



Teen Unemployment: Minimum Wage and Contributing Factors

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Abstract

This study examines the impact of state minimum wage, macroeconomic indicators, and sectoral employment shares on teen unemployment across six U.S. states from 1999 to 2019, using panel regression models with fixed and random effects and holding one state out for out-of-sample validation. The analysis isolates key drivers of youth labor outcomes while controlling time-invariant and unobserved characteristics within states, such as geography and cultural norms. The fixed effects model demonstrates stronger explanatory power ($R^2 = 0.660$) than the random effects model. The results show that GDP growth, rising household income, and increased employment in leisure and retail sectors significantly reduce teen unemployment. By contrast, minimum wage thresholds above \$8 are associated with higher teen unemployment rates. These findings suggest that targeted policies, such as youth wage exemptions or specific sector training subsidies, rather than uniform mandates, can better support teen labor force participation while minimizing adverse effects.

1. Introduction

Teen (aged 16-19) unemployment remains a persistent challenge in U.S. labor markets, particularly in states with diverse economic structures and evolving wage policies. Policymakers face a trade-off: raise wage floors to improve earnings, or risk higher unemployment among vulnerable groups.

This study began with a central question about how state minimum wage policies influence teen unemployment. Empirical literature on the matter offers mixed evidence. Early studies using cross-sectional data often found negative employment effects. In more recent studies, when state-level heterogeneity is controlled, panel-based studies find that the negative employment effects of minimum wage in the early findings are significantly diminished.

However, minimum wage alone does not fully explain variation in teen employment across states. Economic structure, household income, and sectoral employment composition also appear to play important roles. Despite this, few studies explicitly examine wage thresholds, the distribution of teens across industries such as retail, leisure, and agriculture, or validate findings on unseen states. The influence of farm-intensive economies and nonlinear wage effects remains largely underexplored.

This study addresses these gaps by applying panel regression models to teen unemployment data from six U.S. states between 1999 and 2019. The initial model included only Washington (WA) and Idaho (ID), but the results failed to generalize across other states. To enhance model robustness, this study expanded the dataset to include California (CA), Oregon (OR), Utah (UT), North Carolina (NC), and Massachusetts (MA). These states were selected to reflect geographic diversity, variation in minimum wage policies, and differences in sectoral employment, specifically in the leisure, retail, and agriculture sectors. Oregon (OR) is reserved for out-of-sample validation to test model generalizability and predictive accuracy.

This study applies both fixed and random effects regression models to evaluate the relationship between teen employment and a set of wage, macroeconomic and labor market indicators, including the state minimum wage, consumer price index (CPI), gross domestic product (GDP), household income, labor force participation rates, and sectoral employment shares. To account for nonlinearities and regional heterogeneity, the analysis incorporates a binary wage-threshold variable and a farm-state indicator. By integrating rigorous econometric techniques with policy-relevant diagnostics, the study contributes to the broader discourse on

minimum wage design and its implications for youth labor outcomes and offers insights for tailoring wage policies to the structural characteristics of state-level labor markets.

2. Literature Review

2.1 Minimum Wage and Teen Employment

The link between minimum wage policy and teen unemployment has long been debated. Brown, Gilroy, and Kohen (1982) found that a 10% increase in the minimum wage reduced teen employment by 1–3%⁴. However, Card and Krueger (1994) challenged this by comparing fast-food employment in New Jersey and Pennsylvania, finding no significant job loss after a wage increase⁵.

Critics such as Neumark and Wascher (2000) replicated the study using payroll data and found a negative elasticity of -0.21 to -0.22¹⁵. In contrast, Dube, Lester, and Reich (2010) analyzed over 500 counties and found that minimum wage increases raised earnings with little impact on employment, especially when controlling regional economic trends⁸.

More recently, the Congressional Budget Office (2021) projected that raising the federal minimum wage to \$15 could reduce employment by 1.4 million jobs⁷. However, studies cited by the Economic Policy Institute (e.g., Cengiz et al. 2019; Dube 2019) argue that wage hikes improve earnings with minimal job loss, particularly for women and racial minorities^{6,9}. A 2024 synthesis of 97 post-1992 studies found most own-wage elasticities clustered near zero, indicating a minimal impact on employment (Dube & Zipperer, 2025)¹¹.

Despite this extensive literature, several gaps remain. Few studies explicitly assess wage thresholds, which may better capture nonlinear constraints in youth labor markets. Sectoral employment composition, particularly in leisure and retail, where teens are disproportionately represented, is rarely modeled, despite its potential to mediate wage effects. Out-of-sample validation is largely absent as well, leaving uncertainty about model generalizability. The role of farm-intensive economies and structural wage dynamics is also underrepresented in research.

2.2 Macroeconomic and Sectoral Influences

Macroeconomic conditions, such as recessions and inflation, consistently influence youth unemployment. Teens are often in part-time or temporary roles, making them more vulnerable to economic shocks (Hoynes et al. 2012; O'Higgins 2001)^{13,16}. Kahn (2010) found that inflation reduces firms' ability to sustain entry-level jobs, while rising CPI may push teens into the labor force, increasing measured unemployment if job growth lags¹⁴.

Sectoral employment is a critical determinant of teen labor market outcomes. Retail and leisure industries offer accessible entry points for young workers, and expansion in these sectors tends to reduce teen unemployment (Aaronson et al. 2007)¹. In contrast, agricultural jobs are seasonal, physically demanding, and often less accessible to urban youth (USDA 2021)¹⁸. While these dynamics are frequently discussed in narrative analyses and policy reports, they are rarely incorporated as explicit variables in empirical regression models when analyzing teen unemployment, for most studies rely on broad macroeconomic controls or fixed effects. By directly modeling sectoral employment shares, this study moves beyond theoretical acknowledgment and provides a more granular understanding of how industry structure interacts with wage policy to influence teen unemployment.

2.3 Methodological Evolution

Early studies relied on cross-sectional regressions with limited controls, often producing biased estimates, while more recent work uses panel data with state and year fixed effects to account for unobserved heterogeneity. Allegretto, Dube, and Reich (2011) show that once regional shocks and growth trends are controlled for, minimum wage effects on employment become statistically insignificant². Structural models, such as Gorry (2013), simulate youth labor dynamics and suggest nonlinear effects depending on worker productivity¹².

However, most studies focus on in-sample fit and statistical inference without testing how well models generalize unseen data. Out-of-sample validation, essential for assessing predictive robustness, is rarely conducted. This limits the external relevance of findings, especially policy design.

Taken together, the literature supports the use of panel regression with state-level controls to isolate wage effects while accounting for economic context. Our study builds this foundation by modeling both continuous wage levels and threshold effects, incorporating CPI, GDP, household income, sectoral employment shares, and farm-state dynamics. This research will further validate model performance through out-of-sample prediction using Oregon as a test case. This approach balances methodological rigor with policy relevance, offering a more nuanced view of how wage policies shape teen unemployment across diverse economic landscapes.

3. Data Collection and Methodology

3.1 Data Collection

This study used state-level panel data spanning from 1999 to 2019 for Washington, Idaho, California, Massachusetts, North Carolina, and Utah.

The selected states vary widely in economic composition and wage policy orientation. California and Washington consistently maintain the highest minimum wage levels in the country, often exceeding federal standards through indexation and legislative mandates. Massachusetts also exhibits progressive wage policies, while North Carolina and Utah tend to align more closely with federal baselines. Sectoral employment structures differ markedly. California and Massachusetts have large leisure and retail sectors; Idaho and Utah show higher agricultural intensity, and North Carolina reflects a mixed industrial base. These differences enabled cross-sectional analysis of how wage policies interact with local labor market dynamics.

Data was compiled from publicly available sources, including the U.S. Bureau of Labor Statistics (BLS), Bureau of Economic Analysis (BEA), the Federal Reserve Bank of St. Louis, and state-level labor reports^{3,10,17}. Each observation represents a state-year combination, enabling analysis of both temporal and cross-sectional variation. The time frame begins in 1999 to align with the availability of teen unemployment data and excludes post-2019 observations to avoid distortions from COVID-related economic shocks.

The dataset includes the following variables:

- Teen Unemployment Rate: Percentage of individuals aged 16-19 who are unemployed over noninstitutional teen (16-19) actively seeking work
- Minimum Wage: State-level minimum wage, adjusted for inflation

- National Consumer Price Index (CPI): Measures inflationary pressure
- Gross Domestic Product (GDP): State-level economic output (in billions)
- Household Income: Median household income by state and year
- Employment Shares: Percentage of total employment in retail, leisure in total nonfarm employment
- Farm employment Shares: Percentage of farms in total employment
- Teen Population: Number of individuals aged 16–19 (in thousands)
- Labor Force Participation Rate (LFPR): Share of the civilian population aged 16+ that is employed or seeking work
- Teen LFPR: Labor force participation rate for individuals aged 16–19
- Youth Exemption: Binary indicator for states with youth wage exemptions
- Wage Thresholds: Binary indicators for state minimum wage levels above \$8
- Farm-State Indicator: Binary indicator to identify states with farm employment that exceeds 4% of total employment

To ensure consistency across states and years, this study performed several data cleaning steps. Due to incomplete reporting of teen-specific labor force participation rates in North Carolina and Massachusetts, this study used the overall LFPR for all seven states as a proxy. This study also constructed binary indicators for wage thresholds (e.g., Wages Above \$8, Wages Above \$10, Wages Above \$12) to capture nonlinear effects. Finally, a binary term (Farm_State) was created to identify levels when farm employment exceeds 4% of total employment. This transformation was used to assess whether agricultural intensity modifies the impact of sectoral employment on teen unemployment. All the variables were stripped of whitespace, indexed by state and year, and validated for multicollinearity using Variance Inflation Factors (VIFs), with all predictors falling within acceptable ranges.

3.2 Methodology

To evaluate the determinants of teen unemployment, this study employed panel regression models using data from the six states. Regression analysis was used to quantify relationships between the dependent variable and multiple predictors while controlling unobserved heterogeneity.

The dependent variable in this study was the teen unemployment rate in each state. The independent variables included macroeconomic indicators (National CPI, state-level GDP, state median household income), sectoral employment shares (Leisure, Retail), labor force participation rate (LFPR), a binary wage threshold indicator (Wages Above \$8), and a farm binary term (Farm State). These variables were selected to capture both economic conditions and structural labor market dynamics.

$$\begin{aligned} Unemployment_{it} &= \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{it} + \beta_3 Income_{it} + \beta_4 Leisure_{it} + \beta_5 Retail_{it} + \beta_6 LFPR_{it} \\ &+ \beta_7 Wage_Above_8_{it} + \beta_8 Farm_State_{it} + \mu_i + \varepsilon_{it} \end{aligned}$$

Where:

- i indexes states
- t indexes years

- μ_i captures state-specific fixed effects
- ε_{it} is the idiosyncratic error term

The panel data combined observations across states and years, offering several advantages over cross-sectional or time-series data alone. It enabled control for time-invariant state-level characteristics, improves estimation efficiency, and allows for the study of dynamic relationships over time.

Two econometric specifications were employed: Fixed Effects and Random Effects models. Fixed Effects control for unobserved, time-invariant characteristics unique to each state, such as geography, long-term policy orientation, or cultural norms, by allowing each state to have its own intercept. This is particularly useful when unobserved factors may correlate with the independent variables. Random effects assume that state-specific effects are uncorrelated with the regressors, allowing both within-state and between-state variation to inform the estimates. A Hausman test confirms that the Fixed Effects model is preferred, indicating that state-level heterogeneity is correlated with the regressors and must be accounted for.

Model performance was then validated using Oregon as a hold-out test state. This study compared predicted and actual unemployment rates to assess generalizability and robustness. Additional diagnostics included multicollinearity checks using Variance Inflation Factors (VIFs) and specification tests to confirm estimator consistency.

4. Results

Teen unemployment rates across six U.S. states rose sharply during recessionary periods (2008–2013), followed by gradual declines in the years that followed (Figure 1). Recovery severity and pace varied by state, reflecting differences in economic structure and policy. Over the same period, all six states' minimum wages increased relative to 1999 levels (Figure 2). Notably, the trajectory of teen unemployment did not consistently mirror changes in minimum wage levels. This divergence has fueled ongoing debate about whether and how minimum wage policies influence youth labor market outcomes.

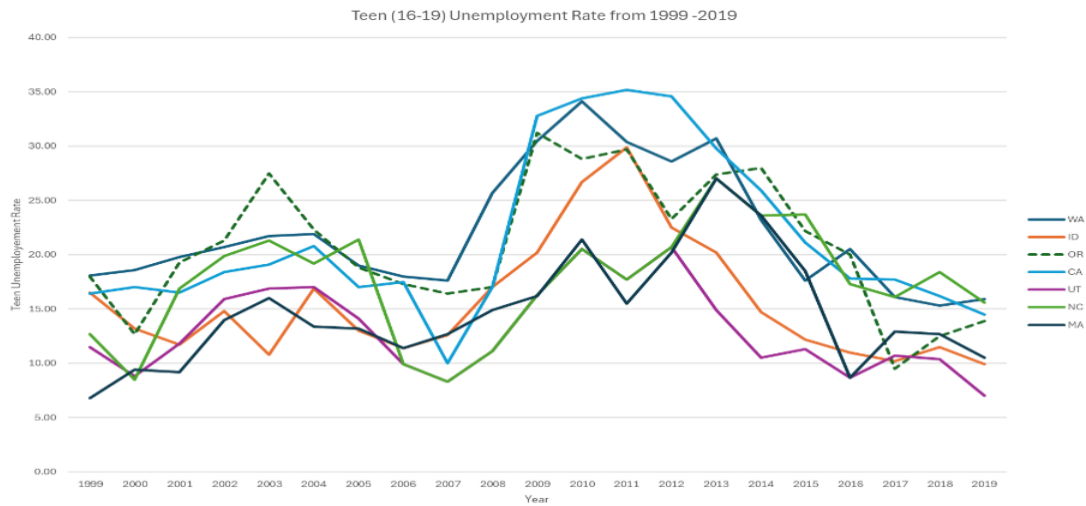


Figure 1: Teen Unemployment Rates in Seven U.S. States, 1999–2019. Oregon, the test case, is represented using a dotted line.

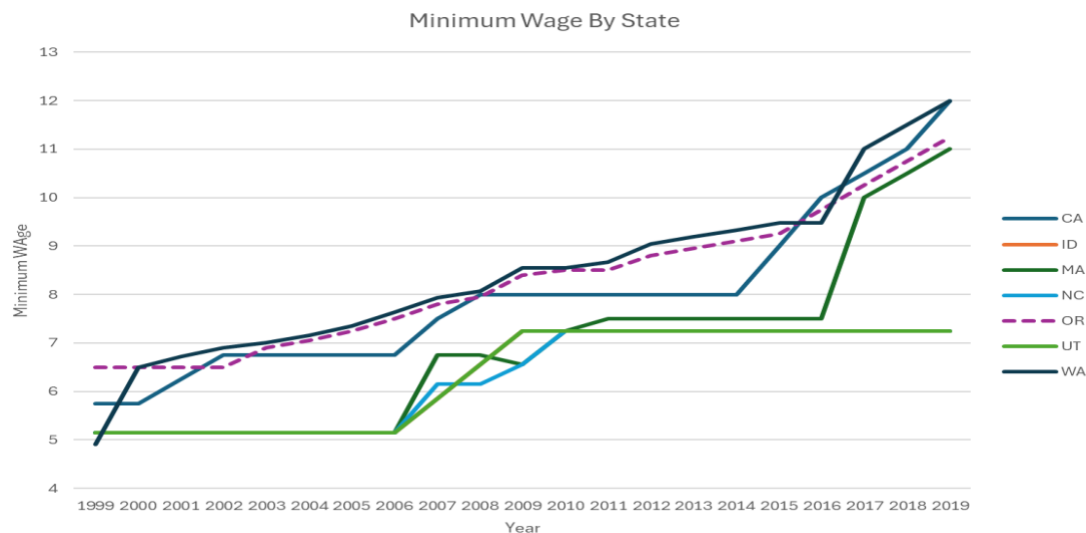


Figure 2: Minimum Hourly Wage in U.S. States, 1999–2019. Oregon, the test case, is represented using a dotted line.

Having run the panel regression model with fixed and random effects, the study outlined coefficient estimates, model diagnostics, and prediction results in the following subsections.

4.1 Fixed Effects Model

The Fixed Effects model yielded R^2 within = 0.660 (Table 1), outperforming the Random Effects model (R^2 within = 0.2574) (Table 2). By yielding a higher within-state R^2 compared to the Random Effects model, the Fixed Effects specification captured a substantially greater share of variation in teen unemployment attributable to changes within each state between 1999 and 2019.

The statistically significant F-statistic ($F = 23.97$, $p < .0000$) further confirmed that the included predictors, such as GDP, household income, labor force participation, sectoral employment shares, and wage thresholds jointly explained a meaningful portion of this variation. The Hausman test supported the use of the Fixed Effects model, indicating that unobserved, time-invariant state characteristics are correlated with the explanatory variables. This correlation violated the assumptions of the Random Effects model, rendering its estimates biased. Therefore, the Fixed Effects specification was preferred because it effectively controlled these state-specific influences, producing more consistent and policy-relevant results.

Table 1. Fixed Effects Model Results (Six-State Panel, 1999–2019)

Variable	Coefficient	Std. Error	T-statistic	P-value	95% CI (Lower)	95% CI (Upper)
const	330.410	38.070	8.680	0.000	254.970	405.860
CPI	0.043	0.038	1.140	0.257	-0.0315	0.117
GDP	-0.0141	0.004	-3.94	0.000	-0.0212	-0.0070
Household	-0.0006	0.000	-7.78	0.000	-0.0008	-0.0005
Leisure	-6.3055	1.164	-5.42	0.000	-8.6124	-3.9985
Retail	-7.3551	1.539	-4.78	0.000	-10.405	-4.3057
LFPR	-2.0957	0.420	-4.99	0.000	-2.9281	-1.2632
Farm_State	6.742	2.029	3.320	0.001	2.722	10.763
Wage	-0.3895	0.619	-0.63	0.530	-1.6159	0.837
Wage_Above_8	5.886	1.504	3.910	0.000	2.906	8.865

R^2 (Overall): 0.6603

R^2 (Within): 0.6603

F-statistic: 23.974 ($p < 0.0000$)

Entities: 6 (WA, ID, CA, MA, UT, NC)

Time Periods: 21 years

Observations: 126

Poolability Test: $F = 32.323$, $p = 0.000$ → Fixed effects preferred

Macroeconomic indicator findings were introduced first. The national Consumer Price Index (CPI) did not exhibit a statistically significant association with teen unemployment rates ($p = 0.257$). By contrast, a one-unit increase in GDP (in billions) was associated with a 0.014 percentage point decrease likely because as businesses grow, they are more likely to hire entry-level workers, including teens, especially in service and retail roles. Similarly, each additional \$1 in median household income corresponded to a 0.0006 percentage point reduction in teen unemployment ($p < .000$). Rising household income may signal broader economic stability and consumer demand, which can stimulate hiring. It may also reduce the financial pressure on teens to seek work during downturns, lowering measured unemployment.

Turning to employment sector dynamics, the results indicated that a percentage point increase in Leisure or Retail employment share reduced teen unemployment by 6.30 and 7.36 percentage points, respectively. These sectors are major entry points for teen workers due to lower skill requirements and flexible scheduling. The Farm State variable, however, was positively associated with teen unemployment ($\beta = 6.74$, $p = .001$). Farm jobs are often seasonal, physically demanding, and less accessible to urban teens, limiting employment

opportunities in farm-heavy states. Additionally, a percentage point increase in LFPR was associated with a 2.10 percentage point decrease in teen unemployment. Higher participation rates may reflect stronger labor market engagement and confidence among teens. When more teens are actively seeking work and employers are hiring, unemployment tends to fall.

Finally, the wage-related findings revealed a nonlinear relationship between minimum wage levels and teen unemployment. The continuous wage variable was statistically insignificant, implying that wage effects were not uniform across all levels. Instead, the binary wage threshold indicator (Wage Above \$8) was positive and significant ($\beta = 5.89$), indicating that minimum wages above \$8 were associated with higher teen unemployment. This pattern may reflect labor substitution, as employers hire more experienced workers or adopt automation when wage floors rise.

4.2 Random Effects Model

The Random Effects model yielded a substantially lower overall R^2 (0.396) (Table 2) compared to the Fixed Effects specification, indicating weaker explanatory power for variation in teen unemployment. The coefficient estimates were less stable across specifications, with several signs reversing, including the Farm State variable, raising concerns about estimator consistency. These inconsistencies suggest that the Random Effects assumption of uncorrelated state-level heterogeneity may not hold, undermining the reliability of its inferences. While the Random Effects model captured some between-state variation, it failed to account for unobserved factors that likely influence youth labor outcomes, making it less suitable for policy analysis in this context.

Table 2. Random Effects Model Results (Six-State Panel, 1999–2019)

Variable	Coefficient	Std. Error	T-statistic	P-value	95% CI (Lower)	95% CI (Upper)
const	168.780	42.570	3.960	0.000	84.460	253.100
CPI	-0.0174	0.031	-0.57	0.572	-0.0784	0.044
GDP	-0.0008	0.001	-0.88	0.379	-0.0026	0.001
Household	-0.00007	0.000	-1.01	0.317	-0.0002	0.000
Leisure	-2.0605	1.074	-1.92	0.057	-4.1868	0.066
Retail	-0.7138	0.479	-1.49	0.139	-1.6632	0.236
LFPR	-1.6852	0.461	-3.66	0.000	-2.5975	-0.7729
Farm_State	-1.8964	1.963	-0.97	0.336	-5.7846	1.992
Wage	-0.7936	0.706	-1.12	0.263	-2.1911	0.604
Wage_Above_8	5.797	2.172	2.670	0.009	1.496	10.099

R^2 (Overall): 0.3958

R^2 (Within): 0.2574

F-statistic: 8.4416 ($p < 0.0000$)

Entities: 6 (WA, ID, CA, MA, UT, NC)

Time Periods: 21 years

Observations: 126

4.3 Robustness Checks

To assess multicollinearity, this study calculated the Variance Inflation Factors (VIFs) for all the predictors. All VIFs fall below 8, with most under falling under 5, indicating acceptable levels of collinearity.

The alternative wage specifications, including *Wages Above \$10*, *Wages Above \$12* and *Wages Above \$8* were evaluated, and the \$8 threshold consistently yielded the strongest and most interpretable effects. This suggests that wage impacts on teen unemployment may be nonlinear, with sharper disemployment effects emerging once wages exceed a critical policy cutoff. The sectoral controls remained stable across specifications, reinforcing the robustness of leisure and retail employment as protective factors.

Additional robustness checks included lagged wage variables and interaction terms between minimum wage and youth exemption policies. These specifications did not yield statistically significant effects, suggesting that there were no significant temporal spillovers or moderating effect of exemption status in the current sample.

Several variables, such as teen population, farm employment percentage, and local CPI measures, were excluded from the final specification due to multicollinearity. Their inclusion distorted coefficient estimates and reduced model interpretability. By refining the predictor set, we improved model stability and ensured that retained variables offer clear and consistent insights into teen unemployment dynamics.

4.4 Out-of-Sample Validation and Visual Diagnostics

To assess model generalizability, Oregon was held out as a test state. The Fixed Effects model achieved lower prediction errors, with Mean Absolute Error (MAE = 3.55) and Root Mean Squared Error (RMSE = 4.44), compared to the Random Effects model (MAE = 4.80, RMSE = 5.62). These metrics suggest that the Fixed Effects model better captured the underlying dynamics of teen unemployment in an unseen state.

Figure 3 plots actual versus predicted unemployment rates in Oregon from 1999 to 2019. The Fixed Effects model closely tracked observed trends, particularly during periods of minimum wage increases and sectoral shifts. In contrast, the Random Effects model tended to underestimate volatility and smooth over local variation, failing to capture inflection points tied to policy or economic shocks.

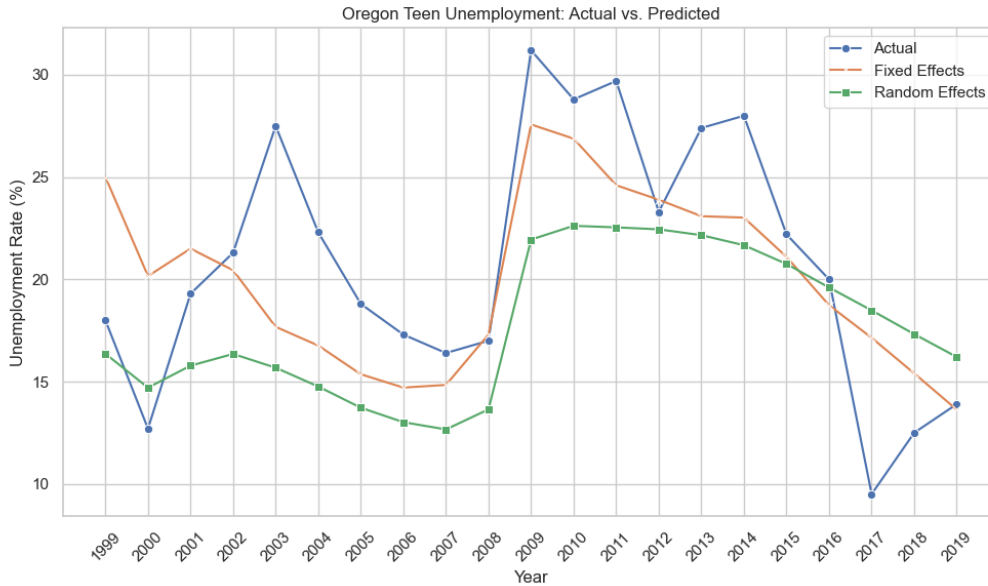


Figure 3: Actual vs. Predicted Teen Unemployment in Oregon, 1999–2019

Table 3 summarizes key model diagnostics. The Fixed Effects model outperformed across all criteria, with higher R^2 (within = 0.660), stronger log-likelihood, and a more significant F-statistic, reinforcing its superior explanatory power. These results confirmed that accounting for state-level heterogeneity is essential when modeling youth labor outcomes, and that Fixed Effects offer a more reliable framework for evaluating wage policy impacts.

Table 3. Model Comparison Metrics (Oregon: Test State)

Metric	Fixed Effects	Random Effects
R^2 (within)	0.660	0.257
R^2 (overall)	0.660	0.396
Log-likelihood	-324.44	-381.05
MAE (OR test)	3.550	4.800
RMSE (OR test)	4.440	5.620
F-statistic	23.970	8.440
p-value (F-statistic)	<.001	<.001

5. Discussion

Higher GDP, rising median household income, and greater employment shares in leisure and retail sectors significantly reduce teen unemployment. These results align with prior research indicating that economic growth and sectoral expansion create accessible entry-level opportunities for youth (Aaronson et al., 2007; Hoynes et al., 2012)^{1,13}. The strong effects of leisure and retail employment support the argument that industry structure plays a crucial role in shaping youth labor outcomes, a factor often overlooked in earlier minimum wage studies that relied mainly on aggregate macroeconomic indicators (as noted in Allegretto et al., 2011, and Dube et al., 2010)^{2,8}.

Conversely, minimum wages above \$8 are associated with higher teen unemployment. This finding is consistent with Neumark and Wascher's (2000) evidence of disemployment effects among teens at higher wage levels, but contrasts with Card and Krueger's (1994) and Dube et al.'s (2010) results showing minimal or no job losses^{5,8,15}. The insignificance of the continuous wage variable suggests that wage effects are nonlinear, concentrated at specific policy cutoffs rather than changing smoothly with each dollar increase. This supports more recent discussions in literature emphasizing the importance of nonlinear modeling and localized thresholds in understanding minimum wage impacts (Dube & Zipperer, 2025; Gorry, 2013)^{11,12}.

Unexpectedly, the CPI does not significantly affect teen unemployment, differing from Kahn's (2010) results that inflation may alter labor force participation¹⁴. This suggests that in the context of this dataset, broader state-level economic indicators such as GDP and household income are stronger drivers of teen employment outcomes than national inflationary trends.

These results have several broader implications. First, they highlight the importance of state-level heterogeneity: policies like minimum wage increases do not have uniform effects across states and sectors. Second, the strong protective effect of leisure and retail employment demonstrates the value of targeted interventions, such as sector-specific training programs or youth wage exemptions, to mitigate disemployment risks while supporting earnings growth. Third, nonlinear wage effects indicate that blanket increases in minimum wages may unintentionally reduce teen employment, particularly in farm-intensive or low-skill sectors.

There are a few limitations to this study. First, the analysis included only six U.S. states over the 1999-2019 period, so the findings may not fully generalize to all states. Expanding the dataset to include more states could improve external validity. Second, the study period ended in 2019 to avoid distortions from the COVID-19 pandemic, meaning recent wage policy changes and post-pandemic labor market dynamics that may alter the relationship between wages and youth employment were excluded, thus limiting the generalizability of the findings for today's labor market. Third, although leisure, retail, and agricultural employment shares were included, other industries employing teens (such as education or health services) were not modeled due to data availability. Their exclusion may understate the complexity of sectoral interactions with wage policy. Fourth, in two cases, teen-specific labor force participation rates were unavailable, requiring the use of overall LFPR as a proxy.

Acknowledging these limitations highlights the need for future research to test additional thresholds, incorporate broader state coverage, integrate dynamic econometric methods, and evaluate the post-2020 labor market environment. Plans are underway to incorporate more states and update the data past 2019 to reflect post-pandemic labor market dynamics.

6. Conclusion

This study investigated the relationship between minimum wage and teen unemployment across six U.S. states from 1999 to 2019, using panel regression models with fixed and random effects. By incorporating sectoral employment shares, household structure, and a binary farm-state indicator, this study isolated the key drivers of youth labor outcomes while controlling for unobserved state-level heterogeneity. The Fixed Effects model demonstrated superior explanatory power ($R^2 = 0.660$) and more consistent coefficient signs, outperforming the Random Effects model both in-sample and in out-of-sample prediction for Oregon (MAE = 3.55 vs. 4.80; RMSE = 4.44 vs. 5.62).

The findings revealed that growth of GDP, state median household income, and employment in leisure and retail sectors significantly reduce teen unemployment, while wage thresholds above \$8 are associated with higher unemployment rates. The insignificance of the continuous wage variable and the robustness of the threshold indicator suggested nonlinear wage effects that merit further exploration. The reversal of the Farm State coefficient between models highlights the importance of estimator choice and caution against pooled assumptions in policy analysis.

The robustness checks confirmed the stability of sectoral and household effects across alternative wage specifications. Multicollinearity diagnostics showed acceptable VIF levels, and out-of-sample validation reinforced the generalizability of the Fixed Effects model. Visual diagnostics further demonstrated its ability to capture state-specific dynamics and wage-induced shifts in teen unemployment.

These results offer timely insights for policymakers to evaluate wage standards and youth employment strategies. By identifying threshold effects and sectoral dynamics, the study suggests that blanket minimum wage increases may have unintended consequences in farm-intensive or leisure/retail-driven economies. The predictive strength of the Fixed Effects model highlights the need for localized policy design. Rather than one-size-fits-all wage mandates, targeted interventions such as youth wage exemptions, sector-specific training subsidies, or transitional employment programs, may better support teen labor force participation without exacerbating unemployment.

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