The Effect of Minimum Wage on the Fast Food Labor Market

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Section 1.0: Introduction

The Effect of Minimum Wage on the Fast Food Labor Market

This research paper will investigate the effects of minimum wage on the fast-food labor market using data taken from 'Fast Food Wage Data NJ'. Studying the impact of the minimum wage on the job market is crucial as policymakers globally show increasing concern for the financial well-being of low-wage workers. Research in this area not only examines direct effects on workers but also uncovers broader economic consequences. This investigation is supplemented by various works such 'Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania' (Card et al., 2000). This attention reflects a societal shift towards fairness in the job market, guiding policymakers in decisions that balance economic growth with social justice on an international scale. This research serves as a vital compass, informing policies that aim to foster inclusive economic growth and improve the overall well-being of the workforce worldwide. Renowned journals and academic magazines have also been exploring this matter through works such as Harvard Business Review's 'When a Higher Minimum Wage Leads to Lower Compensation' (Yu et al., 2021) and The National Bureau of Economic Research's paper 'The Effect of the New Minimum Wage Law in a Low-Wage Labor Market' (Katz et al. 1991).

The dataset at hand depicts the effects of increasing the minimum wage on groups such as the workers at fast food chains and their employers. These numbers are useful for policymakers, such as the government who set the minimum wage, to determine the possible beneficial or non

beneficial outcomes of changing the minimum wage rate. To conduct this research, we will be utilizing the information from “Fast Food Wage Data NJ” to determine if an increase in the minimum wage would lead employers to let off some workers to counteract the increasing cost of paying to pay their salary. This is valuable information that will aid in the amelioration of future policies.

Section 2.0: Data

The data used in this investigation is taken from ‘Fast Food Data NJ’.

The type of data is panel, since it is a combination of cross sectional and time series data.

Table 1: Codebook Table

Variable Name	**Meaning of Variable**
EMPFT	# full-time employees
EMPPT	# part-time employees
WAGE_ST	starting wage ($/hr)
PCTAFF	% employees affected by new minimum
HRSOPEN	number hrs open per day
PSODA	price of medium soda, including tax

Table 2: Type and Level of Measurement of Variables

Variable Name	Variable Type			Level Of Measurement
	Categorical	Numerical		
		Discrete	Continuous	
Wage	✗	✗	✓	Ratio
% of full time employees	✗	✗	✓	Ratio
% of part time employees	✗	✗	✓	Ratio
% increase in price of soda	✗	✗	✓	Ratio
Hours open	✗	✗	✓	Ratio
% of employees affected by increase in minimum wage	✗	✗	✓	Ratio

There are limitations of using solely numerical data in this investigation. It might miss important context, oversimplify complex issues, and not capture personal experiences or biases of minimum wage fast food workers. It can struggle to explain why things happen, not represent social aspects well, and be limited in exploring new trends. Depending too much on surveys may introduce biases, and ethical concerns may be overlooked. Numbers might not fully understand participant views and can quickly become outdated in fast-changing situations.

Section 2.1: Univariate Analysis of Data

Descriptive Statistics

Table 3: Descriptive Statistics Data

Variable	*Mean*	*St. Dev.*	*Minimum*	*Quartile 1*	*Median*	*Quartile 3*	*Maximum*
EMPFT	7.77	7.29	0	3	6	10	40
WAGE_ST	4.58	0.35	4.25	4.25	4.5	4.75	5.75
EMPPT	18.02	10.19	0	10	15	25	60
HRSOPEN	14.23	2.7	7	11.5	15	16	19
PCTAFF	49.8	35.28	0	16.5	50	80	100
PSODA	1.07	0.09	0.85	1.02	1.06	1.12	1.49

WAGE_ST denotes the starting wage that workers are given in the respective fast food chain. WAGE_ST uses the ratio level of measurement. The mean is 4.58 which is only a little greater than the median, 4.5. Because of this difference, one can derive from this table that there is a right skew in its distribution.

Next, the variable EMPFT is the percentage of full time employees at the fast food chain and it uses the interval level of measurement. By observing the data in Table 1 above, it is seen that the mean of this variable (7.77) is greater than its median (6) which produces a right skew in its distribution. The high standard deviation (7.29) also leads to a greater variance in the dataset. This is consistent with the histogram in Figure 1.

The third variable, EMPPT, refers to the distribution of part-time employees across the interviewed fast food chains and this variable uses the interval level of measurement. The mean of the data is 18.05 and the median is 15.0. There is a discrepancy between the mean and the median which produces a right skew in this data set. Moreover, the standard deviation of 10.19 indicates high variance. This descriptive data can be further observed in the Congressional Budget Office, "How increasing the federal minimum wage could affect employment and family income."

PSODA measures the price of a medium soda including tax and uses the interval level of measurement. The mean of this variable is 1.07, just slightly higher than the median which is 1.06. This indicates that the data is skewed to the right. The standard deviation for this variable is 0.09 indicating a lesser variance in the data. These descriptive statistics are supported by the

work of Katz, Lawrence F, and Alan B Krueger. “The Effect of the Minimum Wage on the Fast Food Industry.” National Bureau of Economic Research Working Paper Series, Feb. 1992, www.nber.org/papers/w3997."

HRSOPEN is the number of hours a fast food restaurant is open and this variable uses the interval level of measurement. The mean and median show that the data for this variable is skewed to the right because the median (7) value is smaller than the mean (8.35). Since the standard deviation is small the values are likely clustered close together.

The percentage of employees affected (PCTAFF) by the new minimum wage uses the ratio level of measurement. It has a mean of 49.80 and a median of 50. The distribution of this dataset is skewed to the left. Its high standard deviation (35.28) indicates that there is a great variance in the data meaning that the values are more spread out around the mean.

Histograms

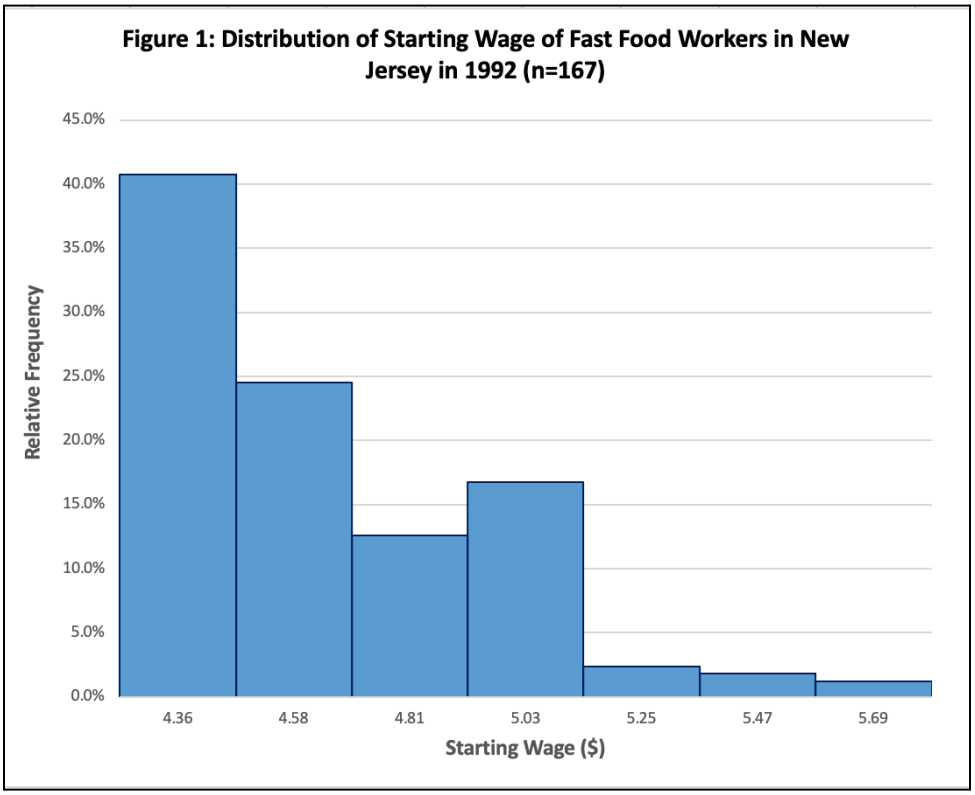


Figure 1 depicts the right-skewed distribution of the starting wage of fast food workers in New Jersey prior to the change in minimum wage. The histogram depicts a sharp right skew, indicating that there is a low frequency of higher wages workers in the fast food chain.

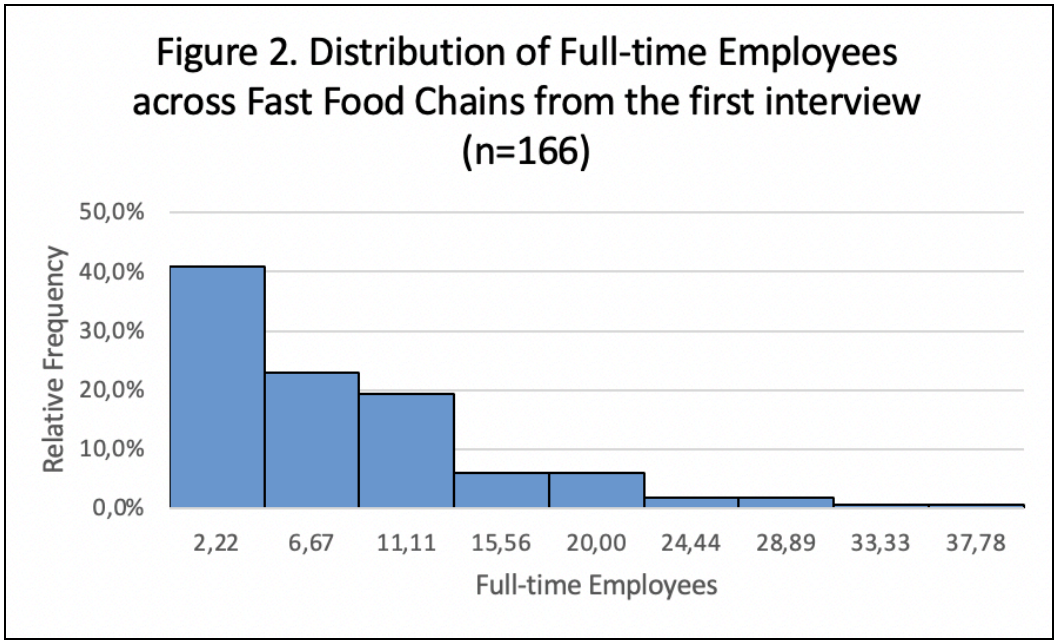


Figure 2 demonstrates the right-skewed distribution of full-time employees at fast food chains in the data gathered from the first interview. It shows that the distribution of full-time employees is right skewed, indicating that full-time employees will be relatively few in each chain.

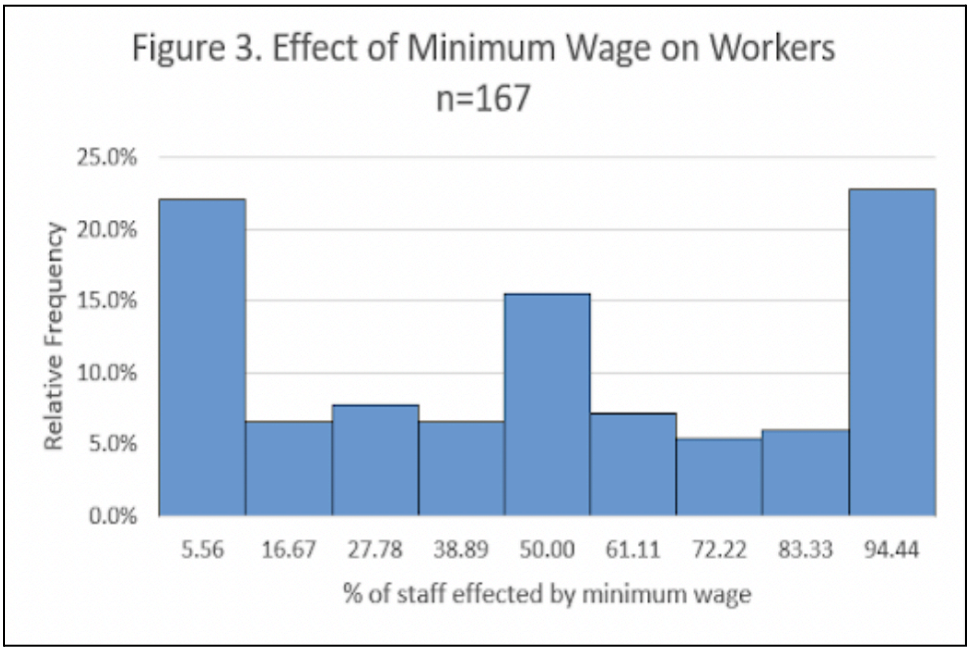


Figure 3 is a graph representing the percentage of staff affected by minimum wage and the frequency of each bin relative to the sample size. In this figure, most of the responses fall either between 0-11%, 44-55%, or 88-100%. This means that at different restaurants or locations, there are contrasting results for the percentage of staff affected by minimum wage.

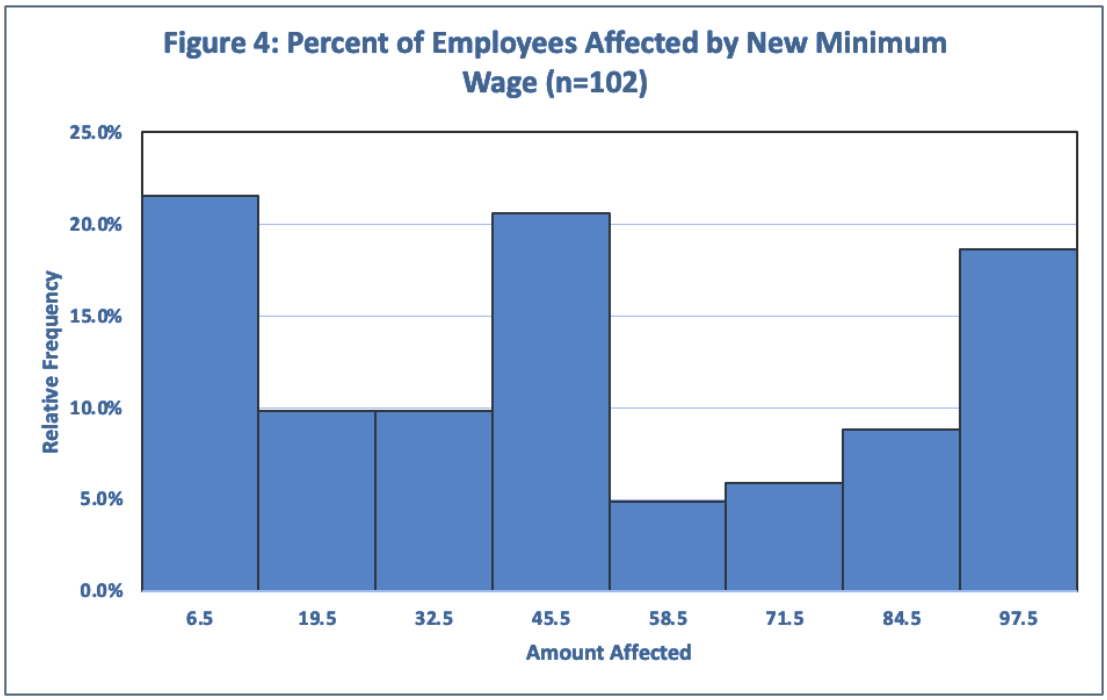


Figure 4 demonstrates the percentage of employees affected by the new minimum wage. The data is distributed around the central value of 45.5 on the x-axis. The histogram displays a symmetrical distribution around the central value of 45.5.

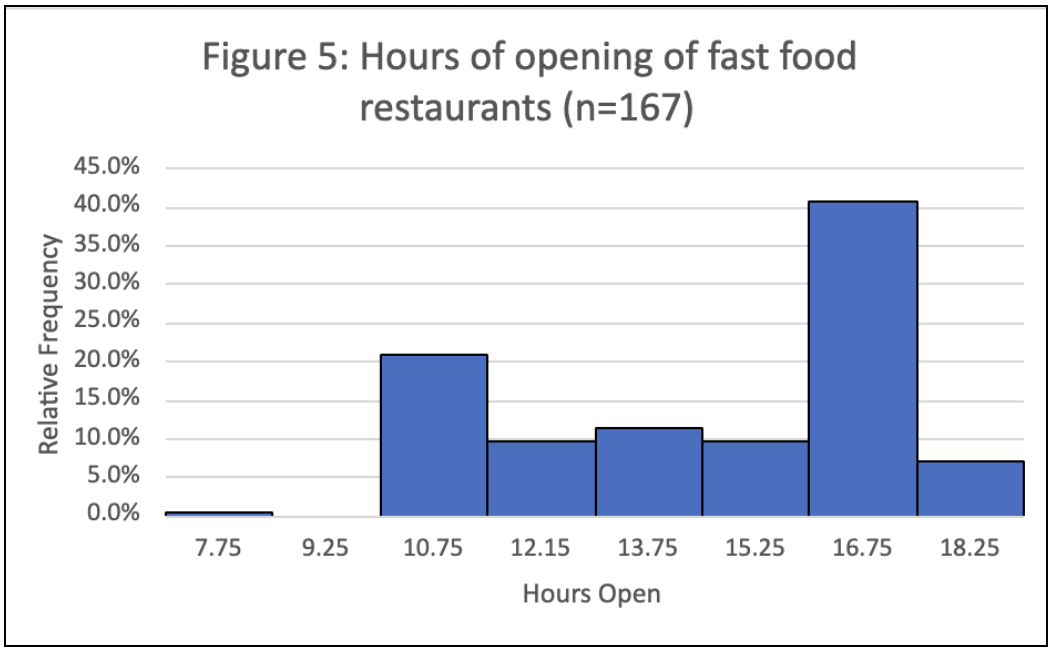


Figure 5 is a graph that shows the left-skewed distribution of hours that a fast food restaurant is open from interview 1. There is an outlier and a mode shown on the histogram. This shows that many fast food restaurants have similar hours in which they are open.

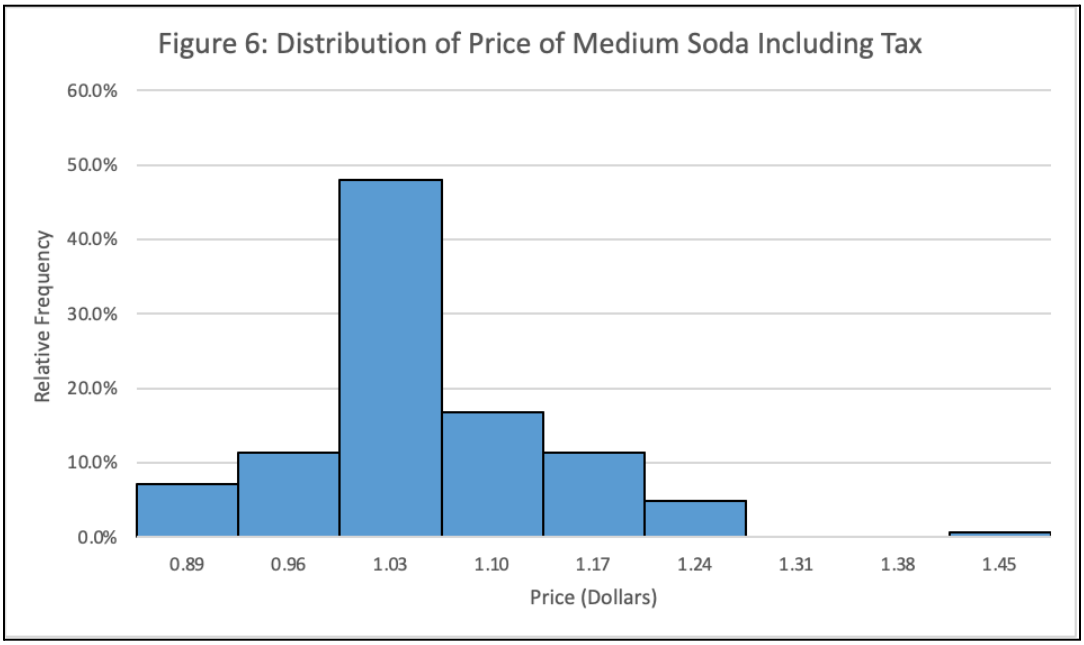


Figure 6 shows the distribution of the price of a medium soda including tax. The histogram shows there is an outlier of $1.45 (0.6%), but otherwise, the prices are relatively similar. This shows that nearly 50% of restaurants have a price of $1.03.

Section 2.2: Bivariate Analysis of data

Correlations

Table 4: Variable Correlations

	WAGE_ST	EMPFT	HRSOPEN	*EMPPT*	PCTAFF	PSODA
WAGE_ST	1.000					
EMPFT	0.154	1.000				
HRSOPEN	-0.101	0.205	1.000			
EMPPT	-0.109	-0.290	0.427	1.000		
PCTAFF	-0.461	-0.262	-0.044	0.080	1.000	
PSODA	0.0288036	0.0540105	0.3627431	0.0958588	0.9984718	1

Figure 3.1: Correlation Between WAGE_ST and EMPFT

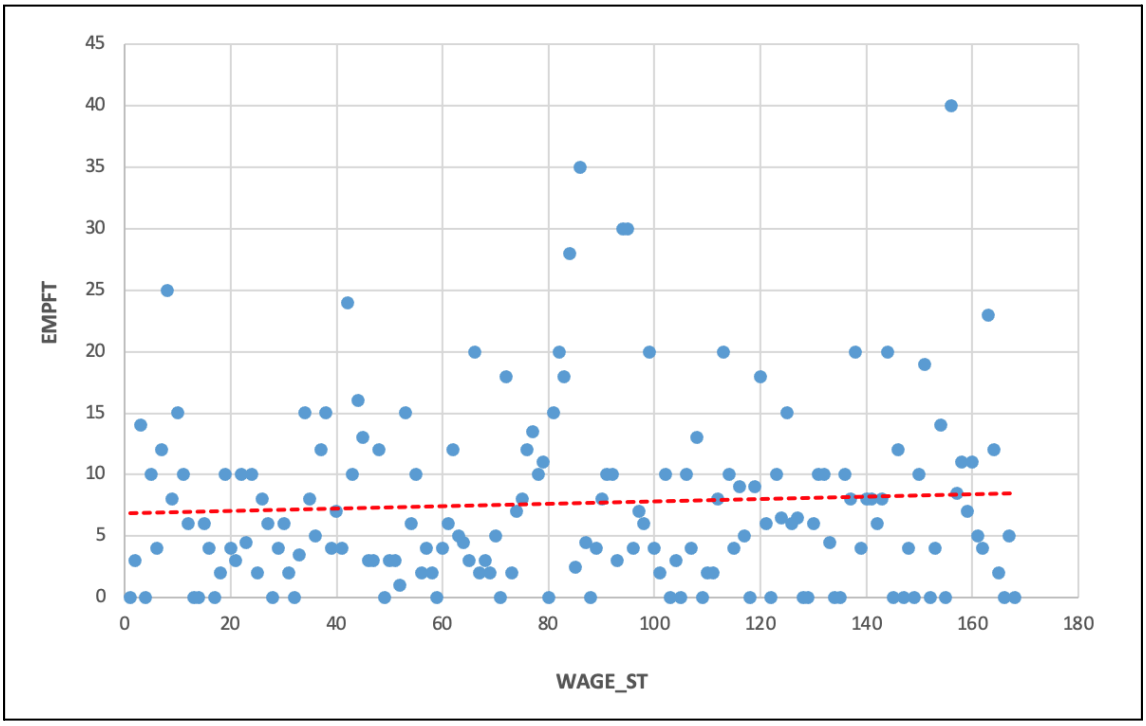


Figure 3.1 displays the correlation between the starting wage (WAGE_ST) and the number of full time employees (EMPFT). As can be observed in the scatter plot, WAGE_ST and EMPFT have a slight directly positive linear correlation. This means that an increase in one of the variables is accompanied by an increase in the other. As stated in Table 3, the correlation between the two variables is 0.154 which is what the scatter plot visually depicts.

This direct relationship between WAGE_ST and EMPFT can be explained by the following: a low starting wage discourages workers from being employed thus leading to a low number of full time employees. On the other hand, a high starting wage incentivizes people to work by providing them with a substantial source of income. This therefore results in a high number of full time employees. This directly proportional relationship between the two variables is conveyed by the correlation of 0.154. However, as this correlation is not highly significant, we

cannot conclude for certain that the two variables have a strong, directly proportional relationship.

Figure 3.2: Correlation between WAGE_ST and EMPPT

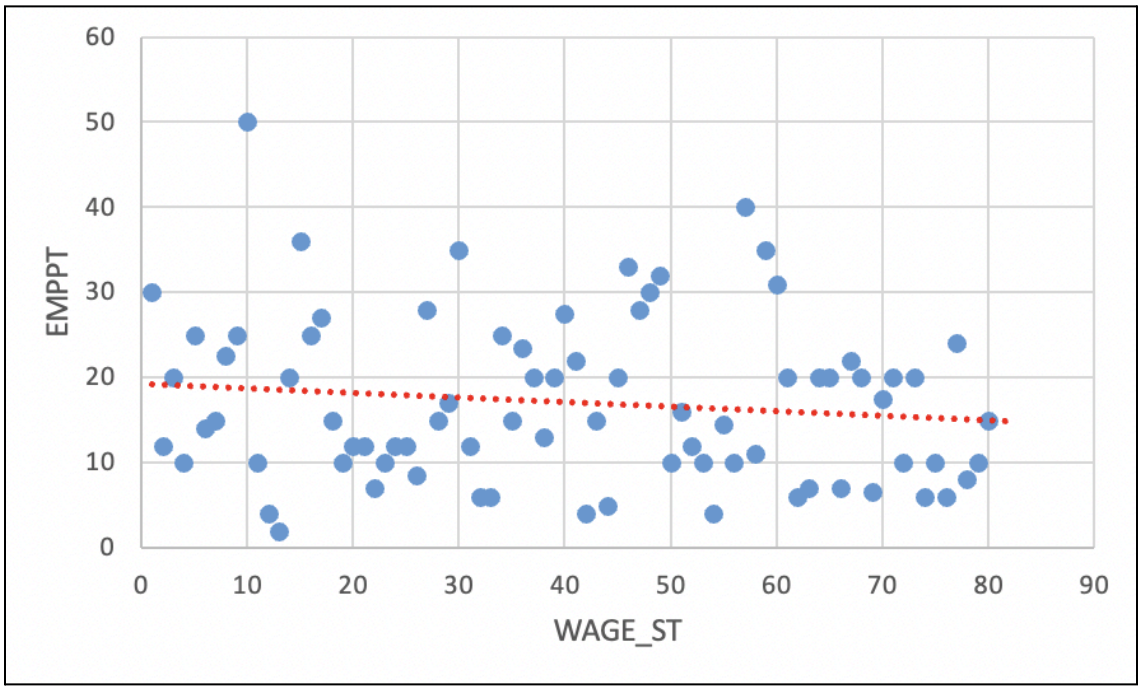
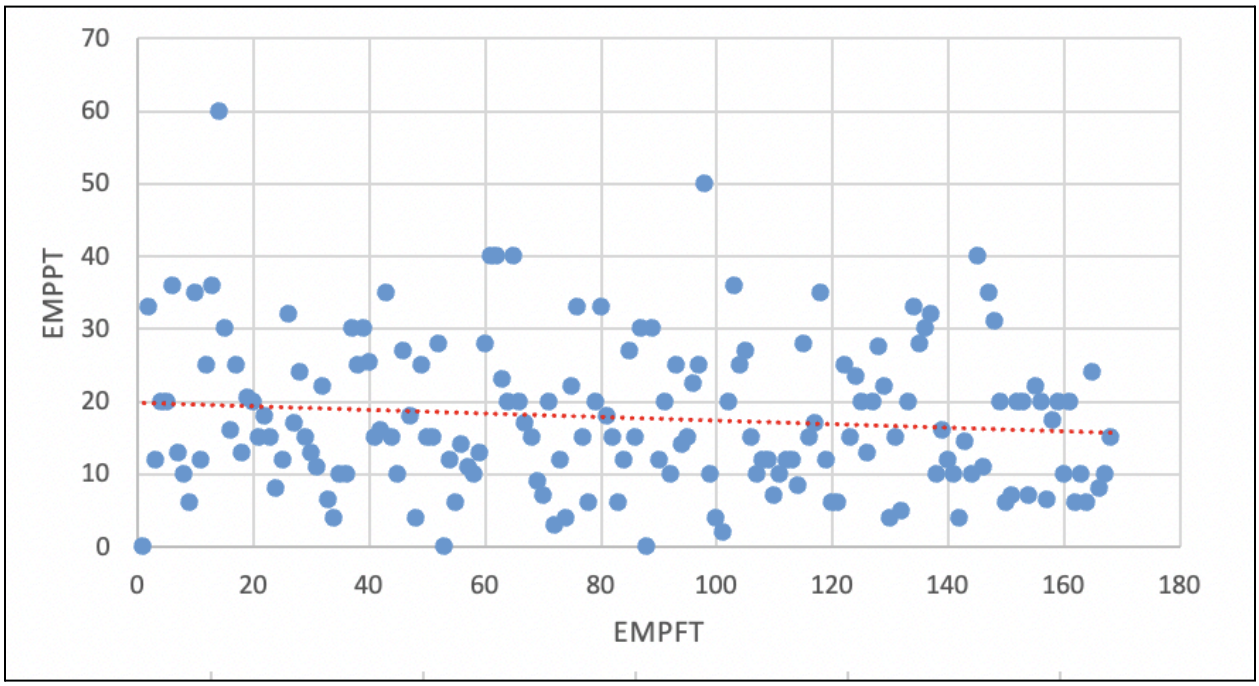


Figure 3.2 displays the correlation between the variables starting wage (WAGE_ST) and the number of part time employees (EMPPT). The scatterplot shows a weak negative correlation between WAGE_ST and EMPPT. The correlation coefficient is r=-0.081. A possible explanation for the negative correlation is that as starting wage decreases so does the number of part time employees.

Figure 3.6: Correlation Between EMPFT and EMPPT



The correlation between the two variables, denoted as EMPFT and EMPPT, in Figure 3.6 is seen to be a weak, negative association. This agrees with the data in Table 3 where it states that the correlation coefficient for these two variables is -0.290. The negative correlation suggests that when one variable, say EMPFT decreases, the second variable (in this case EMPPT) decreases. A potential reasoning as to why there is a weak negative association is because as one variable tends to increase, the other tends to decrease. Therefore, this suggests that as Part-time employees are hired, the less Full-time employees will be working. However, since the data is not a strong correlation, this trade-off isn't as noticeable. This potential reasoning can be further explored in an article published by Business News Daily, where they explore the downsides and different benefits from hiring full-time vs part-time employees.

https://www.businessnewsdaily.com/15815-full-time-vs-part-time-employees.html

Figure 3.7: Correlation between PCTAFF and EMPFT

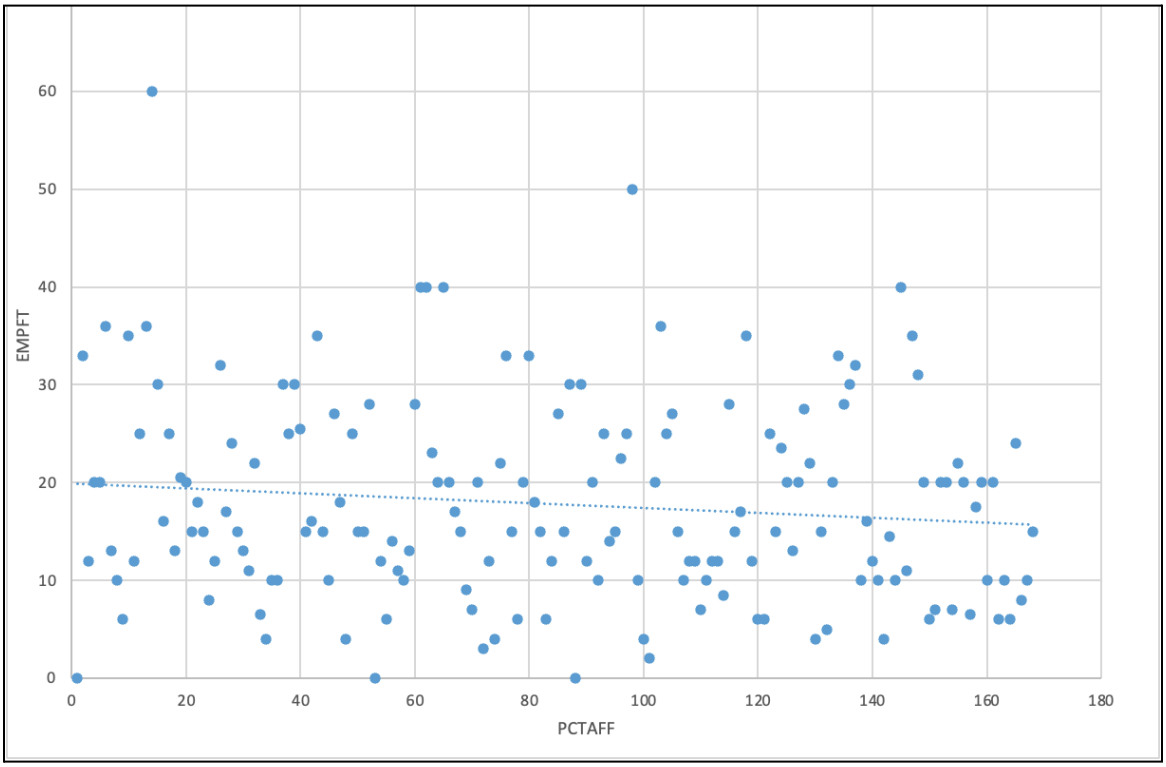


Figure 2.7 displays the correlation between the percentage of employees affected by the new minimum wage (PCTAFF) and the number of full time employees (EMPFT). These two variables have a negative correlation as can be seen in the scatterplot. In table 3 we can further see this negative correlation being demonstrated as the correlation coefficient of PCTAFF and EMPFT is -0.262. This indicates that a decrease in one of the variables is followed by a decrease in the other. A possible explanation that could describe this negative correlation would be that when minimum wage decreases these people who are working full time then switch to part time so that they could work other jobs in order to earn more money.

Figure 3.8: Correlation between HRSOPEN and EMPFT

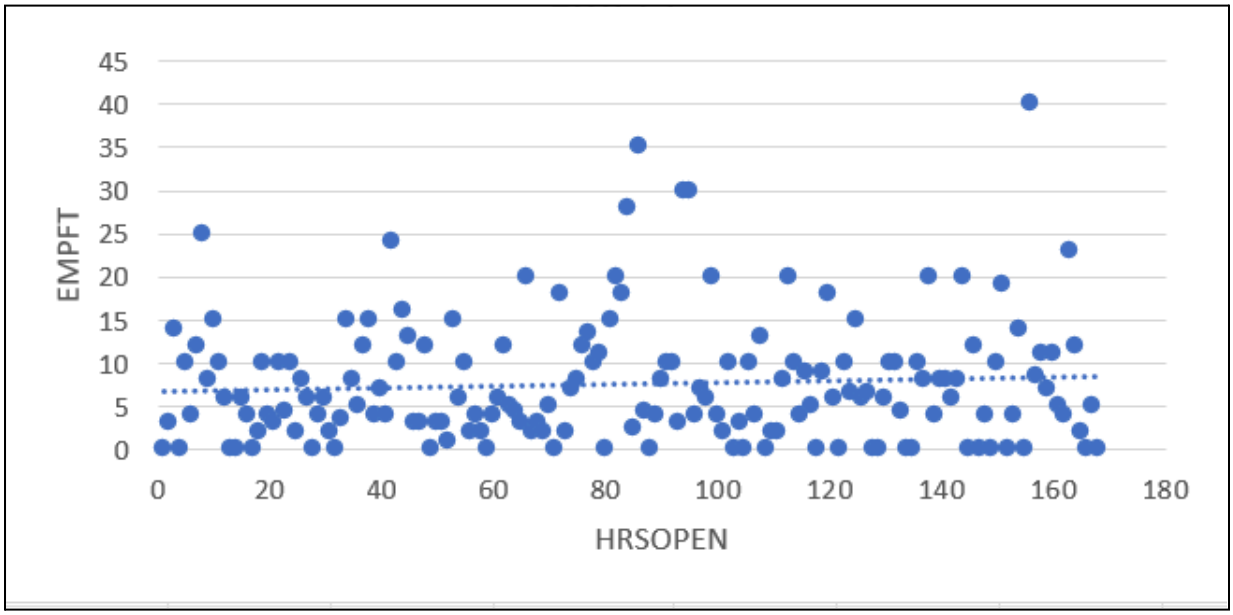
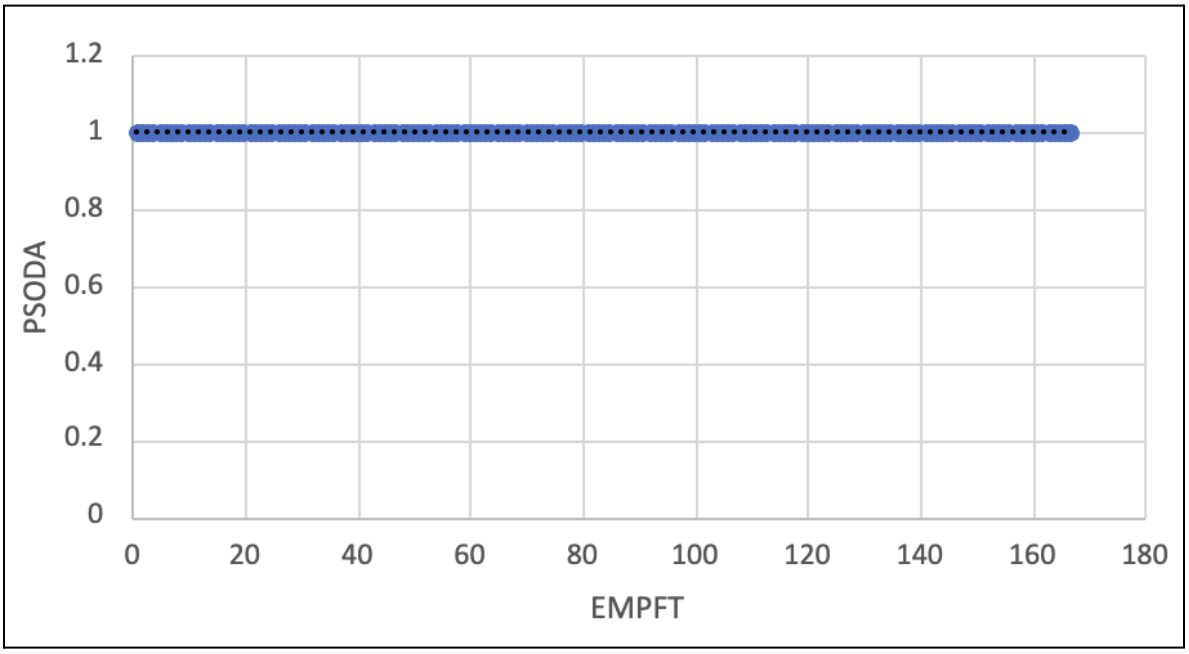


Figure 3.8 represents the relationship between EMPFT or number of full time employees and HRSOPEN or hours that the restaurant is open. There is a slight positive correlation between hours that the restaurant is open and the amount of full time employees. This data agrees with the information in Table 3 as they have a correlation coefficient of 0.205. This means that as one of these variables increases, the other will as well. This can be explained because the longer the restaurant is open, the more full time help is needed. When more restaurants begin to stay open later, they will need more help. Since one will increase when the other is increased, this demonstrates a slight but noticeable positive correlation between hours open and the amount of full time employees at fast food restaurants.

Figure 3.9: Correlation between PSODA and EMPFT



There is no correlation between the price of soda (PSODA) and the number of full time employees (EMPFT). The figure above shows that there is a straight horizontal line in the scatterplot which indicates no correlation between the two variables. The correlation coefficient of PSODA and EMPFT is r=0. A possible explanation for this is that the amount of full time employees would not increase or decrease even if the price of soda was to change.

Section 3.0: Inference Methodology

Histograms:

Histograms visually show how data is spread, making it easy to understand patterns, central tendency, and outliers. They offer a quick overview of the dataset's characteristics, helping

researchers and readers grasp the key features of the data distribution. Histograms (Figures 1-6) were used to understand the frequency distribution of the variables involved in this data set. The majority of the histograms in this investigation are either right-skewed or symmetrical, suggesting that the mean of these variables is greater than or equal to the median.

Correlations:

Correlation graphs provide a quick visual representation of relationships between variables. They reveal the strength, direction, and outliers of correlations, supporting hypothesis testing and enhancing the interpretation of correlation coefficients for a clearer research narrative. To characterize the associations between all the variables in the data set, a correlation table was formed (Table 4). Figures 3.1-3.9 display the relationships between each pair of variables involved. Majority of these graphs portray a negative correlation, indicating that when one variable increases, the other decreases.

Confidence Interval:

A confidence interval is a range of values derived from sample data to estimate the true population parameter. It shows how sure we can be that the actual parameter falls within that range. Confidence intervals help investigations such as this make predictions about populations, compare groups, and better understand the reliability of their findings.

Variable	**Confidence Interval**
EMPFT	7.765 ± 1.105
EMPPT	18.018 ± 1.545

WAGE_ST	5 ± 0.052
PCTAFF	50 ± 5.351
HRSOPEN	14 ± 0.410
PSODA	1 ± 0.014

Hypothesis Testing:

A hypothesis is a claim about a characteristic of a population. The importance of a hypothesis test is to test the characteristic of interest of a population. Hypothesis Testing is a method of statistical analysis where assumptions about the population parameter are tested. It is used to estimate the relationship between 2 statistical variables and further determine if the null hypothesis is possible. This test is important in the field of statistics because it helps statisticians determine whether their data is statistically significant. **This is why we used hypothesis testing as our inference methodology.**

H_0 : The percentage of employees paid starting wage above the minimum wage does not decrease with increase in minimum wage

H_1 : The percentage of employees paid starting wage above the minimum wage decreases with increase in minimum wage

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Section 4.0: Results

	Difference in Proportions		
	Sample 1		Sample 2
n (denominator) =	167		167
x (numerator) =	109		25
Sample proportion (x/n) =	0.653		0.150
		Difference	
Level of significance =		0.050	
Estimated prop under null =		0.401197604790419	
Sample diff in proportions (p1 - p2) =		0.503	
SE of diff in proportions =		0.054	
	Left Tail	Right Tail	Two Tail
	H1: π1 - π2 < 0	H1: π1 - π2 > 0	H1: π1 - π2 <> 0
Critical Value =	-1.645	1.645	1.960
Test Statistic =	9.377	9.377	9.377
p - value =	1.000	0.000	0.000
Decision	FTR H0	Reject H0	Reject H0

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

$$\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

- Claim: The percentage of part time employees paid starting wage above the minimum wage decreases with increase in minimum wage.

- Right tail test

- We fail to reject the null hypothesis, at the 5% level of significance, that the percentage of employees paid starting wage above minimum wage decreases with increase in minimum wage.

- We find evidence that with a higher minimum wage, fewer fast food restaurants pay employees a starting wage above minimum wage. We found this at a 5% level of significance with a p-value of 1 and a test statistic of 9.377.

Difference in Means Test			
	Sample 1		Sample 2
n =	213		213
Sample mean =	0.917		0.933
Sample std. dev. =	0.111		0.112
Squared standard error =	0.000		0.000
		Difference	
Level of significance =		0.05	
Sample diff in mean (mean 1 - mean 2) =		-0.017	
SE of diff in mean =		0.011	
Degree of Freedom =		423.980	
	Left Tail	Right Tail	Two Tail
	H1: μ1 - μ2 < 0	H1: μ1 - μ2 > 0	H1: μ1 - μ2 <> 0
Critical Value =	-1.648	1.648	1.966
Test Statistic =	-1.533	-1.533	1.533
p - value =	0.063	0.937	0.126
Decision	FTR H0	FTR H0	FTR H0

s^2/n

$\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$

$\frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}}$

- Claim: The price of fries increases with minimum wage.

- Left tail test

- We fail to reject the null hypothesis (at the 5% level of significance) that the price of fries increases with minimum wage.

- We have found evidence that there is a difference between the mean of the price of the fries before the increase of minimum wage, and the mean of the price after the increase in minimum wage. We found this with a p value of 0.063 and a test statistic of -1.533.

Difference in Means Test			
	Sample 1		Sample 2
n =	166		167
Sample mean =	7,765		8,341
Sample std. dev. =	7,288		7,175
Squared standard error =	0,320		0,308
		Difference	
Level of significance =		0,05	
Sample diff in mean (mean 1 - mean 2) =		-0,576	
SE of diff in mean =		0,793	
Degree of Freedom =		330,845	
	Left Tail	Right Tail	Two Tail
	H1: μ1 - μ2 < 0	H1: μ1 - μ2 > 0	H1: μ1 - μ2 <> 0
Critical Value =	-1,649	1,649	1,967
Test Statistic =	-0,727	-0,727	0,727
p - value =	0,234	0,766	0,468
Decision	FTR H0	FTR H0	FTR H0

s^2/n

$\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$

$\frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}}$

- Claim: The percentage of full time employees paid starting wage above the minimum wage decreases with increase in minimum wage.

- Right tail test

- We fail to reject the null hypothesis, at the 5% level of significance, that the percentage of employees paid starting wage above minimum wage decreases with increase in minimum wage.
- We find evidence that with a higher minimum wage, fewer fast food restaurants pay employees a starting wage above minimum wage. We found this at a 5% level of significance with a p-value of -0.727 and a test statistic of 0.766.

This research examines the impact of an increased minimum wage on fast-food workers and can offer policymakers valuable insights for informed decision-making. The study quantifies the effects on workers' income, assesses economic stimulation through increased consumer spending, and evaluates the reduction of poverty among low-wage earners. Policymakers can gain an understanding of potential employment impacts, social benefits, and the overall well-being of fast-food workers, informing policies that aim to address income inequality and improve job satisfaction. Additionally, insights into productivity, healthcare access, and public support can guide policymakers in designing effective and socially beneficial minimum wage policies tailored to the unique circumstances of fast-food workers.

Section 5.0: Summary and Conclusion

In this research paper, we undertake an empirical investigation into the dynamic relationship between alterations in the minimum wage and the well-being of minimum wage fast-food workers. Leveraging data derived from the 'Fast Food Wage Data NJ,' our analysis delves into

the interplay between shifts in minimum wage policies and the economic well-being of labor within the fast-food sector. Our findings demonstrate that an increase in the minimum wage not only positively impacts the earnings and work conditions of fast-food workers but also extends its benefits to the broader labor market and product market associated with the fast-food industry. This empirical evidence serves as a crucial contribution to the ongoing discourse on minimum wage policies, emphasizing the advantages that such adjustments can bring to both the workforce and the economic landscape within the realm of fast-food companies. We find that an increase in minimum wage mostly benefits the fast food labor market. In conclusion, our empirical evidence underscores the significance of minimum wage adjustments in enhancing the overall economic well-being within the fast-food industry. This research emphasizes the broader positive effects of such changes, benefiting not only fast-food workers but also contributing to the vitality of the labor and product markets associated with these establishments.

Section 6.0: References

1. Neumark, D., & Wascher, W. (2000). Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Comment. American Economic Review, 90(5), 1362–1396. https://doi.org/10.1257/aer.90.5.1362
2. Yu, Qiuping, et al. “Research: When a Higher Minimum Wage Leads to Lower Compensation.” Harvard Business Review, 10 June 2021, hbr.org/2021/06/research-when-a-higher-minimum-wage-leads-to-lower-compensation.

3. Katz, L. F., & Krueger, A. B. (1991b). The Effect of the New Minimum Wage Law in a Low-Wage Labor Market. NBER Working Papers. https://ideas.repec.org/p/nbr/nberwo/3655.html
4. Katz, Lawrence F, and Alan B Krueger. "The Effect of the Minimum Wage on the Fast Food Industry." National Bureau of Economic Research Working Paper Series, Feb. 1992, www.nber.org/papers/w3997."

Section 7.0: Appendix

Figure 3.3: Correlation between WAGE_ST and HRSOPEN

Figure 3.3 (above), depicts the correlation between wage, denoted WAGE_ST, and the hours that the fast food restaurant is open (HRSOPEN). This figure shows a weak negative correlation

between these two variables, displaying the correlation coefficient -0.101. This suggests that as the hours open tend to increase wages decrease, however due to this negative correlation this association is small.

Figure 3.4: Correlation between WAGE_ST and PSODA

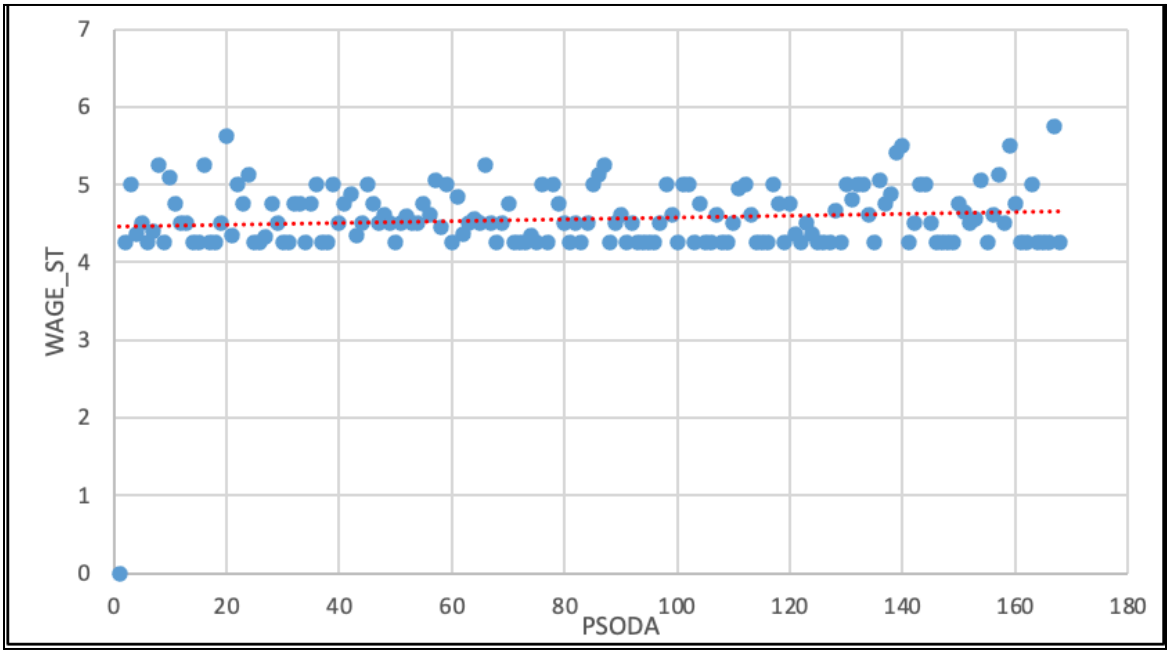

Figure 3.4 depicts the correlation between wage (WAGE_ST) and the price of soda (PSODA). The figure shows that there is a very weak correlation between these two variables, which have a correlation coefficient of 0.029. This correlation suggests that the wage that employees are paid does not affect the price of soda at the restaurants.

Figure 3.5: Correlation between PCTAFF and WAGE_ST

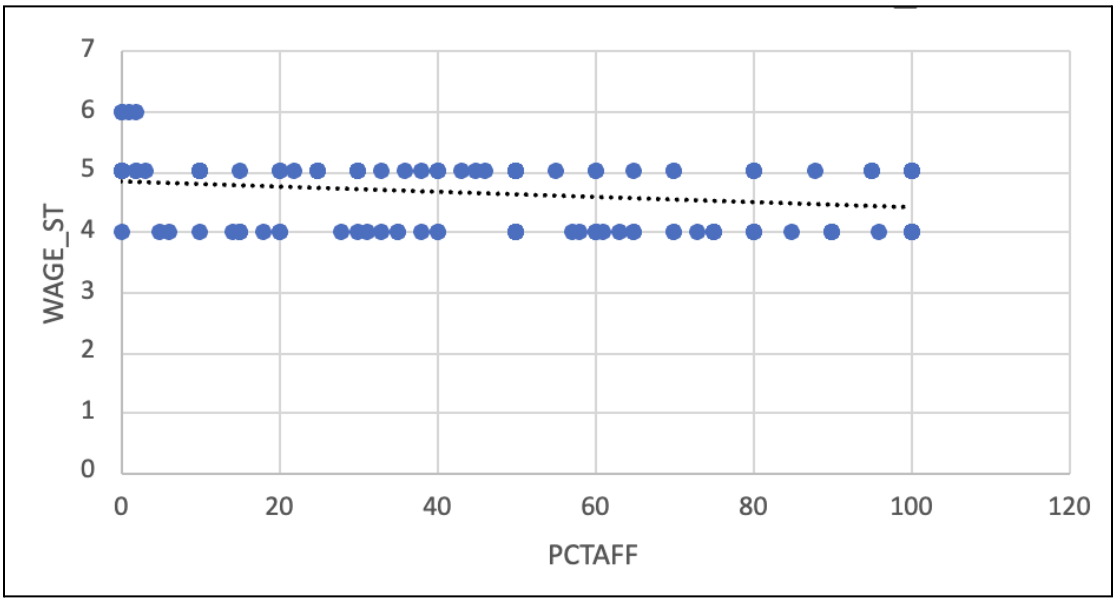

Figure 3.5 shows the correlation between the two variables, percent of employees affected by a new minimum wage (PCTAFF) and starting wage (WAGE_ST). This scatter plot shows that there is a slight negative correlation between the two variables. The correlation coefficient is r=-.29 which further demonstrates that there is a negative relationship between PCTAFF and WAGE_ST. A possible explanation for this negative correlation is that when minimum wage decreases so does the starting wage of new employees.