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The Effect of Minimum Wage Increased on Employment and Total Personal Income: County-Level Estimation from Restaurant and Retail Sector

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Abstract: This research examines the impact of minimum wage policies on employment and personal income in the United States, focusing on food preparation and service occupations and retail occupations. Using state-level and county-level data and employing econometric techniques such as difference-in-differences with continuous treatment and fixed effects, the study finds that moderate increases in the minimum wage do not significantly affect employment levels but lead to modest income effects. Moreover, minimum wage increases result in reduced usual hours worked per week, especially among individuals aged 14 to 21, with females in this age group experiencing a more pronounced effect. The findings highlight the complexity of minimum wage effects across different demographics and geographic regions and the importance of targeted policy considerations for specific demographic groups.

Keywords: Minimum Wage Effect, Difference-in-Differences, Fixed Effect, State Cluster, Demography

1. Introduction

The minimum wage has been a contentious issue for decades, with supporters claiming that it gives workers a minimal standard of living and detractors claiming that it increases unemployment. In spite of these arguments, minimum wage laws are still in place in many nations around the world. Since 2009, the federal minimum wage in the United States has been $7.25 per hour. This rate is applicable to nonexempt covered employees. Additionally, some communities and governments choose their own minimum wages. The higher wage rate is used if the minimum wages set by the federal and local governments differ [1]. The efficiency of minimum wage regulations and their effects on the labor market are still hotly contested issues in a nation with a long history of minimum wage laws.

There are two main approaches to studying the impact of minimum wage in the US. One is to use state-level data and state-fixed effect to estimate the minimum wage effect [2]. Another approach is to study local areas like the county level of minimum wage effect. Examples of such case studies include Using the QCEW dataset to study the effect of minimum wage on labor market outcomes in the restaurant and bar sector [3]. By using state-level data to draw the conclusion, the result of this study regression is not obviously significant, and because of the diverse regional economics, it makes the national level study more difficult to establish a clear relationship between minimum wage and

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outcome variables. While this approach to study can demonstrate diversity, it may also be susceptible to revealing negative effects on employment and income under certain circumstances.

The possible repercussions of such laws on employees, businesses, and the overall economy give rise to the necessity to research how minimum wage rules affect employment and total personal income. According to the proposed method based on state-level variation in U.S. minimum wages, an increase in the minimum wage does not result in a significant reduction in low-wage employment but rather results in modest wage spillovers at the bottom of the wage distribution [4]. On the other hand, a study by the Congressional Budget Office contends that increasing the minimum wage would result in job losses for other low-paid workers, and lower their family's income [5].

County-level studies usually use restaurant industry data from employers. The industry is the most intensive and largest of minimum wage workers. Studies examining the restaurant sector can be deemed as equivalent to investigations of youth employment, given the similarity in the proportion of minimum wage workers in both demographics and the considerable number of teenagers earning the minimum wage employed within this industry. Dube and Lester use separately continuous counties across state borders, continuous county pair, and discontinuities at state borders to estimate the effect of minimum wage on employment and earning in the restaurant industry [6,7].

2. Data Recourse and Sample Construction

This section focuses on why we select food preparation and service occupation and retail occupation as the primary sectors for examining the effects of minimum wages, as well as providing an overview of our dataset and sample construction methodology.

2.1. Sector Selection

Based on data from the U.S. Bureau of Labor Statistics, as presented in the Characteristics of Minimum Wage Workers (Table 1) [8], it was observed that in the year 2019, around 6% of workers who were paid on an hourly basis in service-related roles earned either the federal minimum wage or less. This percentage was the highest among the various significant occupational categories. Furthermore, nearly 70.5% of individuals earning the minimum wage or lower were employed in service occupations, with a majority of them working in positions related to food preparation and serving, accounting for over 55% of this group.

In the Quarterly Workforce Indicators (QWI) data set, we can know the number of workers under age 25 is 15,953 thousand on average between 2011 to 2019, that’s about 13.6% of the total workers. Also, based on the BLS report (Table 2) [8], Typically, minimum-wage employees are of a younger age. Although workers age between 16 to 24 represented only about 19.5% of hourly paid workers, they made up about 43.1% of those paid at or below the federal minimum wage. So, studying the effect of minimum wage increases in younger people in food preparation and service occupation and retail occupations is also necessary.

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Table 1: Low-wage service jobs in 2019: Occupations with workers earning federal minimum wage or less

Occupation	Number of workers (in thousands)				Percent distribution				Percentage of workers paid hourly rates		
	Total paid hourly rates	At or below minimum wage			Total paid hourly rates	At or below minimum wage			At or below minimum wage		
			At minimum wage	Below minimum wage		Total	At minimum wage	Below minimum wage	Total	At minimum wage	Below minimum wage
Total, 16 years and older	82,289	1,603	392	1,211	100.0	100.0	100.0	100.0	1.9	0.5	1.5
Service occupations	19,726	1,131	181	949	24.0	70.5	46.2	78.4	5.7	0.9	4.8
Healthcare support occupations	3,050	41	13	28	3.7	2.5	3.2	2.3	1.3	0.4	0.9
Protective service occupations	2,044	29	5	24	2.5	1.8	1.2	2.0	1.4	0.2	1.2
Food preparation and serving related occupations	7,350	887	100	787	8.9	55.3	25.5	65.0	12.1	1.4	10.7
Building and grounds cleaning and maintenance occupations	3,976	68	22	46	4.8	4.2	5.6	3.8	1.7	0.6	1.2
Personal care and service occupations	3,306	106	42	64	4.0	6.6	10.6	5.3	3.2	1.3	1.9

Table 2: Demographic Analysis of 2019 Minimum Wage Earners Paid by Hourly Rates

Characteristic	Number of workers (in thousands)				Percent distribution				Percentage of workers paid hourly rates		
	Total paid hourly rates	At or below minimum wage			Total paid hourly rates	At or below minimum wage			At or below minimum wage		
		Total	At minimum wage	Below minimum wage		Total	At minimum wage	Below minimum wage	Total	At minimum wage	Below minimum wage
Total, 16 years and older	82,289	1,603	392	1,211	100.0	100.0	100.0	100.0	1.9	0.5	1.5
16 to 24 years	16,021	691	229	462	19.5	43.1	58.5	38.2	4.3	1.4	2.9
16 to 19 years	4,761	272	120	152	5.8	17.0	30.6	12.5	5.7	2.5	3.2
25 years and older	66,269	912	163	749	80.5	56.9	41.5	61.8	1.4	0.2	1.1
Men, 16 years and older	40,918	536	125	411	49.7	33.4	31.8	34.0	1.3	0.3	1.0
16 to 24 years	7,978	226	84	142	9.7	14.1	21.5	11.7	2.8	1.1	1.8
16 to 19 years	2,333	113	46	67	2.8	7.0	11.6	5.6	4.8	2.0	2.9
25 years and older	32,940	310	40	270	40.0	19.3	10.3	22.3	0.9	0.1	0.8
Women, 16 years and older	41,372	1,067	268	800	50.3	66.6	68.2	66.0	2.6	0.6	1.9
16 to 24 years	8,043	465	145	320	9.8	29.0	36.9	26.5	5.8	1.8	4.0
16 to 19 years	2,428	159	75	84	3.0	9.9	19.0	7.0	6.5	3.1	3.5
25 years and older	33,329	602	123	479	40.5	37.5	31.2	39.6	1.8	0.4	1.4

2.2. Data Sources

Our research data for the estimation of my model is from the American Community Survey (ACS), David Neumark State Minimum Wage Data, and the U.S. Bureau of Labor Statistics. The sample I select 2011 to 2019 ACS data, and our four primary outcome variables (dependent variables) include Employment Status, Labor Force Status, Usual Hours Worked per Week, and Total Personal Income.

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The difference between Employment Status outcome and Labor Force Status outcome is Employment Status indicates that whether the respondent was a part of the labor force - working or seeking work - and, if so, whether the person was currently unemployed, the status categories of “Employed”, “Unemployed”, and “not in the labor force”. However, Labor Force Status is a dichotomous variable that shows that a person participates in the labor force. There are individual control variables, including Sex, Age, Race, Marital Status, Hispanic Origin, and Educational Attainment.

2.2.1. Omitted Variable Bias and the Deviation Due to the Inflation Rate

To avoid the omitted variable bias, in this question, we consider the impact of minimum wage laws on employment, it may be because the macro environment, so in the regression model, we add state control variables (state level Unemployment rate and Gross State Product) to avoid the OVB.

Additionally, a paper by Craig K. Elwell discusses inflation and the real minimum wage [9]. The minimum wage was increased to $7.25 per hour in the most recent adjustment in July 2009. It's important to note that, even though inflation has been steadily rising, there have been significant gaps between these adjustments. As a result, over time, the minimum wage's real worth or buying power has drastically decreased. Therefore, we believe that inflation is also a component that may have an influence on the regression model's accuracy. Then, we use the Consumer Price Index (All Urban Consumer) from U.S. Bureau of Labor Statistics and get the CPI average each year to calculate the inflation rate.

$$Rate\ of\ Inflation = \frac{(CPI_{x+1} - CPI_x)}{CPI_x} \tag{1}$$

Based on Equation (1), we got the inflation rate each year from 2011 to 2019 (Table 3). Then the nominal minimum wage, total personal income times the year inflation rate. In this way, we can avoid the deviation due to the inflation rate.

Table 3: CPI of all items in U.S. city average, all urban consumers, and Inflation Rate

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average CPI	Inflation Rate
2011	220.22	221.31	223.47	224.91	225.96	225.72	225.92	226.55	226.89	226.42	226.23	225.67	224.94	1.00000
2012	226.67	227.66	229.39	230.09	229.82	229.48	229.10	230.38	231.41	231.32	230.22	229.60	229.59	1.02069
2013	230.28	232.17	232.77	232.53	232.95	233.50	233.60	233.88	234.15	233.55	233.07	233.05	232.96	1.03564
2014	233.92	234.78	236.29	237.07	237.90	238.34	238.25	237.85	238.03	237.43	236.15	234.81	236.74	1.05245
2015	233.71	234.72	236.12	236.60	237.81	238.64	238.65	238.32	237.95	237.84	237.34	236.53	237.02	1.05369
2016	236.92	237.11	238.13	239.26	240.23	241.02	240.63	240.85	241.43	241.73	241.35	241.43	240.01	1.06699
2017	242.84	243.60	243.80	244.52	244.73	244.96	244.79	245.52	246.82	246.66	246.67	246.52	245.12	1.08971
2018	247.87	248.99	249.55	250.55	251.59	251.99	252.01	252.15	252.44	252.89	252.04	251.23	251.11	1.11633
2019	251.71	252.78	254.20	255.55	256.09	256.14	256.57	256.56	256.76	257.35	257.21	256.97	255.66	1.13656

2.3. Sample Construction

In these control Variables, Sex, Marital Status, Race, and Hispanic Origin, we reconstruct these variables to create new dummy variables called Male, Married, White (for white people), Black (for black people), Asian (for Asian people), and HISPAN (for Hispanic origin).

In the original dataset, there are 28,438,076 observations, but there are a lot of 000 values which means these counties are not identifiable from public-use data in the COUNTYFIP variable, so after removing all these values, and limiting the data only containing person working in food preparation and service occupation and retail occupation.

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Our analysis uses four different samples: the first sample is age 14 to 99, which is all age worker records in QWI including 498,393 observations. The second sample is age 14 to 21 young workers contain 134,387 observations, the third sample is age 14 to 99 female workers include 261,958 observations, and the last sample is age 14 to 21 young female worker cover 70,710 observations.

2.3.1. Logarithmic Transformation

When dealing with highly skewed data, such as income data, it is a common practice to apply a logarithmic transformation. In this case, the dependent variables of total personal income (INCTOT) have been transformed using the natural logarithm. This transformation is necessary because the data in INCTOT is substantial. If the data were not transformed, the coefficient of each independent variable would also be large, which would make the analysis difficult to interpret. The log transformation helps to reduce the skewness of the distribution, making the estimate more suitable for analysis.

2.4. Fixed Effect

In order to enhance the robustness of minimum wage studies, year effects can be controlled for in the data, addressing factors like the business cycle or cohort-size effects that may not be adequately captured by the variables typically included in such analyses. This is a challenge that cannot be overcome in a time-series study. By incorporating year-fixed effects, the model becomes capable of accounting for all time-invariant disparities across the years, such as variations in economic conditions, technological advancements, or policy changes that could impact the outcome variable. Consequently, the model can capture some of the unobserved heterogeneity present across different years, thereby helping to mitigate potential biases in the estimates of other coefficients within the model.

3. Empirical Strategy

The study utilized differences in difference with continuous treatment, the state minimum wage as the treatment, and controlled for state or county and year fixed effects, as well as individual and macro environment control variables. The cluster will be stated in both the state-level model and the county-level model.

3.1. Using the All-State Sample

To investigate the correlation between minimum wages and employment as well as total personal income, our initial approach involves analyzing alterations in employment status and total personal income after a minimum wage hike. This analysis encompasses a comprehensive sample of all states and incorporates fixed effects related to states, time periods, and occupations. Our utilization of state-level data for assessing the impact of minimum wage on employment draws inspiration from the 1992 study conducted by Neumark and Wascher. In their research, they employed panel data encompassing state-level minimum wage legislation and economic conditions spanning the years 1973 to 1989. The authors of this study undertake a reevaluation of existing findings concerning the influence of minimum wage adjustments on employment [2].

$$Y_{i,s,t,o} = \alpha + \beta MW_{s,t} + \gamma X'_{i,s,t,o} + \theta_{s,t} + \rho_s + \omega_t + \eta_o + \varepsilon_{i,s,t,o} \quad (2)$$

The subscripts i, s, t, and o index individual, states, period, and occupations, respectively. Where $Y_{i,s,t,o}$ denotes either employment or other outcomes in state s during the period t, $MW_{s,t}$ is the real

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minimum wage. X' is denotes the individual control variables included sex, age, race, marital status, Hispanic origin, and educational attainment. And θ is macro environment control effects, included the unemployment rate, and state GDP. ρ_s is state fixed effect, ω_t is period fixed effect that controls 2011 to 2019, and η_o is the occupation control for only including food preparation and service occupation and retail occupation.

The inclusion of state fixed effects in studies using purely cross-sectional data addresses a significant criticism concerning unmeasured economic conditions in state economies, which may lead to persistently tight labor markets and higher wages in certain states. By incorporating state-fixed effects into the regression model, the variation in the outcome variable attributed to state-level factors, such as climate, culture, or policies, can be removed. This helps to isolate the impact of other variables of interest on the outcome, such as changes in policy or economic conditions, and mitigates the risk of obtaining spurious or misleading results due to confounding factors that differ across states.

3.2. Using the County-Level Sample

To further study the effect of minimum wage increased on employment and total personal income, we use smaller sample and use county level fixed effect to replace state fixed effect to evaluate the effect of minimum wage increased. The regression model will be:

$$Y_{i,c,t,o} = \alpha + \beta MW_{s,t} + \gamma X'_{i,c,t,o} + \theta_{s,t} + \rho_c + \omega_t + \eta_o + \varepsilon_{i,c,t,o} \quad (3)$$

The subscript c index county-level data, then $Y_{i,c,t,o}$ denotes either employment or other outcomes in county c during the period t (2011-2019). And the $MW_{s,t}$ is same with Equation (2) that also is state minimum wage, because of there no county level minimum wage data, and that also happen on $\theta_{s,t}$ macro environment control variables that also is state-level data.

The inclusion of county fixed effect in this study is to control for unobserved heterogeneity across different counties or geographic regions. The purpose of including county fixed effect is same as as including state effect in Equation (2). The fixed effect captures the average effect of the unobserved factors specific to each county by allowing the intercept or constant term to vary across counties while estimating the other coefficients in the model. This way, any unobservable country-specific characteristics that are constant over time are effectively removed from the analysis. The inclusion of county fixed effects helps to control for any time-invariant county-specific factors, such as regional culture, policy differences, or natural attributes, which could influence the dependent variable (the outcome of interest) alongside the explanatory variables under study.

3.3. Female Control Sample

The issue of women dominating jobs that pay minimum wage is a complex and critical aspect of labor economics and gender inequality. According to Khan and Khatter's research conducted in 2022, women represent a significant majority, approximately 63.5 percent, of the workforce earning at or below the federal minimum wage. Moreover, they are disproportionately represented as tipped workers, often earning even less than the minimum wage due to their reliance on tips [10].

To comprehensively understand the impact of minimum wage on food preparation and service occupations and retail occupations, we recommend using a regression model that exclusively focuses on young females within these specific industries as the sample. This selected sample group is likely to be most affected by changes in the minimum wage, providing a more accurate assessment of the consequences on this vulnerable segment of the workforce.

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4. Estimation Results

4.1. State Level Model Result

Table 4 reports that the relationship between minimum wage and the dependent variable "Employed" which resents employment status. Across all four models, the coefficient of MW is negative, which implies that an increase in MW is associated with a decrease in being employed. However, it is not statistically significant in these four Models. The R-squared values for all four models are relatively low, which suggests that the independent variables in these models account for a limited portion of the overall variability observed in the dependent variable "Employed." This indicates that there might be other factors not included in the models that influence employment status. In Table 5 is the effect of the minimum wage increase on labor force status. These same results apply to explain the relationship between minimum wages and labor force status.

Table 4: State Level: The Effect of Minimum Wage Increased on Employment Status

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	Employed	Employed	Employed	Employed
lnMW	-0.0108	-0.0417	-0.0052	-0.0249
	(0.0109)	(0.0264)	(0.0136)	(0.0326)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	843,339	233,488	463,844	125,178
R2	0.03326	0.01745	0.02305	0.01808
Within R2	0.02203	0.00788	0.01577	0.0073

Table 5: State Level: The Effect of Minimum Wage Increased on Labor Force Status

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	In_labforce	In_labforce	In_labforce	In_labforce
lnMW	-0.0079	-0.0349	-0.0001	-0.0208
	(0.0107)	(0.0282)	(0.0115)	(0.0343)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	843,339	233,488	463,844	125,178
R2	0.02481	0.02304	0.01823	0.02395
Within R2	0.01421	0.0113	0.01088	0.01094

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Table 6: State Level: The Effect of Minimum Wage Increased on Usual Hours Worked per Week

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	UHRSWORK	UHRSWORK	UHRSWORK	UHRSWORK
lnMW	-0.9243*	-1.901***	-0.6653	-2.644***
	(0.4013)	(0.5281)	(0.4546)	(0.6296)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	843,339	233,488	463,844	125,178
R2	0.14894	0.15681	0.08726	0.14633
Within R2	0.08929	0.12322	0.03766	0.11371

Table 6 focuses on the relationship between minimum wage and the dependent variable UHRSWORK (Usual Hours Worked per Week). In Model (1) a statistically significant negative relationship exists between MW and UHRSWORK in all age people at 10% level. As MW increases, UHRSWORK tends to decrease. However, in Model (3), the relationship between MW and UHRSWORK is not statistically significant in all age females. The coefficient for MW is not significantly different from zero, meaning there is no clear relationship between these variables in this model. Comparing Model (1) and (3), the results proved that a statistically significant 10% level negative relationship exists between MW and UHRSWORK in all age people because of males. In Model (2), a statistically significant negative relationship exists between MW and UHRSWORK at 1% level in ages 14-21 people. And in Model (4), there is also a statistically significant negative relationship between MW and UHRSWORK at 1% level in ages 14-21 females. As the minimum wage increases, UHRSWORK tends to decrease.

Table 7: State Level: The Effect of Minimum Wage Increased on Total Personal Income

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	lninc	lninc	lninc	lninc
lnMW	0.1103**	0.1378*	0.1348**	0.1284
	(0.0332)	(0.0614)	(0.0400)	(0.0905)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	842,829	233,420	463,567	125,147
R2	0.31492	0.1695	0.2567	0.16552
Within R2	0.24839	0.13983	0.21504	0.13512

In Table 7, we are also the estimation for each model to analyze the relationship between the independent variable MW and the dependent variable total personal income. In Model (1), the relationship between minimum wage and income is statistically significant at the 5% level in all age people. That is also the same for Model (3), which only includes all age females. Moreover, in Model (2) a statistically significant relationship exists between MW and total personal income in age 14-21

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people at 10% level, but in Model (4) age 14-21 females indicate that it is not statistically significant. then that may be because males influence the relationship between MW and total personal income. Model (2) shows a statistically significant.

4.2. County Level Model Result

To analyze the relationship between minimum wage and the dependent variable "Employed" at the county level, we can focus on the coefficients associated with MW in each of the regression models in Table 8. The coefficients represent the estimated effect of MW on the probability of being employed while holding other variables constant. Overall, the coefficients of MW are generally positive across all four models in Table 8, implying that higher MW values are associated with a higher probability of employment at the state level. However, there is no statistical significance in this table. To make more robust conclusions, it's essential to conduct hypothesis testing to determine the statistical significance of the coefficients. Additionally, interpreting the results should also involve considering the context of the data and the specific model specifications. So, using labor force status as the dependent variable to replace employment status for a more robust conclusion. Table 9 shows the relationship between labor force status and minimum wage, the standard error is better than Table 8 standard error. Therefore, Table 9 is more accurate to represent the effect of minimum wage increase on Employment. And in Table 9 Model (3), the relationship between minimum wage and labor force status is statistically significant at the 10% level in all age females, which means that an increase minimum wage can improve females' participation in labor force.

Table 8: County Level: The Effect of Minimum Wage Increased on Employment Status

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	Employed	Employed	Employed	Employed
lnMW	0.0102	0.0267	0.0181	0.0280
	(0.0142)	(0.0323)	(0.0181)	(0.0414)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	498,393	134,387	261,958	70,710
R2	0.03447	0.02404	0.02501	0.0257
Within R2	0.02327	0.01181	0.01697	0.01125

Table 9: County Level: The Effect of Minimum Wage Increased on Labor Force Status

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	In_labforce	In_labforce	In_labforce	In_labforce
lnMW	0.0202	0.0427	0.0303*	0.0499
	(0.0136)	(0.0337)	(0.0162)	(0.0407)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	498,393	134,387	261,958	70,710

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Table 9: (continued).

R2	0.02836	0.03163	0.02218	0.03241
Within R2	0.01655	0.01658	0.0134	0.01622

Table 10: County Level: The Effect of Minimum Wage Increased on Usual Hours Worked per Week

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	UHRSWORK	UHRSWORK	UHRSWORK	UHRSWORK
lnMW	-2.698*** (0.6793)	-2.910** (0.8344)	-2.770** (0.9114)	-2.739** (0.9116)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	498,393	134,387	261,958	70,710
R2	0.15154	0.1545	0.08343	0.14548
Within R2	0.09447	0.12569	0.04108	0.1159

Table 10 reports the minimum wage affects on UHRSWORK (Usual Hours Worked per Week) in four different samples. Across all four Models, when subjected to distinct sample datasets, a consistent outcome emerges: an increase in the minimum wage is associated with a different extent reduction in the number of hours worked. In Model (1), a statistically significant negative relationship exists between MW and UHRSWORK in all age people at 1% level. Compared to Model (3) at 5% level statistically significant in females, male is impact the relationship more, so that lead to appear a 1% level significant in Model (1). The result of Model (2) and Model (4) is similar, which is a statistically significant negative relationship between minimum wage and UHRSWORK in age 14-21 people whether female or male at 5% level.

Table 11: County Level: The Effect of Minimum Wage Increased on Total Personal Income

	All age	Age 14-21	All age females	Age 14-21 females
Model	(1)	(2)	(3)	(4)
Dependent Var.:	lninc	lninc	lninc	lninc
lnMW	0.3478*** (0.0628)	0.2847** (0.0917)	0.3844*** (0.0727)	0.3047** (0.1060)
Fixed-Effects:				
STATEFIP	Y	Y	Y	Y
YEAR	Y	Y	Y	Y
OCC1990	Y	Y	Y	Y
S.E.: Clustered	by: STATEFIP	by: STATEFIP	by: STATEFIP	by: STATEFIP
Observations	498,117	134,344	261,815	70,690
R2	0.30961	0.17711	0.24895	0.17242
Within R2	0.25039	0.14763	0.21311	0.14092

As Table (11) indicates, the estimated total personal income from county-level panel data is significant in different people samples. In both Model (1) and Model (3), it is evident that an increase in the minimum wage will consistently lead to a significant rise in personal income for all age groups

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and specifically for females, respectively. The statistical analysis indicates a high level of significance at the 1% level, further reinforcing the relationship between minimum wage adjustments and the subsequent increase in personal income. These findings underscore the importance of minimum wage policies in positively impacting the financial well-being of individuals across various age groups and specifically highlight the significance of female workers. In Model (2), the age group of 14-21 demonstrates statistical significance at a 5% level. This finding is consistent with Model (4), which focuses on females within the same age range (14-21). One plausible explanation for this outcome could be attributed to the fact that younger individuals tend to have lower earnings during this life stage compared to older individuals who have accumulated more work experience over a period of five years or more. Consequently, the impact of minimum wage increases might not be as pronounced for younger people as it is for their older counterparts. Further investigation into the income patterns and employment dynamics of these age groups could provide deeper insights into the observed results.

5. Conclusion

This study aimed to examine the impact of minimum wage increases on employment and total personal income using data from the American Community Survey (ACS), David Neumark State Minimum Wage Data, and the U.S. Bureau of Labor Statistics. This paper utilized differences in difference with continuous treatment and control for state, county, and year fixed effects, and control occupation variable that only includes food preparation and service occupation and retail occupation, as well as individual and macro environment control variables.

At the state-level studies (Table 4 – Table 7), the results showed that moderate increases in the minimum wage had no effect on employment levels in this specific occupation. But I found a somewhat income effect of the minimum wage increase. And in the worked hour variable, those aged 14-21 people have a strong effect of increasing the minimum wage, as the minimum wage increase, the worked hour decrease, especially in those aged 14-21 females the effect is more obvious.

How should the degree of difference between local and national estimations be explained? National-level data suggests that the elasticity of labor demand is approximately -1, implying that raising the minimum wage has limited effects on the earnings of impacted workers [6]. To enhance the robustness of analyzing how the minimum wage affects personal income, I've integrated county-level fixed effects into the regression analysis. This approach aims to control for potential factors that could confound the results and considers variations specific to each county. This strategy leads to more precise and dependable regression findings, reinforcing the credibility and strength of our conclusions. The results from analyses in Tables 8 to 11 showcase the outcomes of county-level assessments on the minimum wage increase's effects. These findings suggest that moderate hikes in the minimum wage have a marginal influence on employment levels. Conversely, the research highlights a notable link between the minimum wage increase and both the hours worked and the personal income of individuals. However, when comparing different age groups, it's evident that the impact on hours worked and personal income is less significant for individuals aged 14 to 21 years. This implies that the consequences of minimum wage increases differ across various age groups.

To better understand the degree of variance between local and national estimates, this study incorporated county-level fixed effects into the regression analysis, thereby controlling for potential confounding factors and accounting for variations at the county level. This methodological approach enhances the rigor of the research and strengthens the validity and robustness of the findings. However, there are still aspects that warrant further investigation to gain a comprehensive understanding of the heterogeneity in employment effects resulting from minimum wage increases. Future research could explore additional control variables related to worker characteristics, regional economic conditions, sector-specific factors, and more labor market outcomes to improve the robustness. Moreover, to improve the accuracy of estimations, I should consider expanding the

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sample size and incorporating data from multiple sources or using different demographic and geographic data to study the effect of minimum wage. Utilizing a broader range of datasets could help capture more nuanced effects and account for potential variations across different groups.

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