Minimum Wage and Unemployment Data Analysis Report:

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# 1.0 Executive Summary

This report investigates the long-enduring question: does raising the minimum wage reduce full-time employment? We answer this question by analyzing data from Card and Krueger’s famous 1994 study on the effect that the minimum wage has on employment. First, we give background on research for this topic and then, consider these findings presented in the literature for our recommendation. Next, we provide a description of the data as well as the statistical approaches used. Finally, we conduct rudimentary analysis of the data and conclude with our recommendation.

According to the investigation's findings, employment was higher in the areas analyzed before the minimum wage was raised compared to after the minimum wage was raised. This was deduced from the creation of a new variable (diff.fte), which was defined as the difference in employment before and after. Most of the scores are negative, indicating that employment has decreased as a result of the increase in the minimum wage. Additionally, we used a regression model which took the employment difference as a dependent variable against the restaurants which were the main treatments of interest. In doing so, we found that the restaurants have a significant effect on the employment change, as a unit change in the location of New Jersey calls for a corresponding decrease in the employment difference of about 2.59--which is approximately 3 persons.

The topic of how increasing the minimum wage will affect the economy, and specifically, employment rates is hotly debated. While there has been discourse, in general, there is a consensus among economists: an increase in minimum wage will cause a decrease in the rate of employment. The basis of this belief is that businesses may find it difficult to sustain the same number of workers under a new wage system and so, they will begin to look for other ways to reduce the number of workers, such as through the use of machines, mass layoffs, and outsourcing. The impact of this data analysis is that it substantiates this consensus. We, therefore, discourage minimum wage increases across the United States and recommend that we look for alternative methods for raising full-time workers above the poverty line.

## 2.0 Background

According to Brown, Gilroy, and Kohen (1982), boosting the minimum wage has positive impacts, such as pulling people out of poverty and increasing individual and family income. This, in turn, raises the overall standard of living, allowing lower SES persons to afford expenses such as rent more easily. The authors argue that raising the minimum wage will additionally result in increased employee morale. Increased customer satisfaction will come as a result of happier workers. This means better business and perhaps more jobs. Satisfaction among the workers also means that they will be less likely to leave for better-paying work. This effectively mitigates training costs for companies and results in higher rates of employment.

In a perfect world, the lowest-paid workers at fast-food restaurants, grocery stores, and other establishments would be paid $15 per hour, and these companies' business models would remain unaltered. Santillan, Esquivel, and Campos-Vazquez (2018) believe that the world is imperfect, however. In their view, the propriety of increasing the minimum wage is complicated by several factors that must be taken into account. In raising the minimum wage, firms might exercise an alternative business model, opting for automation over human labor, for instance. Companies utilize automation to minimize costs and avoid higher payroll expenditures. Instead of conversing with a human person at the counter, fast-food customers punch their orders into a computer, which also receives money and deposits the paper sack full of food when it comes out of the kitchen.

Wage increases can also have a potential negative impact on the economy at a macro-level which in turn, causes increased unemployment. Per Santillan, Esquivel, and Campos-Vazquez, most businesses allocate a set amount of money to wage costs in their budgets at least a year in advance (2018). Fluctuations in business volume throughout the year may require compensation adjustments on the fly. The majority of businesses have a firm grasp on how much they want to spend on staff recruitment and so, when companies are required to pay workers more per hour, they either hire fewer workers or assign the same number of workers fewer hours to avoid surpassing their predetermined wage expense restrictions. Many businesses do this, or they outsource jobs to nations where the cost of an employee per hour is significantly lower.

The purpose of this study is to further investigate the findings presented in the literature. In the following data analysis, we will consider both the positive and negative findings presented in these studies. We base our recommendation on this consideration of the literature, as well as the determined relationship between the increase in the minimum wage and the rate of unemployment in New Jersey and Pennsylvania.

3.0 Introduction. The question of how increases in the minimum wage will affect the economy, and employment specifically, has been long debated by economists. This question is important to answer because 3.4 million Americans working full-time live below the poverty line (“A Profile of the Working Poor” 2016). In considering the causes of this problem, we recognize three major labor market problems—those are periods of unemployment, involuntary part-time employment, and low earnings. Of these three labor market problems, low earnings are the most significant problem among workers, with 77 percent experiencing it. Unemployment is the next most common problem afflicting the full-time working poor at 21 percent. Given the context of this report, these numbers are important to consider as they are indicative of an overarching problem that is attempting to be solved with increasing the minimum wage: how do we raise the full-time working poor out of poverty without also impacting the economy negatively? In the event of the data analysis revealing a negative effect of increased wages on employment, we should look for other ways to pull full-time workers out of poverty Despite the ongoing debate on minimum wage and its effects, there is one shared goal, regardless of political affiliation—and that is for no full-time workers to live under the poverty line. In fact, the question of how to do this is one that presupposes the question being addressed. This report will be valuable in shedding light on both questions.

#### 4.0 Data Description and Methodology

This section provides a brief explanation of the data and then, an explanation of the statistical approaches employed. The dataset used in this analysis is from the renowned study on the effects of minimum wage increases on employment, conducted by Card and Krueger (1994). They answer the long-enduring question of how increasing the minimum wage will affect employment by comparing the employment rate in New Jersey with suburban restaurants in Pennsylvania. In 1992, New Jersey, implemented a minimum wage increase while the minimum wage stayed constant in Pennsylvania during this same time. That data is gathered directly from their survey of Burger King, KFC, Roy Rogers, and Wendys in both states—before and after the raising of wages in New Jersey.

For easy access to data, we created some new variables to capture the employment rate after the rise in minimum wage and to also capture the change in wages. We generated a new variable (diff.fte) which records the change in full-time-equivalent (FTE) employment that occurred between early 1992 and late 1992, where the unit is the number of total full-time employees plus 1/2 times the number of part-time employees. We regress this variable on New Jersey, with the state being our main treatment of interest because they experience the minimum wage increase. For further description of the work, bar plots, histograms, and density plots are employed in the following section. It is in this section, that we uncover why this data matters for the question at hand.

Methods

For data modeling, we shall make use of the regression model to see if there is an effect of the minimum wage increase on the rate of unemployment. We make use of the t-test for comparing the mean employment between the two locations. Additionally, a chi-square test for independence will be carried out on employment and wages before and after raising the minimum wage.

The simple linear regression model is given by:

With which is normally and independently distributed with mean o and a constant variance as Y.

The multiple extended model is the given as:

With the X as the predictors and Y as the dependent variables.

##### 5.0 Data Analysis and Results

Exploratory Data Analysis

This section consists of the visualization of data information to investigate the effects of wage increases on employment.

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*Figure 1: Bar plots showing the employment rates before and after the minimum wage increase.*

The charts above depict the employment rate in the two locations studied both before and after the minimum wage increase. For both examples, the left bars indicate higher values than the ones on the right. This suggests that prior to the minimum wage increase, employment was higher.

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*Figure 2: Density plots showing the wages of workers in the fast-food restaurants before and after the minimum wage increase.*

In the density plots above, the wages paid to restaurant workers were higher in Pennsylvania before the increase in minimum wage compared to the wages paid to those in New Jersey. After the increase in minimum wages, both restaurants pay an average of $5 per hour.

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*Figure 3: Histograms showing the difference in wages and employment before and after the minimum wage increase.*

The histograms above serve as a good summary of the findings. Most of the values of the employment difference for the fast-food restaurants considered lie in the negative part of the histogram. This means that the employment of workers was higher when the minimum wage was not yet increased compared to after the increase.

5.1 Regression Analysis

***Table 1: Regression summary of employment on New Jersey (nj)***

|  |
| --- |
| Coefficients: |
| Estimate Std. Error t value Pr(>|t|) |
| (Intercept) 2.057 1.119 1.838 0.0670 |
| njNew Jersey -2.529 1.246 -2.029 0.0433 \* |

The restaurants have a significant negative effect on the employment change. A unit change in the location of New Jersey calls for a corresponding decrease in the employment difference for about 2.59 which is approximately 3 persons. This establishes that the number of employments has reduced as a result of a rise in the minimum wage for workers.

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*Figure 4: Correlation plots of the indicators for restaurant chains in the fast-food restaurants before and after the minimum wage increase.*

Before a regression model will be carried out using all the predictors, we need to establish if there is no multicollinearity among these variables. The plot above is a correlation plot examining the interrelationship of the variables. We can see that the correlations are not high between each pair, hence, there exists no multicollinearity in the predictors.

***Table 2: Model summary of the regression of employment on restaurant chains and nj***

|  |
| --- |
| Coefficients: |
| Estimate Std. Error t value Pr(>|t|) |
| (Intercept) -7.09887 6.57420 -1.080 0.2810 |
| nj -2.28673 1.14780 -1.992 0.0471 \* |
| bk 0.09688 1.46406 0.066 0.9473 |
| kfc -0.67313 1.61694 -0.416 0.6774 |
| roys 1.88363 1.55152 1.214 0.2255 |
| wage\_st 1.91136 1.34898 1.417 0.1574 |

The only significant coefficient is NJ which is the location of restaurants as other coefficients have p-values--the probability of committing type I error--greater than 5%. The fact that wages before minimum wage do not have a significant effect on the employment means that the employment figures are strictly affected after the minimum wage increase.

###### 6.0 Conclusion and Recommendations

From the results of the analysis, employment was higher in the areas analyzed before the minimum wage was raised compared to after the minimum wage was raised. In our effort to uncover this finding, we created a new variable, (diff.fte), which represented the difference in employment before and after. In an analysis of the data, we found the increase in minimum wage decreases employment, particularly in the areas considered for this work. This was indicated by most scores being negative. In using a regression model which considered differences in employment as a dependent variable against the restaurants serving as the main treatment of interest, we found that the restaurants have a significant negative effect on the employment change. A unit change in the location, New Jersey, calls for a corresponding decrease in the employment difference for about 2.59 which is approximately 3 persons. Before a regression model using all the predictors was used, we established that there is no multicollinearity among these variables. It was concluded that the employment figures are strictly affected after the minimum wage increase.

We hereby discourage the raising of the minimum wage across the United States. Considering the findings of this data analysis, we can assume that there will also be a negative impact of minimum wage increases on a macro scale. Most of the literature points to a potential increase in the price index. If prices and the minimum wage both rise by the same percentage, the salary increase will yield no meaningful benefit. So, in addition to increased unemployment, raising the minimum wage will have negative macro-level effects on the economy and further, implicit negative effects on the working poor—these costs would outweigh any benefit the working poor would gain from a raise in the minimum wage. In considering how increasing the minimum wage impacts the unemployment rate, future research should investigate these macro-level effects on the economy. The impacts that increasing the minimum wage has on the economy needs to be considered because the unemployment rate will additionally increase with the economy doing poor.

With this being our recommendation, it is important to address one glaring limitation of the study used for this data analysis—it was conducted within the context of the United States and only a small part of it. As such, our recommendation is only pertinent to policymakers in the United States. That is not to say these findings are not useful to other capitalist states, however. This report as well as the study used for it can serve as a foundation for similar but more complicated studies. The results of this data analysis are indeed useful but please note that these findings are not infallible for this reason. Future, more sophisticated research should be conducted in other parts of the country and eventually, other parts of the world. Would we get the same effects of a minimum wage increase on employment if we conducted the same study in a larger area? This area, and the people residing within it, would differ in terms of characteristics and so, we must ask: would the results also differ?

Our data analysis experienced limitations in terms of time, recourses, and experience. We have discussed the potential impacts of increased wages on the price index but, due to the previously mentioned limitations--as well as page limitations that I am already exceeding--we could not conduct such an in-depth analysis. If future, more complex data analysis is to take this into consideration, they should account for the fact that the legislation was passed in 1990—perhaps companies already adjusted for the price change. Lastly, we did not consider if the raise in the minimum wage resulted in fewer hours worked.

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