negative correlation between the minimum wage and youth employment rates. More specifically, the minimum wage ratio coefficient for their multiple linear regression model including all studied variables is -0.15.

2.3 Time Series Evidence of the Effect of the Minimum Wage on Youth Employment and Unemployment

This paper is an extension of previous literature studying the effects a 10% increase in the minimum wage will have on the youth unemployment rate. Most past research has found that a 10% increase in the minimum wage will reduce teen employment 1-3%. It specifies that most regression models looking at this topic have the following form:

$$Y = f(MW, D, X_1, \dots, X_m)$$

Where Y is the labor force status, MW is the minimum wage, D is a business cycle variable, and X represents all other potential exogenous variables. This particular paper uses 11 different variations of a regression function that includes various supply side variables, such as the ratio of civilian employment to the civilian population, as well as time trend variables. The results of these various regression functions all find a negative relationship between minimum wage and teenage employment, but coefficient values vary from -0.72 to -1.11. Interestingly, while the first literature review we examined found a strong correlation between coverage and the unemployment rate, this paper found that minimum wage has a more important effect on unemployment than coverage.

2.4 The Impact of Youth Unemployment on Adult Unemployment

By measuring the impact that youth unemployment has on future adult unemployment, this paper serves as a confirmation of our initial intuition that youth unemployment and overall unemployment have a causal relationship, and emphasizes the importance of measuring potential impacts minimum wage may have in the youth labor market. The paper draws on the National Child Development Survey to determine how unemployment experienced before the age of 23 influences unemployment trends five and ten years later. The National Child Development Survey is a multi-disciplinary study that follows roughly 17,000 people born in Great Britain in 1958. This type of study allows us to look at data that is not necessarily observable in the labor market and uncovers fundamental causes to unemployment. The paper observes educational history, family background, and certain behavioral factors observed in the NCDS that can only be found in such a longitudinal project.

The results offer evidence of structural dependence, also known as scarring, where unemployment experience in one's youth, even for a short time, significantly increases the probability that they will be unemployed as an adult. Other studies (Arulampalam *et al.,* 2000; Narendranathan and Elias, 1993; Narendranathan *et al.,* 1985) support this conclusion in terms of short term unemployment. Besides an increase in short term overall unemployment, this paper suggest that an increase in youth unemployment will increase adult unemployment in the long term.

The effects in young men are noticed until at least the age of 33, considered prime employment age. The data shows that an extra three months of unemployment before the age of 23, for men, leads to an additional six weeks of unemployment in their prime age. For

women, it leads to roughly three additional weeks. While heterogeneity comes into question for this specific cohort, an upward bias in this correlation is not found.

3. Data

To explore the correlation between minimum wage and youth unemployment, we developed two models. The first is a simple linear regression model and the second is a multiple linear regression model. The simple linear regression model utilizes the youth unemployment rate as the dependent variable and the real minimum wage measured in U.S. dollars as the independent variable. The youth unemployment rate is comprised of all persons between the ages of 15 and 24 who are actively seeking employment, but who are still unemployed. In regressing this model, we used the log of the youth unemployment rate to analyze the percent change on youth unemployment as the result of a change in the minimum wage.

The multiple linear regression model added five additional explanatory variables.

$$lyunemp = \beta_0 + \beta_{minwage} + \beta_{emplratio} + \beta_{unemp} + \beta_{povertyrate} + \beta_{GNIpercap} + \beta_{ypop}$$

The dependent variable *lyunemp* is the log of the youth unemployment rate. The variable *minwage* is the same real minimum wage value used in the simple linear regression model. The variable labeled *emplratio* is the youth employment to overall youth population ratio and uses the same age group as the youth unemployment rate (15-24). We included this variable as a control of the general participation of youth in the labor market. The variable *unemp* represents the overall unemployment rate per country, and *GNIpercap* is gross national income per capita. We included the unemployment rate and the gross national income per capita to control for differences in economic conditions between countries. Finally, *ypop* is the total youth population per country. The data sources used to acquire these variables include the World Bank, OECD Statistics, and the United Nations Statistics Division.

3.1 Summary Statistics

Table 1 shows a break down of the summary statistics for each variable. The data is all taken from the year 2008. The simple linear regression model includes 25 countries; however, when all explanatory variables from the multiple linear regression model are used, there are at most 22 observations due to data availability.

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
yunemp	25	14.412	5.176	5.4	25.4
minwage	25	6.570	4.322	0.61	14.47
ypop	25	5821.371	9660.637	60.339	43945.97
unemp	25	14.412	5.176	5.4	25.4
povertyrate	22	0.119	0.039	.053	0.189
gnipercap	24	31854.580	18349.170	9340	83240
emplratio	24	39.412	13.993	20	69.2

Table 1: Summary Statistics

3.2 Gauss Markov Assumptions

Compliance of the Gauss Markov Assumptions determines whether or not our developed model is biased meaning that the predicted beta values differ from their actual values. These assumptions specify that the model must be linear in parameters; the regressors must be acquired through random sampling; there can be no perfect collinearity between regressors; there must be a zero conditional mean of errors; and homoskedasticity occurs. Our model complies with the first two assumptions because all beta values are linear, and we can assume that the data sources that we used collected all data through random sampling. The third assumption can be verified using STATA by testing the correlation between each explanatory variable.

	gniper~p	minwage	unemp	ypop	povert~e	emplra~o
gnipercap	1.0000					
minwage	0.8603	1.0000				
unemp	-0.0461	-0.1749	1.0000			
ypop	0.0063	-0.1364	-0.0711	1.0000		
povertyrate	-0.2831	-0.2100	0.0669	0.2273	1.0000	
emplratio	0.2735	0.4496	-0.6619	0.2758	0.0411	1.0000

Figure 1: Correlation test between variables

As figure 1 shows, no regressor is perfectly collinear so the third assumption also holds in our model.

4. Results

4.1 Simple Linear Regression Model

As previously described, our simple linear regression model followed the form:

$$lyunemp = \beta_0 + \beta_{minwage}$$

	Model 1	
Minimum Wage	-0.0174	t-value = -0.92
Intercept	2.727	t-value = 18.12
R^2	0.0367	

Table 2: Simple Linear Regression Model Results

As shown in table 2, this model shows a slight negative correlation between the minimum wage and the youth unemployment rate. The coefficient of the minimum wage value can be interpreted as a one-value increase in the minimum wage will lead the youth unemployment rate to drop by approximately 1.74%. Using a one-tailed t-test of statistical significance, the minimum wage variable is not significant at any level. Also, the R^2 value is only 0.0367 meaning that this model only accounts for about 3.6% of variation in the youth unemployment rate. This simple linear regression model shows that minimum wage is not a strong or statistically significant variable to explain youth unemployment on its own.

4.2 Multiple Linear Regression Model

Because the simple linear regression model had a low R^2 value, and therefore did not account for a large portion of the variation in youth unemployment, and because the minimum wage variable is not statistically significant in this model, we deemed it necessary to explore the correlation using additional explanatory variables. Our multiple linear regression model follows the form:

$$lyunemp = \beta_0 + \beta_{minwage} + \beta_{emplratio} + \beta_{unemp} + \beta_{povertyrate} + \beta_{GNIpercap} + \beta_{ypop}$$

The results of this model are summarized in the table below.

This model closely follows the general model used to study the minimum wage versus unemployment correlation stated by Brown, Gilroy, and Kohen, which we mentioned in the third literature review of our paper. This general model typically includes a minimum wage variable, business cycle variables, and a few other potentially exogenous variables. Like this model, we include a minimum wage variable, business cycle variables such as unemployment and GNI per capita, as well as other variables we believe to be exogenously related.

	Model 2	
Minimum Wage	0.0176	t-value = 1.70
Youth employment to population ratio	-0.0058	t-value = -2.45
Unemployment	0.0666	t-value = 12.96
Poverty Rate	-0.1362	t-value = -0.26
GNI per capita	$-2.70e^{-06}$	t-value = -1.20
Youth Population	$3.25e^{-06}$	t-value = 1.43
Intercept	1.8283	t-value = 12.36
R^2	0.9538	

Table 3: Multiple Linear Regression Model

The R^2 value in this model is much higher than in the simple linear regression model and accounts for about 95.38% of variation in youth unemployment. Unlike in the simple linear regression model, this model shows a positive relationship between the minimum wage and youth unemployment, meaning as the minimum wage increases, youth unemployment also increases. The youth employment to population ratio, the poverty rate, and the GNI per capita variables all show a negative correlation with youth unemployment. Intuitively, a negative coefficient for GNI per capita and the youth employment to population ratio makes sense. As gross national income increases, one would expect youth unemployment to decrease as growth in income typically represents economic growth, which signifies lower unemployment as the economy is expanding. Similarly, increases in the ratio of youths who are employed relative to the youth population would always mean that the youth unemployment rate was decreasing unless for some reason the overall labor force dramatically increased without an equivalent increase in the number of youth who were employed. The negative coefficient on poverty rates is more surprising as this would imply that youth unemployment levels decrease as poverty rates increase.

The coefficient for minimum wage is only slightly higher than the coefficient for minimum wage in the simple linear regression model. Specifically, the impact of minimum wage on youth unemployment increases from 1.74% to 1.76%. Using a one-tailed t-test of statistical significance, the minimum wage and youth population variables are statistically significant at 10%. The youth employment to population ratio variable is significant at 2.5%, and the

unemployment variable is significant at 0.5%. The GNI per capita variable and the poverty rate variable are not statistically significant. The low significance of both GNI per capita and the poverty rate could have occurred because multicollinearity exists between these two variables.

4.3 Robustness Test

The GNI per capita and poverty rate variables have low significance; however, we felt they were necessary to include in our model as a control of economic conditions between countries. The possibility that they have low significance in our model because they are jointly significant exists; therefore, we conducted an F-test to determine whether or not this is the case. To conduct this test, we developed a restricted model to compare with our unrestricted model above. The restricted model follows the form:

$$lyunemp = \beta_0 + \beta_{minwage} + \beta_{emplratio} + \beta_{unemp} + \beta_{ypop}$$

The results of the regression of the restricted model are summarized in the table below.

	Restricted Model	
Minimum Wage	0.0049	t-value = 1.00
Youth Employment to Population Ratio	-0.0010	t-value = -1.44
Unemployment Rate	0.0707	t-value = 15.27
Youth Population	$9.67e^{-07}$	t-value = 0.48
Intercept	1.6548	t-value = 13.37
R^2	0.9616	

Table 4: Restricted Multiple Linear Regression Model

Our null hypothesis would be that GNI per capita and the poverty rate are not jointly significant and do not effect the model. After conducting the F-test, we found that our restricted versus unrestricted models has an F value of 2.8955. At 5% level of significance, we cannot reject our null hypothesis since the F statistic at this level is 2.73; however, we can reject our null hypothesis at a 10% level of significance since the F statistic at this level is 3.74. Based on these results, we can conclude that there is a degree of multicollinearity between GNI per capita and poverty rates that lowers their significance in our unrestricted model. Although they are not significant at 5%, these variables are significant at 10%; therefore, they are useful to our model not only because they are jointly significant, but also because they are necessary to act as controls between cross country differences.

5. Conclusions

There have been several research studies conducted on the topic of the effect that minimum wage levels have on both unemployment in general as well as youth unemployment specifically. These papers found a positive relationship between the minimum wage rate and youth unemployment levels. In this paper, we continued this research; however, unlike previous research, we did not include a lag variable or regress data from a time series analysis, but rather used a cross-section of relationships between the minimum wage and youth unemployment from one year.

According to our simple linear regression model, our hypothesis that there will be a positive correlation between the minimum wage and the youth unemployment rate is false. However, we found that in this model, the minimum wage variable was not statistically significant and the overall R^2 value was low. Expanding this exploration of correlation to a multiple linear regression model yielded different results. The coefficient on the minimum wage variable changed signs and became statistically significant at 10%. Also, the R^2 value increased dramatically from 0.0367 to 0.9538, an almost 25% increase. We determined that all other explanatory variables were statistically significant at 10%, taking the joint significance of GNI per capita and poverty rates into consideration, with some variables significant at smaller levels. According to our multiple linear regression model, our hypothesis is correct in predicting a positive correlation between minimum wage and youth unemployment; however, a change in minimum wage will lead to only a 1.76% increase in youth unemployment, which is not a dramatic change.

If we were to approach this question again, we would take cross-country variations in employment laws into consideration. For example, many countries have varying laws regarding at what age it is legal to hire youth as well as minimum wage exemption laws depending on age. Controlling for these variances in our model would give a more precise correlation between minimum wage and youth unemployment. Also, we would like to explore the potential impact that cross-country variance regarding minimum wage coverage within industries would have on the model.

6. References

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7. Appendix

OECD Countries	
Australia Belgium Canada Chile Czech Republic Estonia France Greece Hungary Ireland Israel Japan Korea, Dem. Rep.	Luxembourg Mexico Netherlands New Zealand Poland Portugal Slovak Republic Slovenia Spain Turkey United States United Kingdom

Table 5: List of Countries

Variable	Obs	Mean	Std. Dev.	Min	Max
yunemp	25	14.412	5.175529	5.4	25.4
minwage	25	6.5704	4.321836	.61	14.47
ypop	24	5821.371	9660.637	60.339	43945.97
unemp	25	14.412	5.175529	5.4	25.4
povertyrate	22	.1194545	.0391988	.053	.189
gnipercap	24	31854.58	18349.17	9340	83240
emplratio	25	39.412	13.99319	20	69.2

Figure 2: Summary Statistics STATA Results

```
. regress lyunemp minwage
```

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	0.84
Model	.133406313	1	.133406313	Prob > F	=	0.3697
Residual	3.49960212	22	.159072824	R-squared	=	0.0367
				Adj R-squared	=	-0.0071
Total	3.63300843	23	.157956888	Root MSE	=	.39884

lyunemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
minwage	-.0173716	.0189693	-0.92	0.370	-.0567114	.0219682
_cons	2.727455	.1504878	18.12	0.000	2.415362	3.039548

Figure 3: Simple Linear Regression STATA Results

```
. regress lyunemp minwage ypop unemp povertyrate gnipercap emplratio
```

Source	SS	df	MS	Number of obs	=	21
				F(6, 14)	=	69.82
Model	2.95052118	6	.49175353	Prob > F	=	0.0000
Residual	.098607022	14	.007043359	R-squared	=	0.9677
				Adj R-squared	=	0.9538
Total	3.0491282	20	.15245641	Root MSE	=	.08392

lyunemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
minwage	.0175741	.0103344	1.70	0.111	-.0045911	.0397393
ypop	3.25e-06	2.27e-06	1.43	0.175	-1.63e-06	8.12e-06
unemp	.0666143	.0051419	12.96	0.000	.0555861	.0776425
povertyrate	-.1362289	.5188073	-0.26	0.797	-1.24896	.9765022
gnipercap	-2.70e-06	2.26e-06	-1.20	0.252	-7.55e-06	2.15e-06
emplratio	-.0058291	.0023835	-2.45	0.028	-.0109411	-.000717
_cons	1.828321	.1478844	12.36	0.000	1.511141	2.145501

Figure 4: Multiple Linear Regression Model STATA Results (Unrestricted Model)

```
. regress lyunemp minwage emplratio unemp ypop
```

Source	SS	df	MS	Number of obs	=	24
				F(4, 19)	=	119.07
Model	3.49363877	4	.873409694	Prob > F	=	0.0000
Residual	.139369656	19	.007335245	R-squared	=	0.9616
				Adj R-squared	=	0.9536
Total	3.63300843	23	.157956888	Root MSE	=	.08565

lyunemp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
minwage	.0048938	.0048709	1.00	0.328	-.0053012	.0150887
emplratio	-.00296	.0020529	-1.44	0.166	-.0072567	.0013367
unemp	.0707386	.0046338	15.27	0.000	.0610401	.0804372
ypop	9.67e-07	2.01e-06	0.48	0.636	-3.24e-06	5.17e-06
_cons	1.654878	.1237416	13.37	0.000	1.395884	1.913873

Figure 5: Multiple Linear Regression Model STATA Results (Restricted Model)