

The Effect of Minimum Wage Increases on Employment of Teenagers in New England

Felicia O'Reilly^a

Abstract:

This paper examines the relationship between increasing minimum wage and the number of hours that teenagers ages 15-19 work in New England states during the years 2002-2019. In these years, all New England states have had various minimum wage rates, this paper will use feasible general least squares state-level panel data analysis to see if there is a positive or negative impact on teenage employment due to increases in minimum wage. Data was collected from the Current Population Survey, the American Community Survey, and state census data, and used with an equation derived by Zavodny (2000). State-level panel data analysis for Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island was performed and regression results showed that minimum wage has a negative impact on teen employment in New England.

JEL Classification: J21, J31, J38, J81.

Keywords: Minimum wage, Unemployment, Hours, Teenagers.

^a Bryant University, 1150 Douglas Pike, Smithfield, RI02917. Phone: (207) 756-5591.
Email: foreilly@bryant.edu.

1.0 INTRODUCTION

Minimum wage has been changing in the United States ever since it was established in 1938 with the passing of the Fair Labor Standards Act. The federal minimum wage continues to spark debate across the US as it does not adjust to the rising standards of living. The purpose of minimum wage is to protect workers against being paid too little for their labor. The minimum wage applies to those at the lower end of the wage distribution in the United States. Since it was first instituted, the federal minimum wage has been raised over 22 times. States however are able to set their own minimum wage higher than the federal minimum wage, but not lower than the federal rate. Massachusetts was the first state to enact a minimum wage back in 1912 and other states followed suit. Since minimum wages are defined nominally, “their purchasing power shrinks with inflation,” meaning that employees living off of minimum wage jobs are struggling to keep up with the current standard of living (Simonovits et. al, 2019). Those working minimum wage jobs are more likely to support increasing the minimum wage because they will be the ones reaping the benefits.

Minimum wage has contributed to closing the wage gap in various countries as being a building block for workers to learn valuable skills that they can use when they move up to higher paying jobs. Teen employment on the other hand has been declining for the past few decades as less and less teens are interested in getting a job. There are also more teens who are in school during the summer or opt for community service ventures as a way to add more to their college resumes. Teens are also interested in doing internships, many of which are unpaid which the Current Population Survey does not count as being employed. Financial aid opportunities have also increased over recent years which means having a job is not as important to teenagers to fund their college tuition because they have other options.

There has been limited research into the effect changes in minimum wage has on teen employment in the United States. Teen employment declines during the business cycle but hypothetically, raising the minimum wage should encourage more teens to work, but research has shown that it has the opposite effect. Instead of opting for more work and taking advantage of the pay increase, many teens choose to work less when minimum wage is increased. It is important to examine the full effects of minimum wage

to understand why it has the effects on minimum wage that it does. This paper was guided by three research objectives that differ from other studies: First, it focuses specifically on the 6 New England states from 2002-2019, rather than all 50 states over an extended period of time, in order to get a closer look into the effects of minimum wage. Second, it will utilize feasible general least squares regression analysis rather than fixed effects and random effects in order to account for heteroskedasticity and serial correlation amongst the data. Lastly, it will aim to understand the full effects that increasing state minimum wages has had on teen employment over the years.

The rest of the paper is organized as follows: Section 2 shows some background on the trends of minimum wage in the United States over the past decades. Section 3 gives a brief literature review. Section 4 outlines the data and empirical methodology used. Section 5 presents and discusses the empirical results. Section 6 will discuss the limitations of this study. This is followed by a conclusion in section 7.

2.0 HISTORICAL CHANGES IN MINIMUM WAGE

Figure 1 shows the changes in the federal minimum wage in the United States since 1968. The first federal minimum wage enacted under the Federal Fair Labor Standards Act was \$0.25/hour. Since then, the federal minimum wage was enacted, it has steadily increased. It peaked in 2010 at \$7.25/hour and since 2010, it has remained constant through 2021, but many states have enacted minimum wages above the set federal minimum wage. While some argue that raising minimum wage would raise the earnings of most low-income workers, the government tries to set the minimum wage at a rate that would not cause low-wage workers to become jobless due to companies not being able to afford their workers.

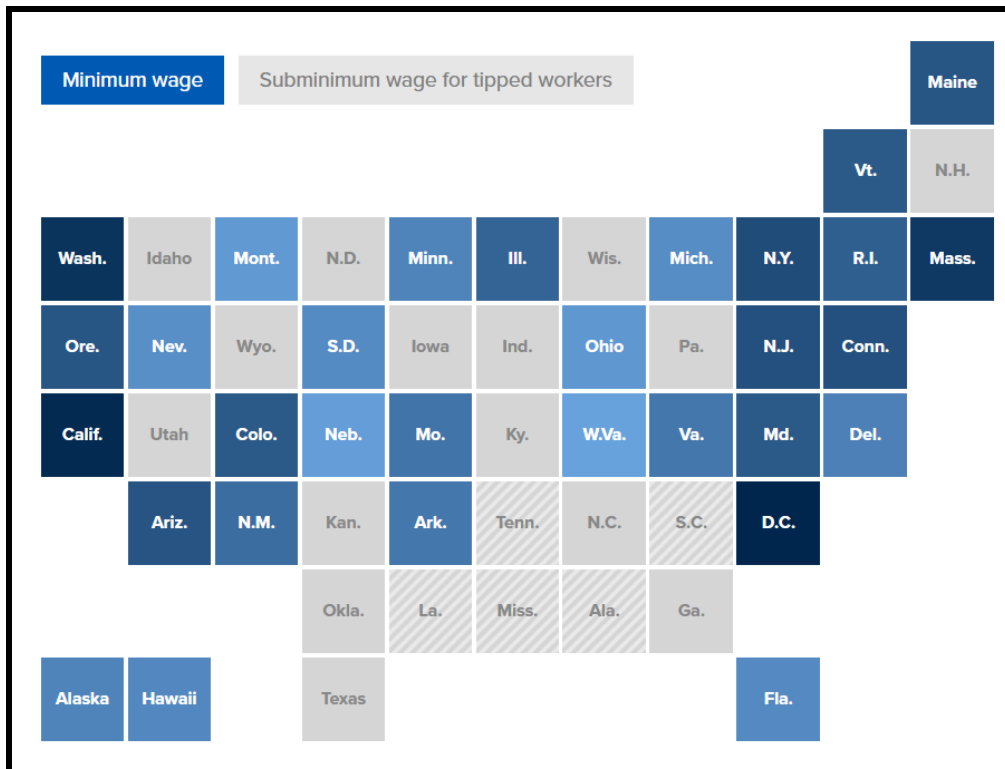
Figure 1: Federal Minimum Wage Rate under the Federal Fair Labor Standards Act



Source: St. Louis FRED (Federal Reserve Bank of St. Louis)

Figure 2 shows states with minimum wages set above the mandated federal minimum wage as of January 1, 2022. The grey states represent states which match the federally mandated minimum wage while the blue represents states that have set their minimum wages above the federal minimum wage. The darker blue states have the highest state minimum wages however the lighter blue states still have minimum wages set over \$7.25/hour. Many states have historically set their minimum wages above the federal minimum wage while others have opted to maintain the federal minimum wage. All 6 New England states except for New Hampshire have state minimum wages above the federal minimum wage rate.

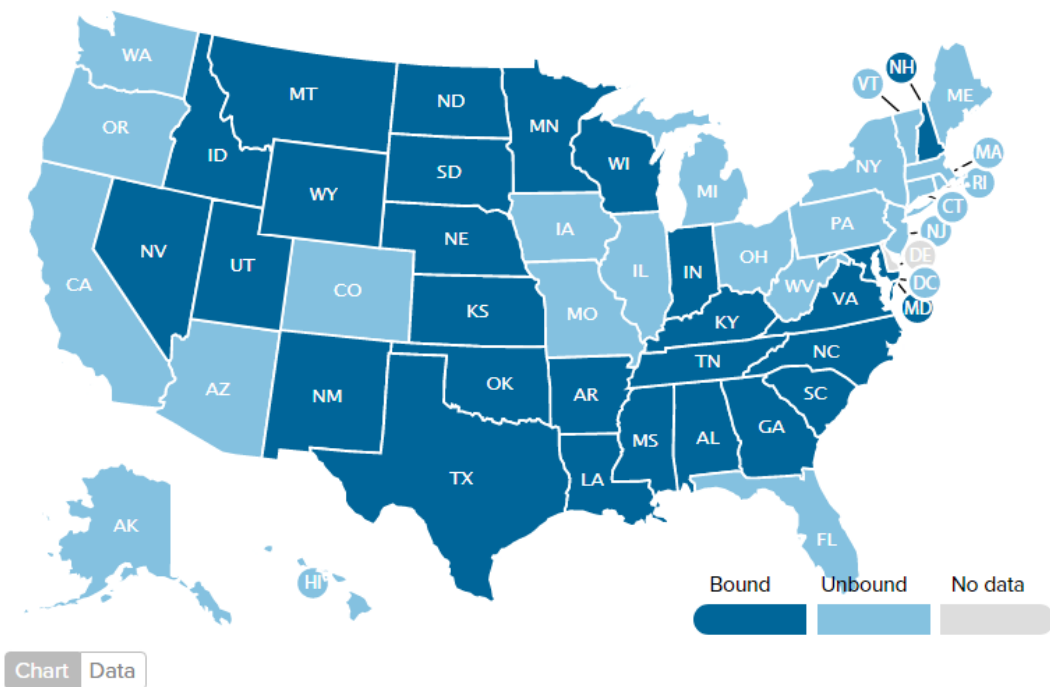
Figure 2: States with Minimum Wage above Federal Minimum Wage as of 2022



Source: Economic Policy Institute

The Economic Policy Institute defines bound states as states with minimum wages less than \$6.55 in January 2008. Unbound states have minimum wages greater than \$6.55 in January 2008. During the Great Recession that hit in late 2007, many blamed the federal minimum wage increase for workers losing their jobs, but the Economic Policy Institute argues that the recession itself is to blame for the loss of jobs, rather than because of the increase in minimum wage as Figure 3 shows.

Figure 3: Bound and Unbound States after the Federal Minimum Wage Increase in 2007



Notes: CW define bound (or unbound) states as those with minimum wages less than (or greater than or equal to) \$6.55 in January 2008. There are no observations for Delaware in my replication of the SIPP low-wage sample.

Source: Economic Policy Institute

3.0 LITERATURE REVIEW

The effects of minimum wage have been a topic of interest for economists ever since its introduction in 1938. There has been large debate for years over whether or not raising the minimum wage would help to close the wage gap by encouraging more people to work. Minimum wage jobs are traditionally held by teenagers as it is normally their first jobs and all that they are qualified for. Since minimum wage jobs are normally starter jobs, meaning it is where workers learn skills in order to move up, they are necessary jobs in the economy. Historical research has shown that typically, minimum wage increases result in a fall in employment as employers hire less so that they do not have to pay as many workers. Larger companies are more equipped to handle minimum

wage increases because they have more money available to pay wages than smaller companies. The smaller companies take a bigger hit from minimum wage increases because they cannot afford to give all of their minimum wage workers raises.

According to the Federal Fair Labor Standards Act, states are allowed to set their own minimum wages as long as the state mandated wage is equal to or greater than the federal minimum wage. Simonovits et. al (2019) researched how public opinion influences state and federal legislation in the United States. Most voters in Simonovits et. al's (2019) study prefer their state minimum wage to be higher than what it is currently set at. While direct democracy institutions may increase representation in enacted policies regarding minimum wage, individual bias still exists which can derail the process entirely. Many constituents have come to the realization that changing minimum wage is more possible at a local level than it is at a national level. As of 2018, Washington had a statewide minimum wage of \$12/hour while the federal minimum wage remained at \$7.25/hour. Seattle, Washington however, required large businesses in the city to pay their employees at least \$15/hour. As raising minimum wage is a primarily liberal agenda, local areas are able to change their minimum wage laws without pushing that agenda on other parts of the state where voters may disagree with the policy.

The previous research on how minimum wage affects teen employment has mostly focused on all 50 states over a broad number of years. In her paper, Madeline Zavodny (2000) looked at state-level and individual-level panel data to examine the effects of rising minimum wage on teen employment. The state-level analysis she conducted showed that while minimum wage increases may lower unemployment rates, it "does not adversely affect hours among either working teens or all teens" (Zavodny, 2000). When minimum wage is raised, firms must find alternative ways to save money if they do not want to fire any of their workers. Some employers choose to reduce the hours of their employees when there is an increase in minimum wage. They also rely on their employees wanting to work less because of their increase in income. Zavodny (2000) found that while minimum wage increases can have negative employment effects, it does not appear to decrease hours of work.

Giuliano (2013) focused on minimum wage effects on the teen labor supply within a large US retail firm; she found that in response to the 1996 federal minimum

wage increase, employment of teenagers increased significantly. She found that if minimum wage is not set too high, it can benefit low-wage workers by “raising both their wages and employment levels” (Guiliano, 2013). The retail sector accounts for many teenage workers in the US so Guiliano’s (2013) research is a good indicator for how minimum wage affects teen employment in the US. While her research showed that compulsory increases in the average wage did not show significant effects on boosting unemployment, teenage workers do not respond the same as the public as a whole when it comes to increases in the minimum wage (Guiliano, 2013). In her findings, Guiliano (2013) found that in markets with lower initial wages to begin with, an increase in minimum wage affected the wages of both adults and teenagers, however it mostly affected adults. In higher-wage markets, minimum wage increases mainly affected the wages of teenagers and had a positive affect on teenage employment in general (Guiliano, 2013). However, she posits that the increases in minimum wage benefit the teen employment the most when there are small increases only and that large increases could have the opposite effect (Giuliano, 2013).

Kalenkoski and Lacombe (2013) looked specifically at how minimum wage increases affect teen employment when employment is correlated across political boundaries. When minimum wage is increased in one state, that often means that employees in neighboring states will cross the state border in order to gain access to higher wages. By using a spatial econometrics approach, Kalenkoski and Lacombe (2013), found that a 10% increase in minimum wage led to about a 2% decrease in teen employment. Kalenkoski and Lacombe (2013) found that most economists researching this type of data used a relative wage rather than the real effective minimum wage. Zavodny (2000) however, argues that using the real minimum wage instead of the average adult minimum wage is imperative because the average adult minimum wage is correlated with business cycle conditions. This means that the effects of business cycle conditions on teen employment would be included when the focus should be on how minimum wage increases affect teen employment.

Cengiz et. al (2019) opted to use a difference-in-differences approach to examine the effect of minimum wages on low-wage jobs using state-level minimum wage changes from 1979 to 2016. In their research on the effects of minimum wage, Cengiz et. al

(2019) found that there has been little research on the effect of minimum wage policies on overall employment. By focusing on the effects of minimum wage on the frequency distribution of wages in the U.S., Cengiz et. al (2019) found that “an average minimum wage hike led to a significant decrease in the number of jobs below the new minimum wage in the five years after implementation.”

Labor force participation for teenagers has been on the decline for many years. There are various reasons for this, many parents do not want their teenage children working during the school year because they want them to focus on their studies. Neumark and Shupe (2019) found that the labor force participation rate of teenagers ages 16-19 fell from 52.7% in 1994, to 43.9% in 2004, and to 34.0% in 2014. Raising minimum wages can reduce employment opportunities for young workers as there are less jobs available. As more low-skilled immigrants come to the U.S., there is also more competition for minimum wage jobs which may discourage teenagers from working. Another reason for teen employment declining that Neumark and Shupe (2019) found is that there are higher returns to schooling, meaning that when minimum wage goes up, often times there is an increase in investment in schooling.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses annual data with a panel data analysis of all 6 New England states for the years 2002-2019. Data were obtained from the Current Population Survey, the American Community Survey, and state census data. Using these numbers, averages were calculated in Excel from equations provided by Zavodny (2000). Fixed effects, random effects, and OLS regression analysis were conducted, and after examining those results, feasible general least squares panel data was conducted to control for heteroskedasticity and auto correlation (AR1) or serial correlation.

Summary statistics for the data are provided in Table 1.

Table 1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Y	108	64.0185	2.6829	58.9	69
MW	108	35.4236	4.2745	27.292	47.2103
URATE	108	5.263	1.9374	2.3	11.2
POP	108	7.0167	0.4607	5.77	7.89

4.2 Empirical Model

This paper uses Zavodny's (2000) model which she used to analyze the minimum wage effects on all 50 states. This study adapts on Zavodny's (2000) original research and specifically examines the data for New England states instead of all 50 states in the years 2002-2019, which will be all years after Zavodny did her research.

The model could be written as follow:

$$\ln Y_{it} = \alpha + \beta \ln MW_{it} + \gamma URATE_{it} + \delta POP_{it} + \sigma S_i + \theta T_t + \varepsilon_{it} \quad (1)$$

Y_{it} is the dependent variable and is the employment to population ratio, average weekly hours of all teens, or average weekly hours of employed teens in state i in year t ; in this case, the teen employment to population ratio was used as a measure for teen employment. There are five independent variables used. MW_{it} is the minimum wage variable and it can be measured by the effective minimum wage deflated using the personal consumption expenditures (PCE) index or the relative minimum wage (the minimum wage divided by average adult hourly earnings). In this case, MW_{it} is measured by the relative minimum wage by state. $URATE_{it}$ is the unemployment rate per state. δPOP_{it} is the ratio of teens aged 15-19 to the total population. S_i and T_t are state and year fixed effects to control for time-invariant unobservable differences across states and business-cycle effects common to all states. Appendixes A and B provide data sources, acronyms, descriptions, and expected signs for using the variables.

5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2 and Table 3, along with the correlation matrix in Table 4. Fixed effects, random effects, and OLS regressions were all conducted in order to figure out which type of regression was best. Due to heteroskedasticity and AR1 correlation, feasible general least squares state-level panel data analysis was performed, and those results showed that consistent with past research such as Zavodny (2000) and Kalenkoski & Lacombe (2011), state minimum wage increases results in a decrease in teen employment.

In Zavodny's (2000) original research, she opted not to perform these types of regressions because of the type of data being analyzed. Though there was some 5% and 10% significance in the OLS, fixed effects, and random effects regression analyses, these regressions did not fit this type of data. Due to AR1 correlation and heteroskedasticity in the data, the probability F test showed that $\text{prob} > F$ was equal to 0. While some believe that this means the data is very significant, having the probability F test equaling 0 means that either the data is flawed, or the wrong regression analysis is being performed. Just as Zavodny (2000) used feasible general least squares analysis for her research, FGLS was the best fit regression analysis for this data. Table 2 shows the results of the fixed effects, random effects and OLS regression below.

Table 2: Multiple Regression Results for New England

	OLS	Fixed	Random
MW	-0.0831*	0.0786**	0.0279
URATE	-1.1246	-0.8202	-0.871
POP	3.2205	2.3655*	2.4551
Constant	50.2844	48.9528	50.3891

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively.

The MW variable estimate was significant at the 5% level and showed that minimum wage has a negative effect on Y, the teen employment to population ratio for New England states. This was expected due to the results of past research and is

consistent with Zavodny’s (2000) research into the effect of minimum wage on teen employment. Her research looked at all 50 states and represents a more in-depth approach to analyzing the effects of minimum wage increases on teen employment. The URATE variable estimate was expected to have a negative impact on teen employment because as unemployment goes up, clearly employment must be going down. While the URATE had a negative effect on teen employment, it did not have any level of significance in the feasible general least squares regression. The POP variable estimate showed a 5% level of significance and FGLS regression results showed that an increase in the teen to total population ratio resulted in an increase in teen employment in New England states. These results were consistent with the research of Neumark & Shupe (2019) and Zavodny (2000). Table 3 shows the results of the FGLS regression analysis below.

Table 3: FGLS Regression Results for New England

Feasible General Least Squares (FGLS)	
MW	-0.0134**
URATE	-0.7297
POP	2.2918**
Constant	52.542

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively.

Table 4 shows the correlation matrix for Y, the measure for teen employment, MW, the minimum wage estimate, URATE, the unemployment rate, and POP, the teen to total population ratio. As expected, the URATE variable has a negative correlation with Y, a relationship which is expressed in the feasible general least squares regression analysis. POP, has a positive correlation with Y, teen employment, and this positive relationship is also expressed in the results of the FGLS regression analysis. MW, however, is shown to have a slight positive correlation with teen employment, Y. This is not represented through the results of the FGLS regression analysis. This has a simple explanation, the signs are opposite in the correlation matrix and the FGLS regression analysis because the original relationship between minimum wage, MW, and teen

employment, Y, is so close to zero, that the difference in signs reflects random variation around zero. Table 4 shows the correlation matrix below.

Table 4: Correlation Matrix

Correlation Matrix				
	Y	MW	URATE	POP
Y	1			
MW	0.023	1		
URATE	-0.6423	-0.2248	1	
POP	0.3539	-0.0492	0.2532	1

6.0 LIMITATIONS

This study only looks at 6 out of the 50 states making it a relatively small sample. In order to get more in-depth results, it would be better to look at all 50 states in order to understand the full effects that raising state minimum wages has on the entire country. It would also be better to look at more years of data, since this research only examined the years 2002-2019, it does not cover the full history of effects that minimum wage has had on New England states. It would also be interesting for future research to focus on one specific state's full history to see if there are any discrepancies amongst the past research. It would also be beneficial for future research to add more variables to the equation to explore what else affects teen employment not only in New England states but in all of the states.

7.0 CONCLUSION

Overall, after conducting feasible general least squares state-level panel data analysis on all 6 New England states for the years 2002-2019, increasing state minimum wages was found to have a negative impact on teen employment in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Increasing unemployment rates was shown to have negative effects on teen employment in New England, while increasing teen to population ratio was found to have a positive effect on teen employment. Increasing minimum wage is not solely responsible for the declining teen

employment that the United States has seen over the years. As Neumark & Shupe (2019) report, though raising minimum wage can reduce employment opportunities for teenagers, the United States has also seen an increase in the number of low-skilled immigrants which has caused more competition for jobs typically held by teenagers who are also low-skilled. Teens are also seeing higher returns to schooling which has caused more parents to encourage their children to spend more time in school and less time working a part-time job.

Appendix A: Variable Description and Data Source

Acronym	Description	Data source
Y	Teen Employment: Teen to total employment ratio	Current Population Survey
MW	Relative minimum wage: measured by dividing the state minimum wage by average adult hourly earnings	American Community Survey/state census data
URATE	State Unemployment Rate (respectively)	Current Population Survey
POP	Ratio of teens aged 15-19 to the total population	American Community Survey
S	State Fixed Effects	New England States
T	Year Fixed Effects	Years 2002-2019

Appendix B: Variables and Expected Signs

Acronym	Variable Description	What it captures	Expected sign
MW	Relative minimum wage: measured by dividing the state minimum wage by average adult hourly earnings	Relative Minimum Wage by State	-
URATE	State Unemployment Rate (respectively)	Unemployment Rate by State	-
POP	Ratio of teens aged 15-19 to the total population	Teen Population Ratio	+

BIBLIOGRAPHY

- Cengiz, D., Dube, A., Lindner, A., & Zipperer, B. (2019). The effect of minimum wages on low-wage jobs. *The Quarterly Journal of Economics*, 134(3), 1405-1454.
- David, H., Manning, A., & Smith, C. L. (2016). The contribution of the minimum wage to US wage inequality over three decades: a reassessment. *American Economic Journal: Applied Economics*, 8(1), 58-99.
- Giuliano, L. (2013). Minimum wage effects on employment, substitution, and the teenage labor supply: Evidence from personnel data. *Journal of Labor Economics*, 31(1), 155-194.
- Kalenkoski, C. M., & Lacombe, D. J. (2013). Minimum wages and teen employment: A spatial panel approach. *Papers in Regional Science*, 92(2), 407-417.
- Lee, D. S. (1999). *Wage inequality in the US during the 1980s: Rising dispersion or falling minimum wage?*. Industrial Relations Section, Princeton University.
- Li, S., & Ma, X. (2015). Impact of minimum wage on gender wage gaps in urban China. *IZA Journal of Labor & Development*, 4(1), 1-22.
- Neumark, D., & Shupe, C. (2019). Declining teen employment: minimum wages, returns to schooling, and immigration. *Labour Economics*, 59, 49-68.
- Sen, A., Rybczynski, K., & Van De Waal, C. (2011). Teen employment, poverty, and the minimum wage: Evidence from Canada. *Labour Economics*, 18(1), 36-47.
- Simonovits, G., Guess, A. M., & Nagler, J. (2019). Responsiveness without representation: Evidence from minimum wage laws in US states. *American Journal of Political Science*, 63(2), 401-410.
- Zavodny, M. (2000). The effect of the minimum wage on employment and hours. *Labour Economics*, 7(6), 729-750.