# The Impact of the Minimum Wage on College Enrollment & Degree Attainment

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**Abstract**
This paper estimates how a minimum wage increase impacts college enrollment and degree attainment. Minimum wage increases may drive people to leave school by providing higher earnings outside of school. Understanding the relationship between minimum wages and educational attainment will add to the discussion of how minimum wage policies impact the labor market. Using data from the American Community Survey and the U.S. Department of Labor, I exploit state and federal minimum wage variation from 2000-2019. Using a difference in differences model and an instrumental variable model, I find that a $1 minimum wage increase in a student's state decreases the likelihood that someone starts college by 0.65 to 2.1 percentage points. The likelihood of earning an associates degree decreases by 0.3 to 5.5 percentage points, and the likelihood of earning a bachelor's degree or higher decreases by 4 percentage points for each dollar minimum wage increase. There is no effect on current enrollment of 18 year old students. The decline in degree attainment indicates that minimum wages affect the educational makeup of the workforce, and therefore educational attainment is an important consideration before implementing a minimum wage increase.

**Keywords:** Minimum Wage, College Enrollment, Educational Attainment

**JEL Codes:** I23, J24, J38

## I. Introduction

Earning a bachelor's or associate's degree leads to a return of 13-15 percent, largely driven by decreasing wages for those without a college degree, and those with an associate's or bachelor's degree consistently earn more than those with only a high school degree (Abel and Deitz 2014). Given the wage premium for those with a college degree, it is important to understand how policy decisions may impact college attendance and degree completion. Raising the minimum wage may change decisions of whether to attend college by increasing potential earnings outside of school. This opportunity cost is a significant portion of the total cost of attending college, and often is higher than the tuition cost for a community college degree (Abel and Deitz 2014). If increasing opportunity cost drives students out of college, minimum wage policies will change the educational makeup of the workforce, affecting the types of jobs workers seek and their wage rates. This paper will answer the question of how the minimum wage impacts college enrollment and degree attainment, contributing to the broader discussion of how minimum wages affect the labor market.

The most recent federal minimum wage increase took effect in 2010, setting the minimum wage at $7.25 (Economic Policy Institute 2023). Several states have implemented higher minimum wages, and democrats in Congress are pushing for a higher federal minimum wage through the Raise the Wage Act (U.S. Congress 2023). My research will help provide an understanding of the potential impacts of a future minimum wage increase. I exploit state and federal minimum wage variation from 2000 to 2019. During this period, the federal minimum wage remained constant from 2000-2007 and from 2010-2019. From 2000-2006, 33 states remained constant at the federal minimum wage rate (U.S. Department of Labor 2023). From 2010-2019, 22 states remained at the federal minimum (U.S. Department of Labor 2023). I

assign each student the minimum wage for their state in the year they were 18, defining this year as the year someone decides whether to enroll in college. Immediately after high school graduation, when most students are 18, is the most common time to start college.[1] Because this year is when the highest portion of students are starting college, the minimum wage in this year is most useful for my research.

Prior research has shown that minimum wages cause a decrease in college enrollment (Wescher, Hutchinson, and Rannou 2018; Lee 2020; Schanzenbach, Turner, and Turner 2023). This effect is clear when looking at community college enrollment (Lee 2020; Schanzenbach, Turner, and Turner 2023), but there may be no effect on four year college enrollment (Schanzenbach, Turner, and Turner 2023). Wescher, Hutchinson, and Rannou (2018), however, claims that there is a decline in four year college enrollment caused by students leaving school to become employed. My paper contributes to resolving the question of whether there is a decline in four year college enrollment. The effect of minimum wages on college degree attainment is largely unexplored, with the exception of Schanzenbach, Turner, and Turner (2023). They find that there is no effect on community college degree attainment but do not consider the effect on bachelor's degree attainment. My research differs from theirs in my data and methods. I use an individual dataset and difference in differences and instrumental variable models. My study is the first in this literature to use an instrumental variable model.

I use data from the American Community Survey and minimum wage data from the U.S. Department of Labor spanning from 2000-2019. I first use a difference in differences model to estimate the effect of state level minimum wage changes during periods with a constant federal minimum wage. I then use an instrumental variable model to address potential endogeneity in

[1] 66% of high school graduates enroll in college that same year, and 85% of college students are under age 25 (National Center for Education Statistics 2023).

state minimum wage changes. This model will ensure that estimates are not biased. I find that a minimum wage increase leads to a decline in degree attainment but has no effect on enrollment of 18 year olds. The decline in degree attainment may be driven by older students dropping out because enrollment of 18 year olds remains unchanged. Reduced degree attainment indicates that minimum wages do have an effect on educational outcomes and will therefore shift the educational makeup of the workforce. This outcome is likely driven by the minimum wage's effect on the opportunity cost of attending college, and given this result it is important to consider the effect on college degree attainment before implementing a minimum wage increase. The following sections first explain how this study fits into existing literature, then explain my data and models, and finally show results and explain the findings and implications of this study.

## II. Literature Review

Research on the relationship between minimum wages and educational outcomes has focused on high school enrollment rates, high school completion and dropout rates, and college enrollment rates. Early papers on the subject focused on high school enrollment rates and found contradicting results, prompting researchers to reexamine the effects of the minimum wage on education using different data sources or empirical methods. The discussion of the impact of minimum wages on education began in the 1970s and 1980s with researchers primarily focusing on high school enrollment. Papers from this time found contradictory results, with some claiming that minimum wage increases boost school enrollment (Matilla 1978), while others found mixed results (Ehrenberg and Marcus 1982) or decreases in enrollment (Cunningham 1981).

In response to these ambiguous results, economists further explored the relationship between minimum wages and high school enrollment in the 1990s and 2000s. Overall, there is a

consensus that higher minimum wages reduce high school enrollment, however, these results may be more pronounced for certain age groups (Neumark and Wascher 1995a, b, 2003; Chaplin, Turner, and Pape 2003). Chaplin, Turner, and Pape (2003) finds that results are only significant when looking at students transitioning from 9th to 10th grade, while Neumark and Wascher (1995a, b) find that minimum wage increases have a negative impact on school enrollment among 16-19 year olds. Higher minimum wages increase the probability that teenagers leave school to become employed, reaffirming the negative impact of minimum wages on school enrollment (Neumark and Wascher 1995b).

Another portion of the literature explores high school dropout and completion rates. These papers either find no effect (Warren and Hamrock 2010) or significant effects only for certain demographic groups (Crofton, Anderson, and Rawe 2009; Smith 2021). Warren and Hamrock (2010) find that state and federal minimum wage changes did not affect high school completion rates for the graduating classes of 1982-2005. Increasing the minimum wage reduces the likelihood that low socioeconomic status teens, defined as teens who have at least one parent who did not graduate high school, will drop out of school but has no effect on dropout likelihood for other students (Smith 2021). Using a case study comparing counties in Maryland, Crofton, Anderson, and Rawe (2009) finds that higher real minimum wages increase dropout rates for Hispanic students but do not affect dropout rates for other groups (Crofton, Anderson, and Rawe 2009). Based on these papers, there is not a clear consensus as to how minimum wage changes affect dropout rates, and it is likely that the effects of minimum wage increases on dropout rates differ based on a person's background. The same disparity in results across population groups may apply when considering college degree completion rather than high school completion.

Prior research has also found that minimum wage increases cause lower levels of overall college enrollment (Wescher, Hutchinson, and Rannou 2018) and community college enrollment (Lee 2020; Schanzenbach, Turner, and Turner 2023). Comparing schools in similar geographic areas with different minimum wage rates, Lee (2020) finds a reduction in enrollment at community colleges in areas with higher minimum wage rates. Wescher, Hutchinson, and Rannou (2018) finds that higher minimum wages decrease college enrollment. Schanzenbach, Turner, and Turner (2023) claims that there is no effect on four year college enrollment but there is a decline in community college enrollment. My research helps to resolve the question of the effect on overall college enrollment rather than looking specifically at community college enrollment. Schanzenbach, Turner, and Turner (2023) also finds that there is no effect on associate's degree attainment. This paper is the only one to consider the effect on college degree attainment, and my research adds to this literature. I revisit the effect of minimum wages on associate's degree attainment and consider bachelor's degree attainment.

Prior research either uses school level enrollment data or individual level school attendance data. Those looking at school level data explore the effects of minimum wage changes on enrollment rates rather than looking at an individual's response to a minimum wage change (Chaplin, Turner, and Pape 2003; Warren and Hamrock 2010; Lee 2020; Schanzenbach, Turner, and Turner 2023). Using individual level data allows researchers to examine outcomes for any given student, and these papers can more effectively account for variables that may affect a specific student's educational decisions. These studies include controls for demographic factors, including sex, race, and ethnicity, and relevant economic characteristics, including the state's unemployment rate, average wages, or average college tuition prices (Neumark and Wascher 1995b; Wescher, Hutchinson, and Rannou 2018; Smith 2021). I use similar methods to

the papers using individual level data, including controls for demographic characteristics and state average economic characteristics and state and year fixed effects.

Wescher, Hutchinson, and Rannou (2018) is the only previous paper that uses individual data to estimate the effect of minimum wage increases on college enrollment. My study is different from theirs in the empirical approach that I use. The most common methods are difference in differences models (Lee 2020; Smith 2021; Schanzenbach, Turner, and Turner 2023) and multinomial probit or logit models (Ehrenberg and Marcus 1982; Neumark and Wascher 1995b; Wescher, Hutchinson, and Rannou 2018). Using a multinomial probit or logit model is more effective in the studies looking at school and work transitions. I use a difference in differences model and an instrumental variable model. This paper is the first to use an instrumental variable to estimate the effect of a minimum wage increase on educational outcomes.

## III. Data & Variables

### *Individual Data - American Community Survey*

My primary dataset comes from the American Community Survey, using samples from 2000 to 2019. This dataset provides information on a person's educational status and demographic background. I use this data for dependent variables and control variables. The dataset is restricted to individuals who are at least 18 and turned 18 in 2000 or later. This age restriction ensures that those included are old enough to be in college and would have made the decision to attend college since 2000. I implement further age restrictions when looking at degree attainment to ensure that the included population is old enough to have achieved a given

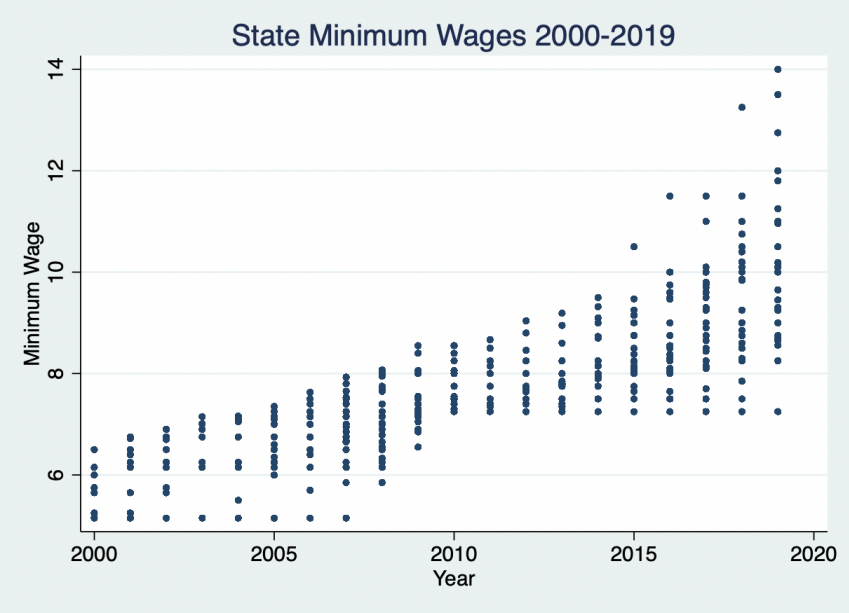
degree. For associate's degree attainment I include ages 20 and older. For bachelor's degree attainment I include ages 22 and older.

***Minimum Wage Data - U.S. Department of Labor***

I use data from the U.S. Department of Labor on minimum wages by state and year from 2000-2019, reported as of January 1st of each year. Figure 1 shows state minimum wage variation from 2000-2019. The lowest point for each year is the federal minimum wage for that year. I apply the minimum wage in a person's state at the beginning of the year they turned 18 to each person in the ACS dataset, defining the year someone turns 18 as the year they decide whether to go to college. I chose this year because immediately after high school is the most common time to enroll in college (National Center for Education Statistics 2023). Although some people may choose to attend college at a later date, the year someone is 18 is the most likely time to start college, and therefore this choice makes the most sense for my paper.

**Figure 1**

*State Minimum Wage Variation 2000-2019*




**Notes**: This graph shows each state's minimum wage level for each year from 2000-2019. Minimum wages are measured in contemporary dollars for any given year. The minimum point for each year is equal to the federal minimum wage for that year.

As seen in Figure 1, there are two periods with no federal minimum wage variation, 2000-2007 and 2010-2019. Federal minimum wage increases took effect in 2008, 2009, and 2010. I will first look at the effect of state increases during the two periods with no federal change then look at the effect of federal increases.

***State Minimum Wage Variation***

I use two samples to estimate the effect of state minimum wage increases. The first sample is from 2000-2006. During this period, the federal minimum wage remained constant at $5.15 per hour. This sample uses ACS data from 2000-2006, including only people who are over 18 and turned 18 since 2000. 33 states remained at the federal rate throughout this sample. The second sample uses data from 2010-2019, including only people over 18 who turned 18 since 2010. For this period, the federal minimum wage remained constant at $7.25 per hour. 22 states remained at the federal minimum wage during this time period. For both samples, I exclude states that are beyond the federal minimum wage rate the first year, ensuring that all states in the sample start with the same minimum wage. Table 1 shows summary statistics of minimum wage variables for each time period. Figure 2 shows which states are in each sample.

**Table 1**

*Minimum Wage Summary Statistics*

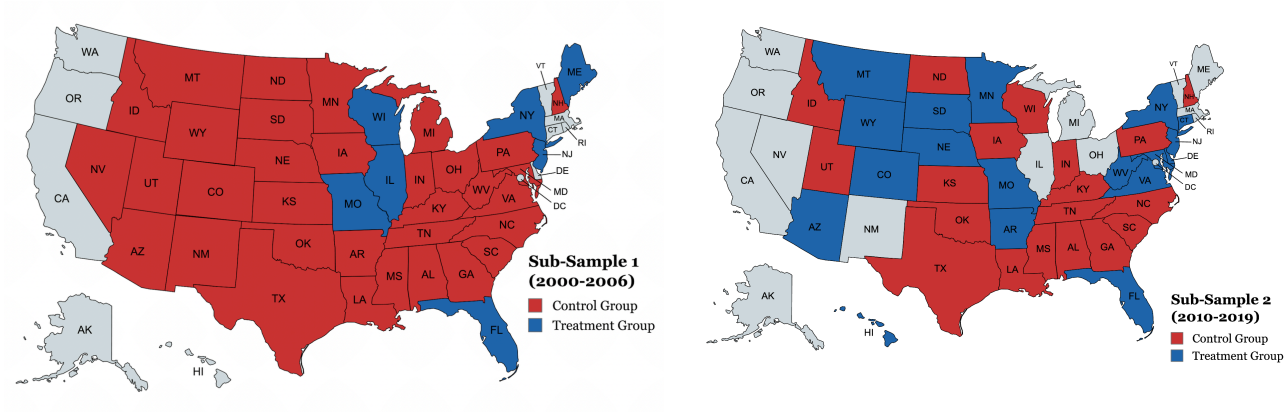
| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **2000-2006** | | | | | |
| Minimum Wage | 330,152 | 5.2 | .238 | 5.15 | 6.75 |
| Increase | 330,152 | .045 | .206 | 0 | 1 |
| Increase Size | 330,152 | .05 | .238 | 0 | 1.6 |
| **2010-2019** | | | | | |
| Minimum Wage | 931,619 | 7.468 | .593 | 7.25 | 12 |
| Increase | 931,619 | .337 | .473 | 0 | 1 |
| Increase Size | 931,619 | .218 | .593 | 0 | 4.75 |

**Notes:** The increase variable indicates whether a person experienced an increase from the previous year. The increase size variable indicates the total increase someone has experienced compared to their state's minimum wage at the beginning of the sample.

**Figure 2**

*State Make-up of Each Sample*

**2000-2006** **2010-2019**

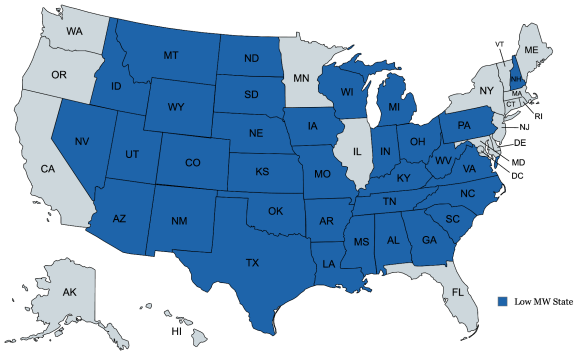



***Federal Minimum Wage Variation***

I use data from 2000-2019 to identify the effect of federal minimum wage increases that occurred in 2008, 2009, and 2010. Several states implemented a minimum wage increase in 2007, right before the federal increase, but were at the federal rate for all other years. For this reason, I exclude 2007, 2008, and 2009 from the sample, creating two distinct periods before and after the federal increases took effect. Here, I identify states that start with a low minimum wage before the federal increase then estimate the effect of the federal increase for these states compared to states that start with a high wage. These states had a minimum wage of $5.70 per hour or lower in 2006. Figure 3 shows which states are considered low minimum wage states.

**Figure 3**

*Low Minimum Wage States*




***Dependent Variable***

I first use a combined measure of enrollment and attainment to capture whether a student starts college, regardless of whether they complete their degree. I use three variables to construct this dependent variable: whether a person is currently in school, what grade they are attending, and their highest grade level attained. This variable equals one for people who are currently in college or graduate school and people who are not in school but have completed at least one year of college. I then use separate dependent variables to consider enrollment and attainment effects. I use indicators for whether someone is currently in college, whether someone has an associate's degree, and whether someone has a bachelor's degree or higher. Table 2 shows summary statistics of these variables sorted by treated and control states for each time period of state minimum wage variation. For both time periods, students in states with a minimum wage increase have higher average enrollment and degree attainment, however, this discrepancy is likely caused by other characteristics in these states that lead to higher educational attainment.

**Table 2**

*Summary Statistics: Treated vs Control States*

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **2000-2006** | | | | | |
| ***Treated States*** | | | | | |
| Started college | 91,031 | .53 | .499 | 0 | 1 |
| Currently enrolled | 91,031 | .413 | .492 | 0 | 1 |
| Associate's degree | 91,031 | .055 | .229 | 0 | 1 |
| Bachelor's degree or higher | 91,031 | .071 | .257 | 0 | 1 |
| ***Control States*** | | | | | |
| Started college | 239,121 | .461 | .498 | 0 | 1 |
| Currently enrolled | 239,121 | .363 | .481 | 0 | 1 |
| Associate's degree | 239,121 | .037 | .188 | 0 | 1 |
| Bachelor's degree or higher | 239,121 | .048 | .214 | 0 | 1 |
| **2010-2019** | | | | | |
| ***Treated States*** | | | | | |
| Started college | 367,712 | .595 | .491 | 0 | 1 |
| Currently enrolled | 367,712 | .431 | .495 | 0 | 1 |
| Associate's degree | 367,712 | .059 | .236 | 0 | 1 |
| Bachelor's degree or higher | 367,712 | .104 | .305 | 0 | 1 |
| ***Control States*** | | | | | |
| Started college | 563,907 | .543 | .498 | 0 | 1 |
| Currently enrolled | 563,907 | .396 | .489 | 0 | 1 |
| Associate's degree | 563,907 | .045 | .208 | 0 | 1 |
| Bachelor's degree or higher | 563,907 | .078 | .268 | 0 | 1 |

**Notes:** Treated states are those with a minimum wage increase. Control states are those without an increase. Started college indicates whether someone starts college regardless of whether they earn a degree or are currently enrolled.

### *Control Variables*

Control variables include individual demographic characteristics and state characteristics. Individual characteristics include sex, race, and ethnicity. Race is split into White, Black, Native American, Chinese, Japanese, other Asian, other race, two major races, and three or more major races. I include dummy variables for each category. Ethnicity is split into Hispanic or non-Hispanic. State characteristics include state unemployment rates (all samples) and average in-state tuition prices (2010-2019 only). I use data on state unemployment rates from the Bureau

of Labor Statistics and assign each person the unemployment rate for their state as of January of the year they turned 18. I use data on state tuition prices from the National Center for Education Statistics. This data is only available starting in 2010, so state tuition prices will only be used as a control variable for the 2010-2019 group. Note that including this variable does not have a noteworthy effect on the results. I also include state and year fixed effects in each model. Table 3 shows summary statistics of all relevant variables for the entire sample.

**Table 3**

*Summary Statistics: Entire Sample*

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Started college | 4,618,892 | .575 | .494 | 0 | 1 |
| In college | 4,618,892 | .274 | .446 | 0 | 1 |
| Associate's degree | 4,618,892 | .071 | .257 | 0 | 1 |
| Bachelor's degree or higher | 4,618,892 | .18 | .384 | 0 | 1 |
| Female | 4,618,892 | .491 | .5 | 0 | 1 |
| White | 4,618,892 | .755 | .43 | 0 | 1 |
| Black | 4,618,892 | .129 | .335 | 0 | 1 |
| Hispanic | 4,618,892 | .146 | .353 | 0 | 1 |
| Age | 4,618,892 | 24.107 | 4.802 | 18 | 37 |
| State unemployment rate | 4,618,892 | 6.016 | 2.079 | 2.1 | 13.7 |
| State average four year tuition | 1,435,250 | 16,148.66 | 2,870.747 | 8,627.514 | 24,478.2 |

**Notes:** This table includes observations from 2000-2019 for people who live in the state they were born in. State average tuition is measured in 2010 dollars.

***Excluding people who have moved***

To ensure that I apply the minimum wage for the correct state to each person, I exclude people who do not live in the state they were born in. If a person indicates that they currently live in the same state they were born in, I assume that they have always lived in that state, and the minimum wage for that state was applicable to their decision whether to attend college. 61% of the sample has always lived in the same state. Table 4 shows that those who have moved states

on average are more likely to attend college and have a bachelor's degree but less likely to have an associate's degree. It is possible that the higher average enrollment and bachelor's degree attainment among people who have moved is due to people moving states to attend college. It is unlikely that someone would earn an associate's degree in a different state, so that may account for the lower number of people who move earning associate's degrees. According to this table, there are noteworthy differences in the educational makeup of the entire sample and the sample I use. These differences should not influence how someone responds to a minimum wage change, but it is important to note that people in the sample I use are less likely to have a bachelor's degree or be currently enrolled in college but are more likely to have an associate's degree than the general population.

**Table 4**

*Effect of Moving States on College Enrollment & Attainment*

| Dependent Variable | (1) Started College | (2) In College | (3) Associate's Degree | (4) Bachelor's Degree or Higher |
|---|---|---|---|---|
| Moved | 0.0611*** | 0.102*** | -0.0169*** | 0.103*** |
| | (0.000365) | (0.00123) | (0.000224) | (0.000424) |
| Observations | 7,553,779 | 721,409 | 6,157,289 | 4,960,664 |
| R-squared | 0.004 | 0.009 | 0.001 | 0.012 |

**Notes:** The moved variable equals one if someone reports that the state they live in at the time of responding to the survey is different from the state they were born in. Column 2 only includes 18 year olds. Column 3 includes ages 20 and up. Column 4 includes ages 22 and up.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

## IV. Empirical Strategy

### *Difference in Differences*

I first use a continuous variable difference-in-differences model:

**Model 1:** $y_{ist} = \beta_0 + \beta_1 increase\ size_{st} + \beta_2 X_i + \beta_3 Z_{st} + \alpha_s + \delta_t + \epsilon_{ist}$

Using this model, $\beta_1$ captures the effect of a $1 minimum wage increase in state *s* at time *t* on the likelihood that a person enrolls in college or earns a degree. The *increase size* variable is relative to a state's minimum wage in the first year of a given sample and is based on the minimum wage in a student's state in the year they are 18. This variable is calculated as the difference between a state's minimum wage in the year a student was 18 and that state's minimum wage in the first year of the sample. $X_i$ indicates individual controls, including dummy variables for sex, race, and ethnicity. $Z_{st}$ indicates state characteristics, including the unemployment rate and the average 4 year in state tuition price in a given state in the year a person was 18. Average 4 year in state tuition prices will only be included for the sample from 2010-2019. $\alpha_s$ and $\delta_t$ indicate state and year fixed effects. I also include a state specific time trend.

***Instrumental Variable***

I then use an instrumental variable model to address potential endogeneity in the first model. A state's minimum wage could be correlated with other characteristics that are not included in the model. Using an instrumental variable will ensure that unobserved factors are not causing biased results. I use an interaction between whether a state has a low minimum wage before the federal minimum wage increase and whether a state is post-2010 as a predictor of a state's minimum wage. A pre-increase low minimum wage is defined as a minimum wage of $5.70 or lower in 2006. This variable is not correlated with college enrollment outside of its effect on the minimum wage, and it is a strong predictor of the minimum wage in a given state. I use the predicted minimum wage as an independent variable to estimate the effect of the minimum wage on college enrollment and degree attainment.

**Model 2:**

**First Stage:**

$$mw_{st} = \alpha + \delta(low\ min\ wage\ *\ post)_{st} + \beta_2 X_i + \beta_3 Z_{st} + \gamma_s + \eta_t + \mu$$

**Second Stage:**

$$y_{ist} = \beta_0 + \beta_1 \widehat{mw}_{st} + \beta_2 X_i + \beta_3 Z_{st} + \gamma_s + \eta_t + \epsilon_{ist}$$

This model assumes that the $low\ min\ wage\ *\ post$ variable is not correlated with the second stage error term and is correlated with a state's minimum wage. This variable only affects college enrollment through its effect on the minimum wage. In both models, $\gamma_s$ and $\eta_t$ indicate state and year fixed effects. $X_i$ and $Z_{st}$ indicate the same controls as used in Model 1. I also include a state specific time trend.

## V. Results

### *Effects of State Increases*

Table 5 shows results from my difference in differences model. This table includes results for a combined measure of enrollment and attainment then separate measures of enrollment and attainment. Column one indicates an overall negative effect on educational outcomes after a minimum wage increase for both time periods. Regardless of whether they complete a degree, people affected by an increase are less likely to start college after a minimum wage increase. For 2010-2019, I find that a $1 minimum wage increase leads to a 0.65 percentage point decrease in the likelihood that someone starts college. The magnitude of the effect is unexpectedly large for the earlier sample, potentially driven by a small sample size or a lower starting minimum wage. Starting with a lower minimum wage may explain why the effect of an increase is stronger, however, the coefficient for 2000-2006 is still larger than expected and may not be the best estimate due to the small sample size and short time period.

**Table 5**

*Difference in Differences Results*

| Dependent Variable | (1) Started College | (2) Currently Enrolled | (3) Associate's Degree | (4) Bachelor's Degree or higher |
|---|---|---|---|---|
| ***2000-2006*** | | | | |
| Min. Wage Increase Size | -0.179*** | 0.00550 | -0.0550*** | -0.185** |
| | (0.00399) | (0.00587) | (0.0137) | (0.0810) |
| Observations | 330,152 | 77,232 | 188,293 | 85,921 |
| R-squared | 0.059 | 0.043 | 0.014 | 0.062 |
| ***2010-2019*** | | | | |
| Min. Wage Increase Size | -0.00653*** | -0.000358 | -0.00327** | 0.00505 |
| | (0.00114) | (0.00179) | (0.00130) | (0.00445) |
| Observations | 931,619 | 204,527 | 557,490 | 309,490 |
| R-squared | 0.053 | 0.043 | 0.014 | 0.080 |

**Notes:** Column 1 shows whether someone has ever enrolled in college, regardless of whether they are currently enrolled. Column 2 shows current enrollment among 18 year olds. Column 3 includes ages 20 and up. Column 4 includes ages 22 and up. All columns include only people who live in the state they were born in and states included in the sample as described above. All columns include state and year fixed effects and controls mentioned in section IV.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In columns 2, 3, and 4, I separate the effect on current enrollment and degree attainment. I find that a minimum wage increase does not affect current enrollment among 18 year olds. The negative coefficients in column 1 indicate that there likely would be a decrease in current enrollment, so a decline in enrollment may occur in later years. This enrollment measure does not consider what type of school a student is enrolled in, so there could be a statistically significant negative effect for students at certain types of schools. My data does not provide detailed enough information to understand whether this is the case.

Results for degree attainment show a decline for associate's degrees but unclear results for bachelor's degrees. For 2000-2006, I find that students are 5.5 percentage points less likely to earn an associate's degree after a $1 minimum wage increase. For 2010-2019, they are 0.33 percentage points less likely to earn an associate's degree. The typical minimum wage increase

in a given year is between $0.40 and $0.60 for states that have an increase. Thus, the actual decline in associate's degree attainment at a given time would typically be half the size indicated by these coefficients. This decline in degree attainment is still meaningful, and many states implement minimum wage increases every year, so they will experience a consistent small decline in the number of people earning associate's degrees.

The results for bachelor's degree attainment are strikingly different for the two time periods. However, the results for the first sample may be less meaningful given the number of years and the age group included. Because I use the minimum wage when someone is 18, I only include people who are 18 within the time period of the sample. I also only include people who are old enough to have a bachelor's degree, ages 22 and up. These restrictions decrease the sample size and only leave years 2004-2006 in the sample. This small time period may be skewing the results and may cause estimates that would not occur over a broader time period. Because the 2010-2019 sample covers more years, it may provide more accurate estimates when the sample is limited to ages 22 and up.

***Effects of Federal Increases***

Here, I use the *low min wage*post* variable as an instrument for a state's minimum wage. To obtain a predicted minimum wage, I use the first stage regression from Model 2. Appendix Table 1 shows the first stage regression results. All first stage regressions had a statistically significant coefficient, indicating that the instrumental variable is a good predictor of the minimum wage. Each coefficient also yields a high F-statistic, shown in Appendix Table 1, further indicating that the *low min wage * post* variable is a strong instrument. Table 6 shows the second stage results.

**Table 6**

*Instrumental Variable Enrollment and Attainment Results*

| Dependent Variable | (1) Started College | (2) Currently Enrolled | (3) Associate's Degree | (4) Bachelor's Degree or higher |
|---|---|---|---|---|
| Minimum Wage | -0.0226*** | -0.00513 | -0.0177*** | -0.0439*** |
| | (0.000438) | (0.00985) | (0.000372) | (0.000825) |
| Observations | 3,301,931 | 409,422 | 2,552,000 | 2,041,419 |
| R-squared | 0.057 | 0.061 | 0.011 | 0.075 |

**Notes:** Column 1 shows whether someone has ever enrolled in college, regardless of whether they are currently enrolled. Column 2 shows current enrollment among 18 year olds. Column 3 includes ages 20-37. Column 4 includes ages 22-37. All columns include only people who live in the state they were born in and states included in the sample as described above. All columns include state and year fixed effects and controls specified in section IV.

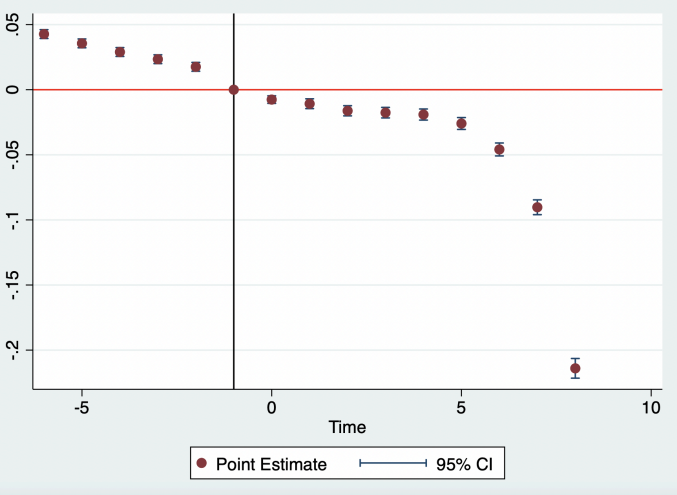
Table 6 shows no change in current enrollment and a decrease in degree attainment for students in low minimum wage states. After a $1 minimum wage increase, someone is 2.26 percentage points less likely to start college but no less likely to be enrolled at 18. Columns 3 and 4 of Table 6 then look at degree attainment. A $1 increase in the minimum wage leads to a 1.77 percentage point decrease in the likelihood that someone earns an associate's degree and a 4.39 percentage point decrease for bachelor's degrees for students in low minimum wage states. The decrease in associate's degree attainment aligns with my earlier findings using a difference in differences model. My difference in differences results for bachelor's degree attainment vary based on the time period, and the instrumental variable results may provide a more accurate picture of bachelor's degree attainment because of the longer time period and larger sample. The larger effect on bachelor's degree attainment compared to associate's degree attainment may be driven by the relative cost of associate's degree programs compared to bachelor's degree programs. Associate's degree programs are typically cheaper and take less time to complete. Students may be more willing to stay in college for two years rather than committing to a four year degree. Students also may have an easier time affording a community college degree compared to a four year degree. Therefore, there is a greater incentive to drop out of a bachelor's

degree program when presented with the opportunity to earn more money outside school. Figure 4 illustrates the results in Table 6 using event study graphs.

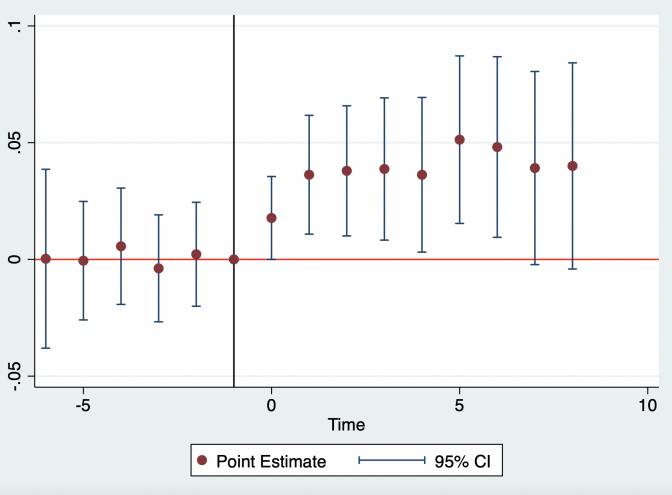
**Figure 4**

*Event Study Results*

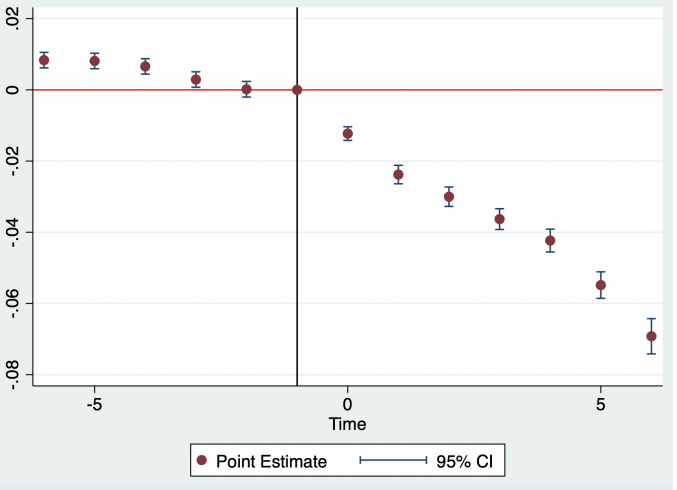
***A. Started College***



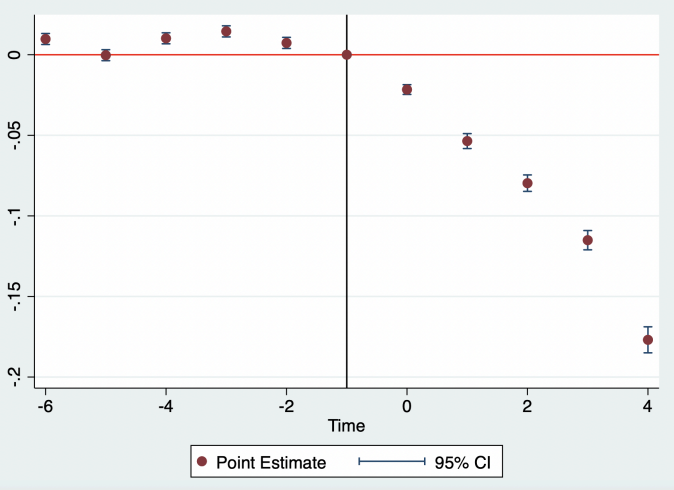

***B. Currently Enrolled***




***C. Associate's Degree Attainment***




***D. Bachelor's Degree Attainment***




**Notes:** Graph A indicates the change in the number of people that enrolled regardless of whether they graduated or are still enrolled. Year 0 indicates the year in which a minimum wage increase occurs. On each graph, the left of the black line is pre-increase and the right of the black line is post-increase.

In these graphs, 2010 is year 0. I group one year before and after a minimum wage increase into year 0. Given that students may enter college at different times and may respond to minimum wage policies at different times, creating a group of years around the time of a policy

change may provide a better estimate of the general response to a policy change. Each event study includes the same controls as used for previous results, state and year fixed effects, and state specific time trends. The graphs for associate's degree attainment and bachelor's degree attainment (C and D) show the decline in degree attainment after the increase. For each of these graphs, the trend in degree attainment is flat prior to the increase, indicating that the minimum wage increase caused the decline in degree attainment. The graph using a combined enrollment and attainment dependent variable (A) similarly illustrates this decline in overall educational outcomes. The graph for current enrollment (B) shows a slight increase in enrollment, however estimates are imprecise, and this result corresponds with the insignificant effect shown in Table 6. Together, these graphs provide convincing evidence of the decline in associate's and bachelor's degree attainment caused by a minimum wage increase and illustrate the insignificant effect on current enrollment of 18 year olds.

***Results by Race and Ethnicity***

Given the decline in associate's and bachelor's degree attainment, I then sort results for these outcomes by race and ethnicity. These results are shown in Table 7. The negative result is still present across each population group. For both associate's degree attainment and bachelor's degree attainment I find that there is a stronger effect for the White population compared to non-White and for the non-Hispanic population compared to the Hispanic population. The difference is most pronounced when comparing the White and non-White population for bachelor's degree attainment; White people experience a 4.6 percentage point decline in the likelihood of earning a bachelor's degree compared to a 1.7 percentage point decline for the non-White population. This result indicates that non-White students are more committed to

staying in college regardless of potential earnings outside of school. The overall decline in bachelor's degree attainment is largely driven by White students.

**Table 7**

*Attainment Results by Race and Ethnicity*

| | (1) White | (2) Non-White | (3) Hispanic | (4) Non-Hispanic |
|---|---|---|---|---|
| ***Associate's Degree*** | | | | |
| Minimum Wage | -0.0193*** | -0.0169*** | -0.0121*** | -0.0197*** |
| | (0.000408) | (0.000678) | (0.000921) | (0.000382) |
| Observations | 1,942,923 | 609,077 | 367,009 | 2,184,991 |
| R-squared | 0.009 | 0.009 | 0.008 | 0.011 |
| ***Bachelor's Degree*** | | | | |
| Minimum Wage | -0.0456*** | -0.0166*** | -0.0308*** | -0.0418*** |
| | (0.000931) | (0.00157) | (0.00183) | (0.000881) |
| Observations | 1,565,358 | 476,061 | 284,025 | 1,757,394 |
| R-squared | 0.050 | 0.060 | 0.037 | 0.072 |

**Notes:** Results for associate's degree attainment include ages 20-37. Bachelor's degree attainment includes ages 22-37. All columns include the same controls as previous results, state and year fixed effects, and a state specific time trend. Hispanic includes anyone who identifies as Mexican, Puerto Rican, Cuban, or other hispanic.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

When comparing Hispanic and non-Hispanic students, the difference in bachelor's degree attainment is less pronounced. Non-Hispanic students still experience a greater effect, however the difference between the two groups is not as large as the difference between White and non-White students. When looking at associate's degree attainment, there is a larger difference between Hispanic and non-Hispanic students than White and non-White students. However, the disparity in the magnitude of the effect between groups is not as large for associate's degree attainment compared to bachelor's degree attainment. The results in Table 7 show that race and ethnicity do play a small role in how a student responds to a minimum wage increase.

Across both the difference in differences and instrumental variable models, there is a decline in associate's degree attainment and no effect on enrollment of 18 year olds. The

magnitude of the effect on associate's degree attainment is between 0.3 and 5.5 percent. The results for bachelor's degree attainment differ between the two models. The instrumental variable model indicates a decline in bachelor's degree attainment. Given the larger sample size in the instrumental variable model and the clear decline in bachelor's degree attainment in the event study graph, the negative result is likely more accurate. The decline in degree attainment is likely driven by students dropping out at a later age because enrollment of 18 year olds is unaffected.

## VI. Robustness Checks

### *Including All States*

For my difference in differences model I have excluded states that start higher than the federal minimum wage because these states have already experienced an increase beyond the federal rate at the start of the sample. Results including these states are shown in Appendix Table 2. The results remain largely consistent, however, the magnitude of the coefficient for bachelor's degree attainment from 2000-2006 decreased. This indicates that part of the large coefficient in the initial results is driven by excluding certain states. Excluding always treated states is intended to provide a clearer picture of the effect of the minimum wage increase by having a pre and post increase period for all people included in the sample. In this case, excluding these states leads to a large coefficient that does not occur when including always treated states.

### *Assigning Low Minimum Wage States*

For the instrumental variable model, I distinguish a group of low minimum wage states that were affected by the federal minimum wage increase. Several of these states implemented minimum wage increases in other years or had minimum wages slightly higher than the federal rate in the period before the federal increase. I test to see if my assignment of low minimum

wage states is affecting the results by estimating results for a group of states that remained at the federal minimum wage throughout the entire sample. Here, I exclude states that were considered low minimum wage but were above the federal rate. I find that the results are consistent when looking at a sample where the federal minimum wage increase was the only increase they experienced. Appendix Table 3 shows these results. The results remain consistent for all dependent variables except current enrollment. The coefficient for current enrollment becomes significant at the 10% level. There may be a negative and significant effect on current enrollment in states with especially low minimum wages, and including states with slightly higher wages dilutes these results. For all other dependent variables, the results remain consistent with a similar magnitude. Therefore, which states I include does not have a large impact on the outcome, so I prefer to include all states that were affected by the federal increase, as I did for my main results.

***Inflation Adjustment***

In this paper I use nominal minimum wage variables rather than adjusting for inflation. It is not standard in the literature to adjust for inflation, so I prefer using nominal measures of the minimum wage. Appendix Table 4 shows difference in differences results after adjusting for inflation. Results remain consistent with my earlier findings, indicating that adjusting for inflation would not cause different results. When adjusting for inflation, the magnitude of negative coefficients is slightly higher. This result is consistent with expectations, given that a real minimum wage increase would correspond with a larger increase using nominal variables. Future research could benefit from further exploring effects of real minimum wage increases rather than focusing on nominal increases.

## VII. Conclusion

I use a difference in differences model to estimate the effect of state minimum wage increases on college enrollment and degree attainment across two periods of time with state minimum wage variation but a constant federal minimum wage. I then use an instrumental variable to estimate the effect of a federal minimum wage increase in states that were affected by this increase. My results show that minimum wage increases lead to a decline in associate's and bachelor's degree attainment without affecting current enrollment of 18 year olds. In response to a $1 minimum wage increase students are between 0.3 and 5.5 percentage points less likely to earn an associate's degree. Students are 4.3 percentage points less likely to earn a bachelor's degree or higher. When considering these results it is important to remember that states rarely implement a $1 minimum wage increase in a given year. States tend to implement smaller increases over a number of years. Based on this pattern, states will experience a small but consistent decline in associate's and bachelor's degree attainment if they decide to implement minimum wage increases. Because enrollment of 18 year olds is unaffected, the decline in degree attainment is likely driven by older students dropping out. Further research on this topic should explore whether this is the case and what is driving the decline in degree attainment.

The magnitude of my results varies based on the time period and the population included in the sample, but degree attainment results are negative and statistically significant across all time periods and groups used. I find that white students are more responsive to minimum wage changes compared to non-white students. White students are 4.6 percentage points less likely to earn a bachelor's degree compared to a 1.7 percentage point decline for non-white students. There is less disparity in results when comparing based on ethnicity and when looking at associate's degree attainment. This result sheds light on how students of different backgrounds

make educational decisions and value certain degrees. White students are more likely to earn a bachelor's degree in general (U.S. Census Bureau 2023), however, a higher portion of these students may be making decisions based on their potential earnings outside of school because they are more responsive to a minimum wage increase. The negative result in bachelor's degree attainment for the overall population is primarily driven by a decline among white students.

Despite the potential long term benefits of attending college, a higher minimum wage pushes students away from earning a college degree. Discussions of whether to raise the minimum wage are typically centered around a comparison between the benefit that workers will gain from higher wages and a potential rise in unemployment, negatively impacting workers. Education and skill attainment are often left out of this discussion. As I have shown in this paper, minimum wages change an individual's educational decisions. This response to a minimum wage increase will change the educational makeup of the workforce and have a lasting impact on workers' wage rates and the types of jobs that are available to them. Workers who choose not to earn a college degree because of a minimum wage increase may have fewer opportunities for wage growth and are sacrificing the opportunity to achieve a higher earning career by going to college. However, if higher minimum wages bring workers a higher quality of life where they do not need to attend college to earn a living wage, the policy may benefit workers. Students make significant sacrifices to attend college, often going into debt, and raising the minimum wage could alleviate pressure on students to earn a degree. Regardless of the potential benefit or loss to workers, policy makers should be aware of this decline in educational attainment resulting from a minimum wage increase. This outcome is not often discussed when considering whether to raise the minimum wage, and my research indicates that raising the wage will cause a shift in the educational makeup of the American workforce.

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## IX. Appendix

**Table A.1**
*First-Stage Instrumental Variable Results*

| VARIABLES | (1) Minimum Wage | (2) Minimum Wage | (3) Minimum Wage | (4) Minimum Wage |
|---|---|---|---|---|
| Low min wage * post | 1.810*** | -0.368*** | 1.562*** | 1.387*** |
| | (0.00134) | (0.00447) | (0.00126) | (0.00122) |
| F-Statistic | 1.8e+06*** | 6765.72*** | 1.5e+06*** | 1.3e+06*** |
| Observations | 3,301,931 | 409,422 | 2,552,000 | 2,041,419 |
| R-squared | 0.643 | 0.856 | 0.740 | 0.811 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table A.2**
*Difference in Differences Results Including All States*

| VARIABLES | (1) Started College | (2) In College | (3) Associate's Degree | (4) Bachelor's Degree or Higher |
|---|---|---|---|---|
| **2000-2006** | | | | |
| Increase size | -0.142*** | 0.00530 | -0.00814** | -0.0754*** |
| | (0.00302) | (0.00543) | (0.00323) | (0.00804) |
| Observations | 413,225 | 96,861 | 235,113 | 107,132 |
| R-squared | 0.062 | 0.049 | 0.013 | 0.067 |
| **2010-2019** | | | | |
| Increase size | -0.00967*** | -0.000253 | -0.00378*** | -0.00574* |
| | (0.000846) | (0.00140) | (0.000960) | (0.00336) |
| Observations | 1,435,250 | 312,252 | 863,987 | 481,805 |
| R-squared | 0.057 | 0.047 | 0.013 | 0.085 |

**Notes:** Previous results exclude states that start above the federal minimum wage in the first year of the sample. In this table, all states are included. This table includes controls mentioned in the data section, state and year fixed effects, and a state specific time trend. This table only includes people that live in the state they were born in.

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table A.3**
*Instrumental Variable Results - Restricted Low Min. Wage Definition*

| VARIABLES | (1) Started College | (2) In College | (3) Associate's Degree | (4) Bachelor's Degree or Higher |
|---|---|---|---|---|
| Minimum Wage | -0.0215*** | -0.0149** | -0.0160*** | -0.0456*** |
| | (0.000586) | (0.00664) | (0.000464) | (0.00101) |

| | | | | |
|---|---|---|---|---|
| Observations | 2,112,894 | 260,641 | 1,635,599 | 1,309,010 |
| R-squared | 0.057 | 0.059 | 0.010 | 0.076 |

**Notes:** This table only considers states that are at the federal minimum wage rate throughout the entire sample to be low minimum wage states.

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table A.4**
*Inflation Adjusted Difference in Differences Results*

| VARIABLES | (1) Started College | (2) In College | (3) Associate's Degree | (4) Bachelor's Degree or Higher |
|---|---|---|---|---|
| **2000-2006** | | | | |
| Increase Size | -0.217*** | 0.00664 | -0.0832*** | -0.218** |
| | (0.00480) | (0.0115) | (0.0178) | (0.106) |
| Observations | 330,152 | 77,232 | 188,293 | 85,921 |
| R-squared | 0.059 | 0.044 | 0.015 | 0.063 |
| **2010-2019** | | | | |
| Increase Size | -0.0108*** | -0.000658 | -0.00510*** | 0.00715 |
| | (0.00172) | (0.00272) | (0.00197) | (0.00679) |
| Observations | 931,619 | 204,527 | 557,490 | 309,490 |
| R-squared | 0.053 | 0.043 | 0.014 | 0.080 |

**Notes:** This table uses minimum wage variables measured in 2010 dollars to calculate the real increase a student experiences relative to their state's minimum wage in the first year of the sample.

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1