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A Promise Worth Keeping? Impacts of Tennessee Promise

Paige Schoonover
University of Colorado Boulder

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Department of Economics



University of Colorado Boulder
Boulder, Colorado 80309

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Abstract

In this paper, I examine a novel tuition assistance program, the Tennessee Promise. Since the Fall of 2015, the state of Tennessee has covered all tuition and fees not covered by other scholarships or grants for high school graduates at qualifying two-year institutions. I use the timing of the policy's implementation and employ quasi-experimental methods to demonstrate that the Tennessee Promise program increased associate's degree attainment by 1.2 percentage points and bachelor's degree attainment by 2.4 percentage points four years after implementation for cohorts graduating high school in 2015 and 2016. Seven years after program implementation, there is a 1.2 percentage point increase in associate's degrees and a 0.6 percentage point increase in bachelor's degrees for the same cohorts, indicating that the program increased associate's degrees and decreased time to degree for bachelor's degrees. I find that this increase in educational attainment leads to increases in wage income and delays in marriage and childbirth, indicating that Tennessee Promise was successful not only in increasing educational attainment but also improving socioeconomic outcomes of treated cohorts. The findings from this study may be more generalizable than those from localized studies, offering broader lessons on the potential impacts of similar initiatives in other states or at the federal level.

1 Introduction

The cost of obtaining a college degree is rising, with the average tuition, fees, and room and board for a student in the 2022-2023 school year reaching \$30,884 at a public, four-year institution. However, only 63.5% of students who began a four-year degree at a public institution in 2016 completed a degree within 6 years.¹ Due to rising costs and the relatively high likelihood of not completing a degree, attending a two-year institution either for a terminal degree or as a substitute for the first few years of a bachelor’s degree is becoming increasingly popular. In particular, many states have begun implementing free tuition programs to offset the costs associated with two-year institution attendance. The goal of these programs is to encourage degree and certificate completion with the hope that this will ultimately increase economic activity in the state.

In this paper, I examine the impacts of the Tennessee Promise program. The Tennessee Promise program is a novel tuition assistance program that was introduced as part of the “Drive to 55” campaign in 2013 which set the goal of increasing the share of Tennesseans with a college degree or certificate to 55% by 2025. Beginning with the graduating class of 2015, high school students in Tennessee were eligible for a “last-dollar” scholarship to cover any tuition and fees not otherwise covered by federal or state aid. Eligibility for this program is not related to merit, need, or degree field but rather to criteria such as completing mentoring and community service requirements.

I begin by using Integrated Postsecondary Education Data System (IPEDS) data and implement a difference-in-differences (DID) strategy to estimate within-state changes in graduation rates and degree conferral at two-year institutions. While prior findings on enrollment by [Nguyen \(2020\)](#) indicate that enrollment at Tennessean two-year institutions increased, it is unclear whether these increases in enrollment would eventually lead to increased educational attainment for treated individuals. I find that graduation rates at Tennessee two-year institutions increased by 3.5 percentage points (6.7%) following the enactment of Tennessee Promise. Associate’s degree conferral increased 13.0%, but certificate conferral decreased by 9.9%, indicating some substitution of certificates for associate’s degrees.

I then use the 2019 American Community Survey (ACS) to study the impacts of this program on treated individuals, including a heterogeneity analysis as well as the impacts of the program on second-degree outcomes such as income, marriage, and childbirth for individuals estimated to have graduated high school in 2015 or 2016. I again utilize a DID strategy as the primary methodology and with alternative methodologies such as synthetic difference-in-differences implemented for robustness. I find significant increases in completed schooling,

¹Data on college cost and graduation rates are obtained from the Digest of Education Statistics, which is compiled by the National Center for Education Statistics. The tuition, fees, room, and board can be found in table 330.10, and graduation rates are found in table 326.10. The tables can be found here: https://nces.ed.gov/programs/digest/current_tables.asp.

with increases in the proportion of individuals with associate’s degrees as their minimum level of education of 4.3 percentage points (11.8%) and an increase in the proportion of individuals with bachelor’s degrees as their minimum completed schooling of 3.1 percentage points (10.2%) four years after program implementation. There is significant heterogeneity in who is most affected by this program. In particular, men in treated cohorts experience a 2.8 percentage point increase in associate’s degrees compared to women in treated cohorts, while treated women are 1.8 percentage points more likely to have a bachelor’s degree than treated men. There is also significant heterogeneity by race, with White treated individuals being 6.9 percentage points more likely to have an associate’s degree or more compared to treated non-White individuals.

This increase in completed schooling leads to an increase in wage income of 5.7%. Additionally, I find that this increase in completed schooling delays marriage, with treated individuals being 0.4 percentage points (4.5%) less likely to be married by age 20 and 2.6 percentage points (13.1%) less likely to be married by age 22. There are similar delays in childbirth, as treated individuals are 0.8 percentage points (7.4%) less likely to have their first child by age 20 and (5.3%) less likely to have their first child by age 22.

Finally, I use 2022 ACS data to analyze the impacts of the program 6-7 years after treatment for the 2015 and 2016 cohorts. While this analysis does require the additional assumption that COVID-19 affected outcomes similarly in treatment and comparison states, we can capture more medium-run impacts of the program if we accept this assumption as reasonable. Treated cohorts are 1.9 percentage points (4.6%) more likely to have an associate’s degree or more. They are also 0.6 percentage points (1.9%) more likely to have a bachelor’s degree or more, although these results are only marginally significant. The smaller increase in bachelor’s degree attainment as compared to results from the 2019 ACS indicate that a key outcome for bachelor’s degree attainment may be decreased time to degree completion. Increases in educational attainment for treated cohorts lead to increased wage income of 6.3%. There is no significant impact on the likelihood of being married or having a first child by age 23. Treated individuals are 1.3 percentage points (3.7%) more likely to be married by age 25 but are still 1.5 percentage points (5.9%) less likely to have had their first child.

This paper contributes to the literature on the relationship between financial aid and college attendance and completion. The human capital model developed in [Becker \(1964\)](#) predicts that, all else equal, an exogenous reduction in tuition will induce marginally motivated students to enroll. In particular, [Dynarski et al. \(2021\)](#) found that the commitment of free tuition has especially large impacts. Empirical evidence on the effects of Tennessee Promise on enrollment has been consistent with this ([Nguyen, 2020](#)). The effects of tuition reduction programs on educational attainment are less obvious. Previous work has found

positive impacts of smaller-scale scholarships on degree completion ([Carruthers et al., 2023](#); [Doyle, 2009](#); [Kane, 2007](#); [Dynarski, 2000, 2003](#); [Castleman and Long, 2016](#)). However, a large-scale program such as Tennessee Promise introduces a broader range of students, and the diversity in backgrounds, academic preparedness, and socioeconomic status may lead students to respond differently to the program’s benefits, making it unclear whether similar increases in educational attainment will be observed. I provide the first analysis on how a large-scale last-dollar scholarship affects educational attainment and find large, positive effects on educational attainment, which is consistent with previous literature.

Additionally, I contribute to literature on the effects of scholarships limited to two-year institutions on educational attainment. Previously studied programs such as the Kalamazoo or El Dorado Promise were first-dollar programs that could be used at either two-year or four-year institutions. There are concerns that free community college programs might divert students who originally intended to pursue a bachelor’s degree. Some worry that students may opt for the more affordable community college route initially, but then face challenges in transferring to a four-year institution or lose motivation to continue their education beyond an associate degree. This could potentially reduce the number of students completing bachelor’s degrees, especially if they face barriers during the transfer process. I perform the first analysis of the educational attainment impacts of a program limited to two-year institutions and provide suggestive evidence that Promise programs do not, on net, divert bachelor’s-intending students from four-year colleges.

Finally, I provide early insights on how a scholarship like Tennessee Promise affects earnings, marriage, and childbirth in the years after high school, contributing to the literature on the socioeconomic impacts of increased educational attainment for students on the margin of increasing their human capital. I join [Carruthers et al. \(2023\)](#) and [Hershbein et al. \(2021\)](#) as one of the first studies to examine the labor market impacts of Promise forms of financial aid, and the larger sample sizes allowed by a larger-scale program lead to more precise estimates. Understanding the program’s impact on income helps assess whether it successfully improves students’ financial stability in the long term. To my knowledge, I am the first to study the impacts of Promise programs on marriage and childbirth. Demonstrating that Tennessee Promise delays marriage and first childbirth contributes to economic literature by providing evidence on how access to free community college can influence life-cycle decisions that affect labor market participation and long-term economic outcomes. This finding supports the broader understanding of how educational opportunities can shift personal choices in ways that increase human capital investment, leading to greater financial stability and productivity over time.

The findings of this paper have significant implications for the generalizability of state-funded tuition assistance programs, particularly those focused on two-year institutions. Un-

like previous studies that examined localized programs, such as those limited to a single city or county, the Tennessee Promise program was implemented state-wide, covering a diverse population across urban, suburban, and rural areas. This broader scope allows for more comprehensive insights into how similar last-dollar scholarship programs might perform in other states or regions with varied demographics and economic conditions. The results suggest that even within diverse settings, such programs can effectively increase educational attainment and income and decrease time to degree while influencing social behaviors such as marriage and childbirth. Therefore, the outcomes of this study may provide a valuable reference for policymakers and educational institutions considering the adoption or expansion of similar initiatives in other states or at the national level, given the observed positive impacts on both educational and socioeconomic outcomes.

The rest of the paper is structured as follows. In Section 2, I present detailed information on the Tennessee Promise program. Section 3 introduces a conceptual framework to guide the empirical analysis. An institutional analysis of the effects of Tennessee Promise is presented in Section 4. Section 5 focuses on individual-level results, and Section 6 expands these results to examine post-pandemic outcomes. I discuss the implications of the results and conclude in Section 7.

2 Background

Promise programs are location-based tuition assistance programs that guarantee free college for eligible students. Some of the earliest and most prominent examples include the Kalamazoo and El Dorado Promise. Unlike traditional need or merit based scholarships, recipients needed only to graduate from a public high school within the school district to qualify. While research has been conducted on the effects of these localized programs (Andrews et al., 2010; Bartik et al., 2021; Swanson and Ritter, 2018), Tennessee Promise is the first state-wide program of its kind.

Former Tennessee governor Bill Haslam introduced Tennessee Promise in 2014 as part of his “Drive to 55” campaign, which set the goal of increasing the percentage of Tennesseans with a post-secondary degree or certificate to 55% by 2025. Students are eligible for the Tennessee Promise scholarship if they are Tennessee residents and apply by November 1 of the academic year in which the student will graduate from high school, complete a home school program, or earn a GED or HiSET.² To be eligible for the scholarship, students must graduate from a public Tennessee high school, enroll in an eligible institution the fall semester after graduating from high school, complete mentoring and community service requirements, and maintain a 2.0 GPA at their institution. Eligible institutions include any of the state’s

²Students who graduated from any public or private high school in Tennessee are eligible. If the student earns a GED or HiSET after dropping out of school, this must be done prior to the student’s 19th birthday.

13 community colleges or 27 colleges of applied technology.³

Tennessee Promise is a last-dollar scholarship, meaning the scholarship covers the cost of tuition and mandatory fees not otherwise covered by a federal Pell grant, the HOPE Scholarship, or the Tennessee Student Assistance Award at an eligible institution. For the first eligible cohort (individuals graduating high school in spring 2015), 57,660 students applied for Tennessee Promise with 16,207 students completing all requirements and enrolling at an eligible institution, and these numbers have increased slightly each year. College-going rates for this cohort increased by 5.9 percentage points compared to the college-going rate for the spring 2014 cohort, and FAFSA filing rates increased by 9.1 percentage points. In the academic year 2015-2016, the average Tennessee Promise award amount was \$2,190, and this number increases to \$3,488 if \$0 awards are excluded.⁴ According to IPEDS data, the average tuition and fees at a Tennessee two-year institution in 2015 was \$3,938, so Tennessee Promise was responsible for covering more than half the cost of attending a two-year institution for individuals who received an award.

3 Conceptual Framework

It is worth thinking carefully about the types of students who are affected by this program and their possible outcomes. The effects of this policy on educational attainment and later life outcomes will be captured by observing the outcomes of the compliers, or those whose choice of whether or where to start higher education is affected by the policy. Unlike the enrollment question answered by [Nguyen \(2020\)](#), these outcomes are much more nuanced and depend on potential offsetting effects. There are two possible types of compliers, which I will refer to as New Access Enrollees and Alternative Path Enrollees. New Access Enrollees are individuals who would not have attended any college immediately following high school in the absence of Tennessee Promise given their expected returns and/or liquidity restraints. These compliers are a result of the democratization effect suggested by [Brint and Karabel \(1989\)](#) in which two-year institutions provide a place in higher education for individuals who otherwise may not attend college and represent approximately 75% of the increased enrollment at two-year institutions found in [Nguyen \(2020\)](#). The remaining 25% of increased two-year institution enrollment is due to Alternative Path Enrollees, or individuals who would have attended a four-year college in the absence of Tennessee Promise but are enticed to attend a two-year institution instead of a four-year institution due to the decrease in cost, a result of the diversion effect suggested by [Rouse \(1995\)](#). It is important to note that Alternative Path

³Students may also use the scholarship at other eligible institutions offering an associate degree program. However, the award at these institutions is capped at the average cost of tuition and mandatory fees at the two-year institutions.

⁴The numbers listed here are from the TN Promise Report 2019, an annual report on Tennessee Promise compiled by the Tennessee Higher Education Commission. Annual reports for 2017-2023 can be found at <https://www.tn.gov/thec/research/tn-promise-annual-report.html>

Enrollees consist of individuals who both may or may not have succeeded at a four-year institution.

A New Access Enrollee will experience an increase in educational attainment regardless of whether they are successful at the two-year institution. At a minimum, they will now have some higher education, while they would have not continued past a high school education in the absence of the program. They may also obtain an associate's degree or certificate from the two-year institution or transfer to a four-year institution to attempt or obtain a bachelor's degree after accumulating credits or obtaining a degree at the two-year institution.

The effects of Tennessee Promise on Alternative Path Enrollees are more complex. First consider an Alternative Path Enrollee who would not have succeeded at a four-year institution. It is possible that this complier may still drop or fail out of the two-year institution without obtaining a degree or certificate, experiencing a no real change in educational attainment. However, they will incur less debt than they would have by starting at a four-year institution. It is also possible that this complier was better suited to a two-year institution and therefore will experience an increase in educational attainment. There are many reasons that an individual may experience greater success at a two-year institution, including greater flexibility, lower costs, personalized support, career-focused programs, and a more accessible and supportive learning environment. In this case, they may obtain an associate's degree or a certificate from the two-year institution, or, if beginning at a two-year institution provides a smoother transition into higher education, the individual may be able to transfer to to a four-year institution and complete a bachelor's degree. Therefore, an Alternative Path Enrollee who would not have succeeded by beginning at a four-year institution could experience no change in educational attainment or an increase in educational attainment.

Now consider an Alternative Path Enrollee who would have succeeded at a four-year institution. While Tennessee Promise provides financial relief, the differences in institutional structure, resources, and student life between four-year and two-year institutions may pose challenges for some students. Those who might have thrived at a four-year institution could find that the lack of academic rigor, extracurricular activities, or specialized resources at a two-year school hinders their success. Therefore, this complier may not succeed at a two-year institution and drop or fail out, leading to a decrease in educational attainment. This complier may also experience a decrease in educational attainment if they complete an associate's degree or certificate but choose to not continue on and complete a bachelor's degree at a four-year institution. Finally, it is possible that this complier will transfer to a four year college after accumulating credits or completing an associate's degree, leading to the same educational attainment with less debt incurred. Therefore, an Alternative Path Enrollee who would have succeeded at a four-year institution will either experience a decrease in educational attainment or no change in educational attainment.

This framework highlights the complexity of evaluating the net effects of Tennessee Promise on educational attainment, as potential outcomes vary significantly. This ambiguity, especially regarding the outcomes for Alternative Path Enrollees, suggests that the overall impact of Tennessee Promise on educational attainment could range from positive to neutral or even negative, depending on the individual circumstances of the students involved. Therefore, while Tennessee Promise may increase access to higher education, its broader effects on long-term educational outcomes are uncertain and require further empirical investigation.

4 IPEDS Analysis

I begin with an analysis of graduation rates and degree conferrals at two-year institutions following the implementation of Tennessee Promise to better understand the effects on educational attainment. While [Nguyen \(2020\)](#) focuses on the immediate impact on enrollment at two-year colleges, this does not reveal whether increased enrollment leads to meaningful outcomes, such as degree or certificate completion. Enrollment alone does not guarantee success, as students may face challenges like academic underpreparedness, limited support services, or persisting financial difficulties that result in dropout or failure to graduate. By analyzing graduation rates at two-year institutions, we can better evaluate whether Tennessee Promise helps students not only enroll but also succeed in obtaining credentials that enhance their career prospects.

Further, examining degree conferrals at two-year institutions provides insight into the types of qualifications students are earning, whether associate degrees or certificates, and whether the program is fostering greater completion rates. This focus allows us to assess whether Tennessee Promise increases attainment at the two-year level, which is critical for understanding its role in shaping educational pathways for students who would otherwise not pursue higher education. It also helps clarify whether the program is effectively supporting students through to completion, or whether it increases access without corresponding improvements in graduation outcomes.

4.1 Data

Data for this analysis primarily comes from the Integrated Postsecondary Education Data System (IPEDS), which is maintained by the National Center for Education Statistics. I begin by focusing on the direct impacts of Tennessee Promise on graduation rates and degree or certificate conferral at public two-year institutions. My main variables of interest are graduation rate, associate's degrees, and certificates at degree-granting public two-year institutions for 2010-2019. Total graduation rate is the rate required for disclosure and/or

reporting purposes under Student Right-to-Know Act. This rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort. A completer is defined as a student who receives a degree, diploma, certificate, or other recognized postsecondary credential. In order to be considered a completer, the degree or other award must actually be conferred. The adjusted cohort includes all individuals in an entering cohort except those who left the institution as a result of death or permanent disability, service in the armed forces (including those called to active duty), service with a foreign aid service or the federal government, such as the Peace Corps, or service on official church missions. Associate’s degrees are defined as an award that typically requires at least 2 but less than 4 years of full-time equivalent college work. I construct the certificates variable by combining the IPEDS variables for certificates of 2 but less than 4 years, certificates of 1 but less than 2 years, and certificates of less than 1 year.

Following Saboe and Terrizzi (2019) and Nguyen (2020), the analysis includes time-varying controls such as published in-state tuition, student-faculty ratio, and percentage of full-time first-time undergraduate students awarded any financial aid in the previous academic year. Additionally, I obtain data on state-level unemployment rates from the Bureau of Labor Statistics (BLS) and control for unemployment rate in the year prior to the college-entrance decision for each cohort, as we know that changes in unemployment rates can directly influence choices related to education. I also control for changes in state population using population counts from the Census Bureau. Changes in population would likely be directly reflected in the number of degrees or certificates conferred, so this control allows me to observe the effects on degree conferral that are not a result of changes in population.

4.2 Methodology

While Tennessee was the first state to implement a large-scale promise program, several other states implemented some variation of a large-scale tuition assistance program in the years following. Since these programs vary widely in requirements and would have been implemented too late for significant effects on degree attainment to appear in the observation period, any state with a large-scale tuition assistance program implemented after 2010 but prior to 2019 is excluded from the sample. The states included and excluded from the sample are shown in Figure 1. A listing of the programs and year enacted can be found in the appendix in table A-1.

My primary estimation follows that of Card and Krueger (1994) to address changes in overall enrollment trends and systematic differences between the cohorts in Tennessee and other states that existed prior to policy implementation. My main specification is as follows:

$$Y_{isc} = \alpha + \beta * TN * After_{isc} + \gamma X_{isc} + \eta Z_{sc} + \delta_c + \mu_s + \epsilon_{isc} \quad (1)$$

Figure 1: Treatment and Comparison States

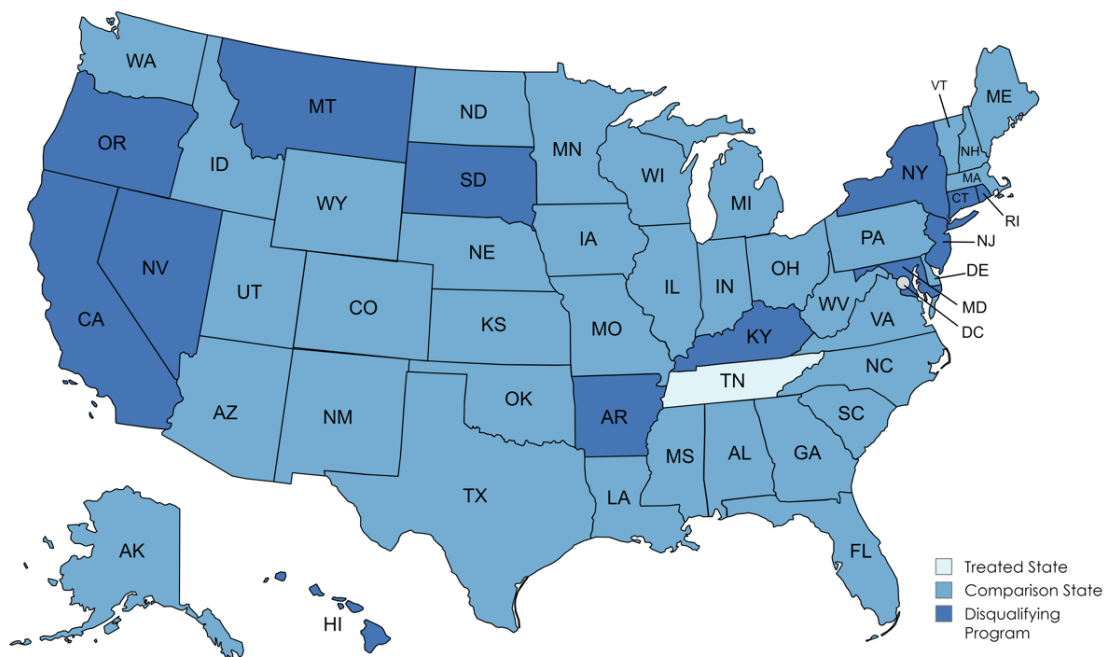


Table 1: Degree Conferral Results

	Total Graduation Rate	Log(Associates)	Log(Certificates)
TN*After	0.0387*** (0.0051)	0.0900*** (0.0272)	-0.0585 (0.0363)
N	5,536	5,512	5,402

Notes: Standard errors are clustered at the state level. Data is from IPEDS, which is maintained by the National Center for Education Statistics. Total graduation rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort. Certificates are the sum of all certificates of two but less than four years, one but less than two years, and less than one year that were conferred in a given year. Sample sizes vary across outcomes because not all institutions grant both associate’s degrees and certificates.

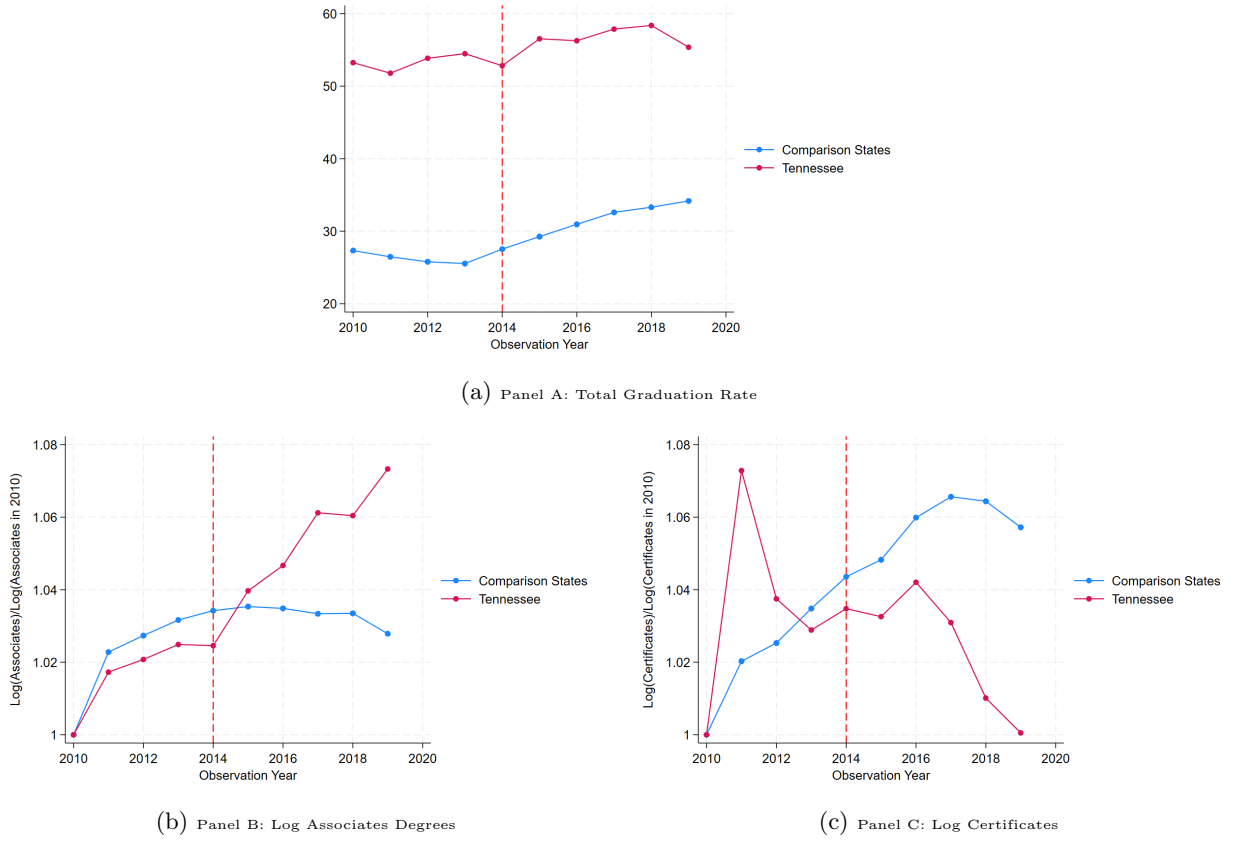
where Y_{isc} is degrees conferred and graduation rate for institution i for cohort c in state s . Cohorts are based on entering cohort for graduation rate and year of degree or certificate completion for associate’s degree and certificates, and state is determined by location of the institution. $TN * After_{isc}$ is a binary indicator that will be 1 for cohorts at Tennessee institutions beginning in 2015 and 0 otherwise. X_{isc} is a vector of institutional characteristics including posted in-state tuition, student-faculty ratio, percent of full-time first-time students receiving financial aid. Z_{sc} consists of state-level unemployment rates and population. Additionally, cohort and state fixed effects δ_c and μ_s are included.

A key identifying assumption in the difference-in-differences (DID) framework is the parallel trends assumption, which posits that, in the absence of the treatment, the outcome variable would follow a similar trajectory over time for both treated and untreated groups. This assumption is inherently untestable, as we cannot directly observe the counterfactual scenario in which the treatment did not occur for the treated group. However, we can gain some insight into the model’s validity by examining whether the trends in the outcome variable were similar for both groups before the introduction of the treatment. In this context, we would expect that, prior to the implementation of the Tennessee Promise program, educational attainment rates — such as graduation rates or degree conferrals — would display similar patterns over time for both Tennessee and non-Tennessee states. Descriptive trends in figure (2) reveal similar pre-trends in graduation rates and associate’s degree conferrals between Tennessee and comparison states, although the pre-trends for certificate conferral display greater variability.

4.3 Results

Table 1 reports coefficients β from equation 1 for graduation rate and degree conferral. There is an increase in graduation rates for treated institutions of 3.9 percentage points 6.8% as well as a 9.0% increase in associate’s degrees conferred. However, there is a decrease in certificates conferred of 5.9%, although these results are not statistically significant. The increase in graduation rates observed in the analysis suggests that the Tennessee Promise

Figure 2: Mean Graduation Rates and Degree Conferrals



Notes: Data is from IPEDS, which is maintained by the National Center for Education Statistics. Total graduation rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort. Certificates are the sum of all certificates of two but less than four years, one but less than two years, and less than one year that were conferred in a given year. Log(Associate's) and Log(Certificates) are divided by the log of that outcome in 2010 in order to account for differences in levels due to population differences across treatment and comparison states.

program has been successful in providing students with the necessary financial support and incentives to persist through to graduation. This may reflect the program’s effectiveness in reducing the financial barriers that often hinder students from completing their degrees or be a result of other components of the program such as mentoring, which we do know has a positive effect on degree completion (Bettinger and Baker, 2016). Additionally, the significant rise in the number of associate’s degrees conferred aligns well with the program’s objective of promoting the attainment of postsecondary credentials. This increase indicates that the Tennessee Promise is not only effective in boosting initial enrollment but also in supporting students’ progression through their studies to achieve two-year degrees.

Overall, these findings demonstrate that the Tennessee Promise has a beneficial impact on both graduation rates and the completion of associate degrees, highlighting its role in improving educational outcomes for students at two-year institutions. However, the program’s effect on certificate conferral appears less pronounced. The observed decrease in certificate completions, although not statistically significant, suggests that the program might not have a uniform impact across all types of credentials. This variation in effects points to the need for further investigation into how the program influences different educational pathways and whether additional support or adjustments are necessary to address potential disparities.

4.4 Robustness

The validity of the DID analysis hinges significantly on the characteristics and dynamics of the comparison group. The heterogeneity of states included in the comparison group may lead to significant differences in educational policies, economic conditions, and demographic characteristics, making it difficult to isolate the impact of Tennessee Promise. For instance, states that are geographically distant from Tennessee might have unique educational systems, varying costs of community colleges, or different student support mechanisms that could independently influence graduation rates and degree conferrals. This variability can introduce confounding factors that obscure the causal relationship being examined. Furthermore, states outside the immediate region may experience different economic shocks or trends, impacting educational outcomes in ways that are not directly comparable to Tennessee. Consequently, these factors can undermine the parallel trends assumption critical for a valid DID analysis, making it more challenging to draw accurate conclusions regarding the effects of Tennessee Promise on educational attainment.

Neighboring states often provide a more suitable comparison group for a DID analysis due to their geographic proximity, similar socioeconomic characteristics, and comparable educational contexts. These states are likely to have analogous demographic profiles and economic conditions, which can mitigate potential confounding variables that may arise when including more geographically and culturally distant states. By focusing on states that share

borders with Tennessee and explicitly excluding those that have implemented their own free community college programs during the study period, the analysis can better account for regional trends, as neighboring states are often influenced by similar economic conditions, cultural factors, and policy environments. Moreover, neighboring states are less likely to introduce policies or reforms that diverge significantly from those in Tennessee within the same timeframe, which strengthens the assumption of parallel trends.

Therefore, I employ a DID analysis using only neighboring states as robustness following [Dynarski \(2000\)](#), among others. The comparison states for this analysis are Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Although Arkansas and Kentucky also border Tennessee, they are excluded from the analysis, as they enacted some form of large-scale financial aid program during the study period. While the restriction to these states may provide a better comparison group, there are also likely spillover effects of the policy to neighboring states as students residing in counties that border Tennessee in neighboring states are also eligible for Tennessee Promise. The expected direction of the bias due to spillover effects is not clear. It is possible that spillover effects could bias results upward if students residing in these counties in comparison states are instead enrolling and completing a degree or certificate at a Tennessee institution. However, it is also possible that these spillover effects bias results downward. First, it is possible that comparison state students who respond to Tennessee Promise are more cost-conscious because they correctly anticipate that they have a lower likelihood of succeeding, thus lowering the graduation rate. Comparison state students may also be beginning at a Tennessee institution but finishing a degree at an institution in their home state, perhaps due to a preference for lesser commute times or smaller class sizes, which would bias results for both graduation rate and degree conferral downward.

Results from this analysis are found in appendix table [A-7](#). Graduation rates and associate's degree conferrals do still increase, although the results are smaller in magnitude and insignificant due to the smaller sample sizes. Results for associate's degree conferrals in this analysis are well within the confidence interval of the main results. This analysis of only neighboring states does indicate a much larger decrease in certificate conferrals of 30%. This supports the main analysis results that there does appear to be some substitution between associate's degrees and certificates among compliers.

I perform a synthetic difference in differences (SDID) analysis as an additional robustness check. This estimator still relies on the parallel trends assumption of the traditional DID but reweights and matches on pre-exposure trends like a synthetic control method. Therefore, the comparison group will consist most heavily of states that had the most similar pretrends to Tennessee. Results from this analysis can be found in appendix table [A-3](#). Point estimates from this analysis are very similar to those in the main difference in difference analysis.

5 ACS Analysis

While an institution-level analysis provides valuable insights into the effects of Tennessee Promise on graduation rates and degree conferrals, it does not capture the full picture of the program’s impact on overall educational attainment. By complementing this with an analysis using individual data from the ACS, we can gain a more nuanced understanding of how the program affects educational outcomes at the individual level. Moreover, using individual-level data from the ACS enables us to study the broader impacts of the Tennessee Promise across different demographic groups, such as race and gender. This analysis can reveal heterogeneous effects that are not visible when only looking at aggregated institutional outcomes. Finally, this additional analysis allows us to understand whether an increase in educational attainment affects other outcomes like income or choices related to marriage and children. Overall, the individual-level analysis provides a comprehensive assessment of the program’s effectiveness in improving educational attainment across the state.

5.1 Data

I utilize the 2019 American Community Survey (ACS) extracted from IPUMS USA to observe cohort-level outcomes. The 2019 ACS was chosen to observe effects from the program prior to the COVID-19 pandemic. My primary variables of interest are minimum completed schooling and exact completed schooling, which I construct using EDUCD, a variable in the ACS which indicates respondents’ educational attainment, as measured by the highest year of school or degree completed. Additionally, I examine second-order effects related to income, marriage, and children. Income is observed using the variables “inctot” and “incwage” in the ACS, and I also construct logarithmic variables for both total and wage income. I restrict marriage outcomes to individuals who report being married only once, which includes 97% of individuals who have ever been married. This choice was made in order to observe age at first marriage, as the data only includes the year of the most recent marriage. I construct the variable for age at first marriage using birth year and year of marriage. Finally, I observe the number of children born to an individual and construct a variable for age at first child using age of the individual and age of their oldest child.

Observations take place in 2019, so I use birthplace to classify students rather than current state of residence because I cannot observe the state in which they graduated high school, and current location could be affected by educational choices. I perform an analysis using current location for robustness, and results are not particularly sensitive to this choice. Treatment status is dependent on anticipated high school graduation year, with the policy going into effect for individuals in cohorts with an expected high school graduation year of 2015 or later. Because I cannot observe anticipated high school graduation year in the data,

I construct an estimation using birth year and quarter. In Tennessee, a child must turn 5 on or before August 15 to enroll in Kindergarten according to state law T.C.A. § 49-6-201. However, students may be allowed to enroll if they will be 5 on or before September 30 if they are deemed emotionally and academically mature enough by the director of schools under state law T.C.A. § 49-6-3001(b)(2)(B). Therefore, a cohort consists of individuals born between Q4 of a given year and Q3 of the following year for the purposes of this analysis. For example, any individual born between October 1, 1996 and September 31, 1997 would be assigned to the 2015 cohort.

5.2 Methodology

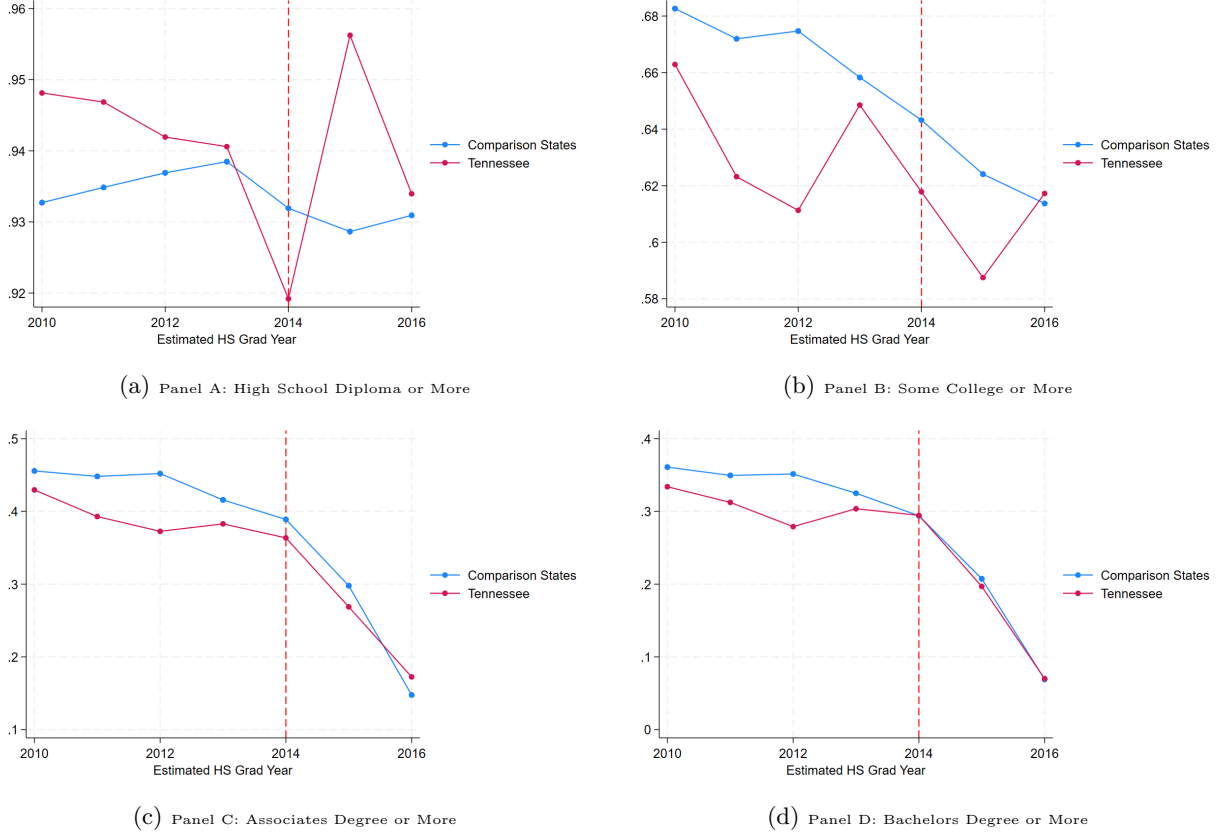
State treatment status is consistent with that in the IPEDS analysis. My main specification is as follows:

$$Y_{isc} = \alpha + \beta * TN * After_{isc} + \gamma X_{isc} + \eta Z_{sc} + \delta_c + \mu_s + \epsilon_{isc} \quad (2)$$

where Y_{isc} is outcomes such as the highest level of education completed, marital status, etc. for individual i in cohort c in state s . Cohorts are defined by estimated high school graduation year and states are determined by birth state. $TN * After_{isc}$ is a binary indicator that will be 1 for an individual born in Tennessee with an anticipated high school graduation year of 2015 or 2016 and 0 otherwise. X_{isc} is a vector of characteristics including gender, race, and first language spoken, and Z_{sc} includes state-level unemployment rates and population. Cohort and state fixed effects δ_c and μ_s are included, and it is important to note that the cohort fixed effects will absorb any differences in outcomes related to age for the ACS analysis as outcomes are from a single cross-section of data.

Again, the DID analysis relies on the parallel trends assumption, and we can assess the plausibility of this assumption by comparing whether the outcome trends were similar for both groups before the treatment was introduced. In this analysis, we would expect that prior to the implementation of the Tennessee Promise program, educational attainment in Tennessee and comparison states followed similar patterns over time. To support this assumption, I display mean educational attainment in figure 3. Trends appear to be similar in most cases, although the comparison group experiences smoother trends due to increased observations averaging out small fluctuations. There is a dip in high school graduation in 2014. However, it is important to note that this dip would not have influenced implementation of the policy as it was announced in 2013. The dip also should not be a result of students delaying high school graduation to gain eligibility for Tennessee Promise as we are observing educational attainment 5 years after their anticipated high school graduation. Finally, these students would still be in the 2014 cohort if they did delay graduation to gain eligibility, as

Figure 3: Mean Educational Attainment



Notes: Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Outcomes are binary variables that are 1 if the individual reports completing at least that level of education.

cohorts are constructed based on *anticipated* rather than *actual* high school graduation year, so it is possible that the 2014 cohort is partially treated.

5.3 Results

Educational Attainment The main results from the DID analysis can be found in Table 2. Panel A displays results for minimum completed schooling. That is, an individual would be considered to have a minimum of a given level of schooling if they have completed that much schooling or more. There is a small but significant effect on a high school diploma or higher of 0.7 percentage points (0.7%). Similarly, there is an increase in at least some college education of 1.7 percentage points (2.6%) for treated cohorts. There are much larger effects for completed higher education, with a 4.3 percentage point (11.2%) increase in associate's degrees or higher and a 3.1 (10.1%) percentage point increase in bachelor's degrees or higher for treated cohorts.

Table 2: Education Results

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	0.0067*** (0.0023)	0.0165*** (0.0037)	0.0433*** (0.0064)	0.0316*** (0.0063)
Panel B: Exact Completed Schooling				
TN*After	-0.0165*** (0.0037)	-0.0268*** (0.0063)	0.0117*** (0.0029)	0.0258*** (0.0050)
N	151,858	151,858	151,858	151,858

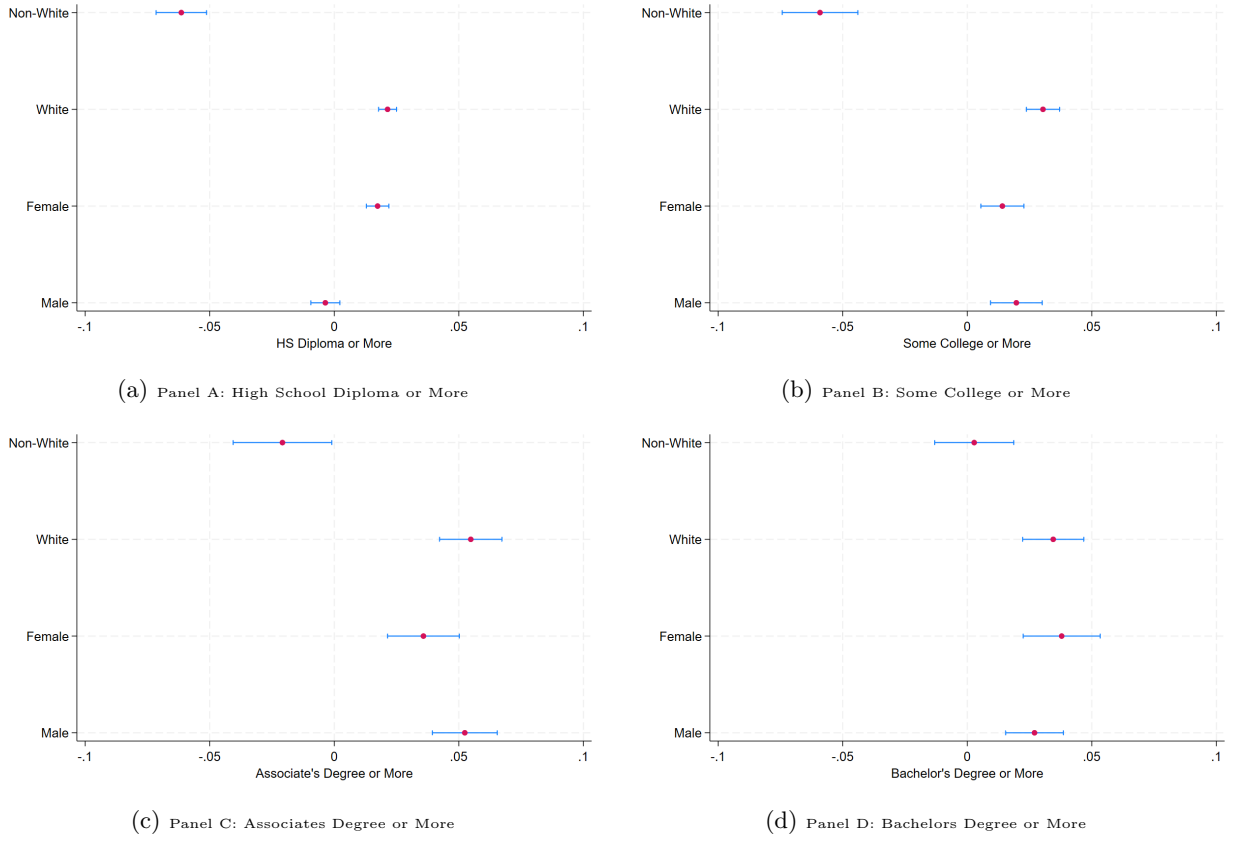
Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

Panel B displays results for exact level of completed schooling. There is a decrease of 1.7 percentage points (5.8%) in high school diplomas as the highest level of education completed for treated cohorts. There is an even larger effect on some college, with a decrease in some college as the highest level of schooling completed of 2.8 percentage points (10.5%). Treated cohorts have an increase in associate’s degrees of 1.2 percentage points (15.2%) and an increase in bachelor’s degrees of 2.4 percentage points (8.6%) compared to comparison state cohorts. A SDID analysis is performed for robustness, and results are consistent with those from the DID analysis, as shown in table A-4.

Heterogeneity There is significant heterogeneity among who is most affected, as shown in Figure 4. In particular, males and white individuals seem to be most impacted by the treatment. Males in treated cohorts experienced a 5.1 percentage point increase in a minimum of associate’s degrees and a 2.5 percentage point in a minimum of bachelor’s degrees, and white individuals experienced a 5.5 percentage point increase in associate’s degree or higher education and a 3.4 percentage point increase in bachelor’s degree or higher education. Women experience smaller effects on a minimum of associate’s degrees of 3.6 percentage points, which appears to be driven primarily by attainment of bachelor’s degrees or more (3.4 percentage points). Non-White individuals do not experience a significant increase in higher education completion.

These findings underscore a critical point about the unequal distribution of benefits from the Tennessee Promise program. While the program has successfully increased educational attainment for both men and women, their experiences with the program’s impact reveal notable gender differences. Specifically, men appear to benefit primarily through increased attainment of associate’s degrees, which may reflect either preferences or structural factors

Figure 4: Heterogeneity Figures - Samples Restricted



Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Outcomes are binary variables that are 1 if the individual reports completing at least that level of education.

Table 3: Triple Difference Education Results

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
Male×TN×After	-0.0222*** (0.0023)	0.0055 (0.0052)	0.0167*** (0.0043)	-0.0112** (0.0046)
White×TN×After	0.0742*** (0.0058)	0.0778*** (0.0090)	0.0691*** (0.0111)	0.0247** (0.0113)
Panel B: Exact Completed Schooling				
Male×TN×After	-0.0078 (0.0052)	-0.0112** (0.0046)	0.0280*** (0.0036)	-0.0175*** (0.0044)
White×TN×After	-0.0778*** (0.0090)	0.0087 (0.0096)	0.0443*** (0.0055)	0.0385*** (0.0095)
N	151,858	151,858	151,858	151,858

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

that lead men to choose shorter-term programs or vocational paths. On the other hand, the gains for women are largely seen in the form of increased bachelor's degree attainment, suggesting that women may be more likely to utilize two-year institutions as a substitute for the first two years of a four-year degree. This divergence could highlight varying aspirations, societal expectations, or differences in career planning between genders, as well as possible systemic factors that influence the types of degrees men and women pursue.

The lack of significant increases in higher educational attainment and decreases in ever beginning higher education for non-White individuals is particularly of note, as it suggests that the program may not be addressing or alleviating the specific challenges that disproportionately affect this group. Structural inequities, such as socioeconomic barriers, unequal access to high-quality K-12 education, or systemic racism, may be preventing Non-White students from fully benefiting from the Tennessee Promise program. Additionally, the 40% increase in community college enrollment following the program's implementation could be having unintended general equilibrium effects, potentially crowding out non-White individuals from accessing these institutions. This displacement suggests that while financial barriers may have been reduced, the Tennessee Promise program might not fully account for capacity constraints or other indirect effects that disproportionately impact non-White students.

These findings suggest that while the Tennessee Promise program is a step in the right direction, further policy measures are needed to ensure its benefits are equitably distributed across all demographic groups. Targeted interventions, such as additional support services or outreach for underrepresented or disadvantaged populations, could help bridge the gap and make higher education more accessible for those who are currently not benefiting as

much from the program. It also calls for a more nuanced understanding of how race, gender, and socioeconomic factors interact with educational policies, and how these policies can be better tailored to meet the diverse needs of the population they serve.

Earnings and Family While we know that increased education generally leads to increased income (Angrist and Krueger, 1991; Card, 1999; Oreopoulos, 2006), the impacts of Tennessee Promise on income are potentially less obvious. However, New Access Enrollees may have previously opted out of higher education due to correctly perceiving that the financial returns on education were low in their particular context, perhaps due to the nature of the local labor market or their personal career prospects. Even with the increased access to education provided by policies like Tennessee Promise, these individuals might not experience a significant boost in income. The policy may open doors to educational opportunities, but if the underlying economic conditions or job market realities haven't changed, the returns on education for this group may remain low, limiting the overall impact on their income levels.

There is in fact an overall positive effect of the program on earnings. Earnings effects are displayed in Table 4. Treated cohorts experience an increase in income of \$1,967 annually compared to comparison cohorts, which appears to be driven by an increase in wage income of \$2,115, or a 5.7% increase in wage income. This overall increase suggests that Tennessee Promise participants, on average, benefit from higher earnings, consistent with previous findings in the literature that link increased education to higher income.

However, these results may mask significant heterogeneity in outcomes among different groups. As noted, New Access Enrollees may have done so based on a rational assessment that the financial returns to education in their specific context were low. For these individuals, the Tennessee Promise policy may enable them to obtain a degree, but this does not guarantee a substantial increase in income if their educational attainment does not align with high-paying job opportunities. Therefore, while there is an average positive effect on income, the program's impact on specific groups may be more limited, particularly in areas with weaker labor markets.

The expected impact of Tennessee Promise on marriage and childbirth are similarly unclear. First, it must be the case that there are individuals who would otherwise marry during the time that they are now enrolled in school in order for there to be any possible effect. Appendix figures A-20 display the percentage of individuals married by ages 18-28 for cohorts prior to the enactment of Tennessee Promise. 8.8% of all individuals in untreated cohorts born in Tennessee were married by age 20, and this rises to 11.3% of individuals with no more than a high school diploma. This indicates that there may indeed be individuals who would marry by age 20 in the absence of Tennessee Promise but delay marriage after treatment. A delay in marriage and childbirth may be due to an incapacitation effect or the

Table 4: Income Results

	Total Income	Log Income	Wage Income	Log Wages
TN*After	1,967*** (474.7)	0.0341 (0.0221)	2,115*** (462.3)	0.0567** (0.0214)
N	151,858	134,460	151,858	125,910

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Table 5: Marriage and Family Results

	Married by Age 20	Married by Age 22	First Child by Age 20	First Child by Age 22
TN*After	-0.0035** (0.0013)	-0.0256*** (0.0019)	-0.0079*** (0.0008)	-0.0092*** (0.0014)
N	151,858	134,684	151,858	134,684

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age "x" is a binary variable that is 1 if age married is less than or equal to "x" and 0 otherwise. Age at first child is constructed by subtracting age of eldest child from the respondent's age. First Child by Age "x" is a binary variable that is 1 if age at first child is less than or equal to "x" and 0 otherwise. Results for age 20 include the full sample because all individuals were at least 20 at time of observation, but results for age 22 are restricted to individuals who were at least age 22 at time of observation.

human capital effect ([Adamecz-Völgyi and Scharle, 2020](#)). The incapacitation effect refers to the possibility that individuals may not have the desire, time, or opportunity to have a child while they are in school. The human capital effect may raise the opportunity cost of marrying or having a child earlier due to an increase in expected wage, leading to delays. However, it is also possible that individuals who see an increase in earnings as a result of increased educational attainment may feel more financially prepared to marry or have children sooner, counteracting the typical trend of increased education delaying these events.

Second order effects related to marriage and family are displayed in Table 5. Compared to individuals in comparison cohorts, individuals in treated cohorts are 0.4 percentage points (4.5%) less likely to be married by age 20 and 2.6 percentage points (13.1%) less likely to be married by age 22. Additionally, individuals in treatment cohorts are 0.8 percentage points (7.5%) less likely to have their first child by age 20 and 0.9 percentage points (5.3%) less likely to have their first child by age 22. Again, these results are consistent with previous findings.

5.4 Robustness

Again, there are potential concerns with including states in various regions of the country in the comparison group, so I employ the DID analysis using only neighboring states in the comparison group. However, because students residing in counties bordering Tennessee were also eligible for Tennessee Promise, this restriction will likely lead to a downward bias in results due to spillover effects. Any individual born in a neighboring state who did take advantage of Tennessee Promise would increase educational attainment in the comparison state following treatment. The results from this analysis can be found in appendix section [A.4](#). The point estimates do tend to be smaller in this analysis but are typically in the confidence interval of results in the main analysis.

In addition to the DID analysis, I perform a synthetic differences-in-differences (SDID) approach, as it combines the strengths of traditional DID and synthetic control methods. SDID chooses comparison group weighting based on similar trends to the treatment unit in the pre-period rather than weighting on similar levels as in traditional synthetic control methods. This is particularly beneficial in this analysis since it is reasonable to assume that not all states will exhibit similar educational trends. The results of this analysis are similar to the main analysis and can be found in appendix section [A.3](#).

A placebo analysis in which the 2013 and 2014 cohorts are considered “treated” is performed as well, and the results are displayed in appendix section [A.5](#). The placebo analyses indicate that there were not prior trends in the pretreatment period that may explain the results found in this paper. Results in the majority of placebo analyses are not statistically significant, although there are significant negative results for associate’s and bachelor’s or more. However, it is important to note that the Tennessee Promise was announced in 2014, so it is unlikely that the policy was designed in response to any declines. Placebo analysis do also indicate slight decreases in income, but these appear to be driven by outliers as the logarithmic results are near zero and insignificant. Finally, marriage results indicate that early marriage and childbirth may have been trending upwards prior to treatment.

Additional robustness checks related to earnings and family can be found in appendix section [A.6](#). Results in table [A-14](#) indicate that individuals are less likely to be “flailing” in their first two years after high school graduation, which is defined as not being enrolled in school or employed. Additionally, treated individuals are less likely to be enrolled in school in 2019, a likely mechanism for increased income. Also, there are near zero changes in income for individuals in treated cohorts who are currently enrolled in school or whose highest level of education is a high school diploma or less. These robustness checks indicate that any increase in income is indeed likely a result of increased education due to Tennessee Promise.

6 2022 Analysis

I then conduct a similar analysis of the effects on the 2015 and 2016 cohorts utilizing data from the 2022 ACS. While this analysis relies on the assumption that COVID-19 affected trends in education, income, and marriage similarly across all states, it still offers valuable insights. If the assumption holds reasonably well, incorporating 2022 data allows us to understand the more medium-run impacts. By examining outcomes in 2022, we can capture a more comprehensive picture of how the program influences participants several years after high school graduation, providing valuable information about its longer-term effectiveness and stability.

Additionally, an analysis using 2022 data allows us to analyze the program’s impact in a different economic and social context, shaped by the ongoing recovery from the COVID-19 pandemic. This period represents a critical juncture for evaluating the medium-run effects of the Tennessee Promise, as participants navigate post-pandemic labor markets and educational environments. Understanding these medium-run outcomes is essential for policymakers to gauge whether the program’s initial benefits translate into sustained improvements in economic mobility and life choices over time, and to identify any adjustments needed to enhance its long-term success.

Educational Attainment I again examine the effects of Tennessee Promise on educational attainment for cohorts anticipated to graduate high school in 2015 and 2016. These individuals would be 24-25 at the time the 2022 ACS data was collected, so the majority of individuals would have completed a degree if they were going to do so directly after graduating high school. Treated cohorts are 2.0 percentage points less likely to have a high school diploma or more, indicating that high school students in Tennessee may have been more harshly affected by the COVID-19 pandemic than students in untreated states. Individuals in treated cohorts are 0.8 percentage points less likely to have ever begun higher education and are 2.7 percentage points less likely to have exactly some college. Results for the percentage of individuals with associate’s degree are persistent, with treated individuals experiencing a 1.3 percentage point increase in associate’s degrees as their final level of education. Treated individuals are also 1.9 percentage points more likely to have an associate’s degree or higher. Individuals in treated cohorts also experience a marginal increase in bachelor’s degree attainment as their minimum level of schooling, although there is no significant impact in bachelor’s degrees as the final level of schooling. There was a significant increase in bachelor’s degrees four years after program implementation, so the lack of an increase seven years after implementation may indicate that the program encouraged individuals to complete a degree more quickly due to the continuous enrollment requirement.

Table 6: Education Results (2022 ACS)

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	-0.0180*** (0.0019)	-0.0045*** (0.0033)	0.0199*** (0.0033)	0.0053 (0.0039)
Panel B: Exact Completed Schooling				
TN*After	0.0045 (0.0033)	-0.0245*** (0.0027)	0.0146*** (0.0020)	0.0036 (0.0041)
N	156,580	156,580	156,580	156,580

Notes: Standard errors are clustered at the state level. Data is from the 2022 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

Table 7: Income Results (2022 ACS)

	Total Income	Log Income	Wage Income	Log Wages
TN*After	2,617*** (514.0)	0.0260** (0.0124)	3,080*** (513.0)	0.0627*** (0.0131)
N	225,181	198,474	225,181	184,053

Notes: Standard errors are clustered at the state level. Data is from the 2022 ACS extracted from IPUMS. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Earnings and Family Seven years after program implementation, treated individuals continue to experience increases in income. Total income increased by \$1,967 annually, which is driven by increases in wage income of \$2,115 annually, or 5.7%. Treatment individuals are 0.3 percentage points less likely to be married by age 23, although these results are not statistically significant, and they are 1.3 percentage points (3.7%) more likely to be married by age 25. This indicates that Tennessee Promise likely did not prevent marriage but only delayed it. Individuals are also 0.1 percentage points less likely to have their first child by age 23, although again these results are not statistically significant, and 1.5 percentage points (5.9%) less likely to have their first child by age 25.

7 Conclusion

In this paper, I study a significant policy intervention aimed at improving educational attainment in Tennessee. By offering last-dollar scholarships to cover tuition and fees at two-year institutions, Tennessee Promise has successfully increased associate's degree attainment

Table 8: Marriage and Family (2022 ACS)

	Married by Age 23	Married by Age 25	First Child by Age 23	First Child by Age 25
TN*After	-0.0030 (0.0023)	0.0133*** (0.0025)	-0.0011 (0.0019)	-0.0152*** (0.0025)
N	156,580	140,222	156,580	140,222

Notes: Standard errors are clustered at the state level. Data is from the 2022 ACS extracted from IPUMS. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age “x” is a binary variable that is 1 if age married is less than or equal to “x” and 0 otherwise. Age at first child is constructed by subtracting age of eldest child from the respondent’s age. First Child by Age “x” is a binary variable that is 1 if age at first child is less than or equal to “x” and 0 otherwise.

by 1.2 percentage points and bachelor’s degree attainment by 2.4 percentage points within four years of implementation for the 2015 and 2016 high school graduate cohorts. These results suggest that the program effectively reduces financial barriers to education, particularly for marginal students who might not otherwise have attended college.

Moreover, the program has generated notable economic and social impacts. Increased educational attainment correlates with higher wage income, with treated cohorts experiencing a wage increase of 5.7% four years after high school graduation. Additionally, the program appears to influence life choices beyond education and income; it is associated with delayed marriage and childbirth, reflecting potential shifts in social behavior among the affected cohorts. These findings provide broader evidence that educational financial aid programs, particularly those targeting two-year institutions, can have significant and sustained impacts on both education and socioeconomic outcomes.

While the Tennessee Promise program’s effects on associate degree attainment have remained stable seven years after its introduction, its impact on bachelor’s degree attainment appears to diminish over time. This suggests that while the program effectively supports students in completing two-year degrees, its influence on bachelor’s degrees may operate more through decreasing time to degree completion. However, it is important to note that the lack of a decrease in bachelor’s attainment while increasing associate’s attainment is in itself a success of the program. Furthermore, there is evidence of heterogeneous effects, with more significant impacts observed among certain demographic groups, such as males and white individuals, highlighting the need for further research into the program’s distributional impacts.

Overall, the evidence from the Tennessee Promise program offers valuable insights for policymakers considering similar tuition assistance programs in other states or at the national level. While the program demonstrates that targeted financial aid can enhance educational attainment and economic outcomes, it also underscores the importance of ongoing support and complementary policies to ensure equitable benefits across all demographic groups and

sustain improvements in higher education attainment over the longer term.

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Table A-1: State Sample Exclusions

State	Program Name	Year Enacted
South Dakota	Build Dakota Scholarship	2015
Oregon	Oregon Promise Program	2016
Arkansas	Arkansas Future Grant	2017
California	California College Promise Program	2017
Hawaii	Hawaii Promise Program	2017
Kentucky	Work Ready Kentucky	2017
New York	Excelsior Ever Upward	2017
Rhode Island	Rhode Island Promise	2017
Montana	Montana Promise Grant	2018
Nevada	Nevada Promise Scholarship	2018
Connecticut	Pledge to Advance Connecticut	2019
Maryland	Maryland Community College Promise Scholarship	2019
New Jersey	Community College Opportunity Grant	2019

Appendix

A.1 State Classification

Table A-1 includes all states not included in the sample and lists the program they enacted during the study period. These programs may have altered educational trends in the state, and thus they are excluded from the sample. The programs vary in requirements for eligibility, with some restricted to certain degrees or certificates or prioritizing low income students.

A.2 Current State of Residence Analysis

In my main analysis, I determine treatment status using birthplace rather than current state of residence. In this section, I perform an analysis using current state of residence to determine treatment status to help test whether results are consistent across varying assumptions. If the conclusions drawn from both methods are similar, this suggests that results are robust and not sensitive to how treatment is defined, which provides stronger confidence that Tennessee Promise had a genuine effect on educational attainment. Results from this analysis are displayed in table A-2 and are similar to results in the main analysis.

A.3 Synthetic DID Estimation

I consider a more flexible identification strategy and employ the synthetic difference in differences estimator developed by Arkhangelsky et al. (2021). This estimator still relies on the parallel trends assumption of the traditional DID but reweights and matches on pre-exposure trends like a synthetic control method. This allows me to emphasize states that are most similar to Tennessee in the pre-periods. In this estimator, unit weights are designed such that the average outcome for the treated units in the pre-period is approximately parallel to the weighted average for control units, and time weights are designed so that the average posttreatment outcome for each of the control units differs by a constant from the weighted average of the pretreatment outcomes for the same control units. However, this estimation

Table A-2: Education Results (Current State of Residence)

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	0.0077 (0.0048)	0.0011 (0.0141)	0.0317** (0.0124)	0.0208 (0.0147)
Panel B: Exact Completed Schooling				
TN*After	-0.0011 (0.0141)	-0.0305*** (0.0109)	0.0108 (0.0074)	0.0181 (0.0165)
N	151,858	151,858	151,858	151,858

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

Table A-3: Graduation Rates and Degree Conferral - SDID Point Estimates

	Total Graduation Rate	Log(Associates)	Log(Certificates)
TN*After	0.0030 (0.0214)	0.1674** (0.0782)	-0.2215 (0.2413)
N	340	340	340

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Total graduation rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort. Certificates are the sum of all certificates of two but less than four years, one but less than two years, and less than one year that were conferred in a given year.

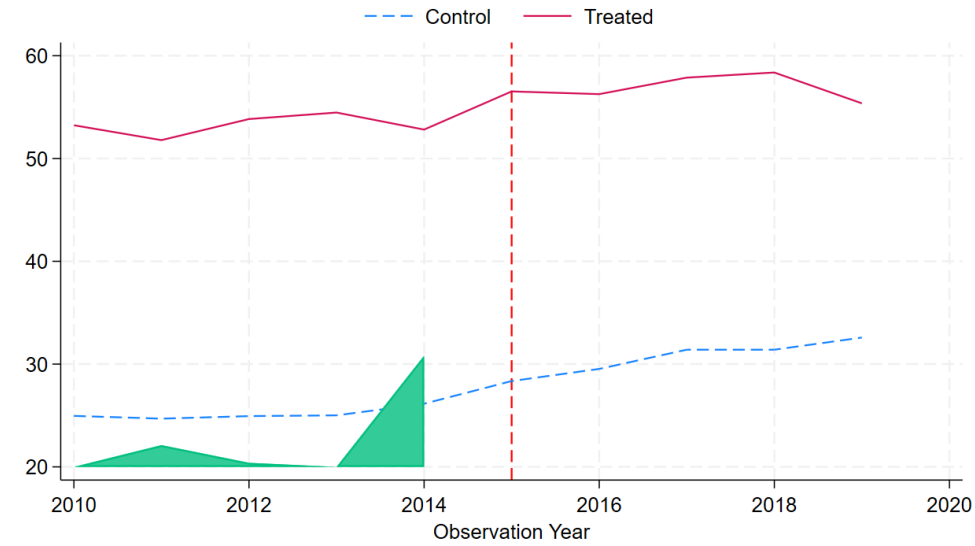
does provide less precise estimates than my standard DID estimation, likely due to there being little systematic heterogeneity in outcomes by either state or cohort.

As in the synthetic control method, observations are collapsed to the state-cohort level for this methodology. The methodology begins by finding weights $\hat{\omega}^{sdid}$ that align pre-treatment trends in the outcome of the unexposed states with those for Tennessee and time weights $\hat{\lambda}^{sdid}$ that balance pre-treatment cohorts with posttreatment ones. The weights chosen by the SDID algorithm are displayed along with the graphical results for each analysis. A larger circle indicates that the state is weighted more heavily in the analysis. Then these weights are used in a basic two-way fixed effects regression to estimate the average causal effect of the treatment in this setting with 37 states and 7 cohorts is:

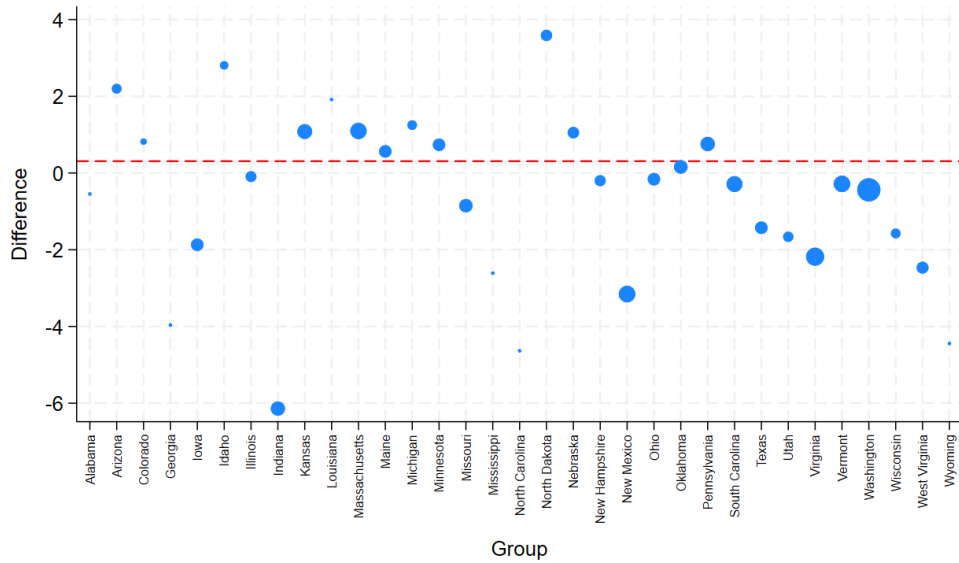
$$(\hat{\beta}^{sdid}, \hat{\alpha}, \hat{\gamma}, \hat{\delta}, \hat{\mu}) = \arg \min_{\beta, \alpha, \gamma, \delta, \mu} \left\{ \sum_{s=1}^{37} \sum_{c=2010}^{2016} (Y_{sc} - \alpha - \beta * TN * After_{sc} - \gamma X_{sc} - \delta_c - \mu_s)^2 \hat{\omega}^{sdid} \hat{\lambda}^{sdid} \right\} \quad (3)$$

Results for graduation rate and degree conferrals can be found in table A-3. Interestingly, the SDID analysis indicates no increase in graduation rate, but also does not indicate a decrease either. Therefore, we should still expect to observe an increase in degree conferrals. This is indeed the case, as associate's degree conferrals increase by 16.7%. Similar to the

Figure A-1: SDID Results - Graduation Rates



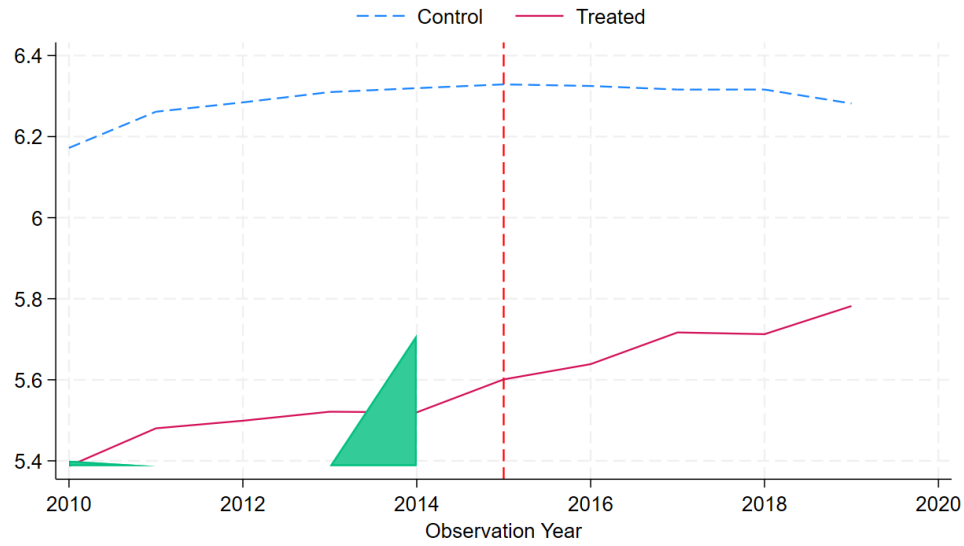
(a) Panel A: Total Graduation Rate



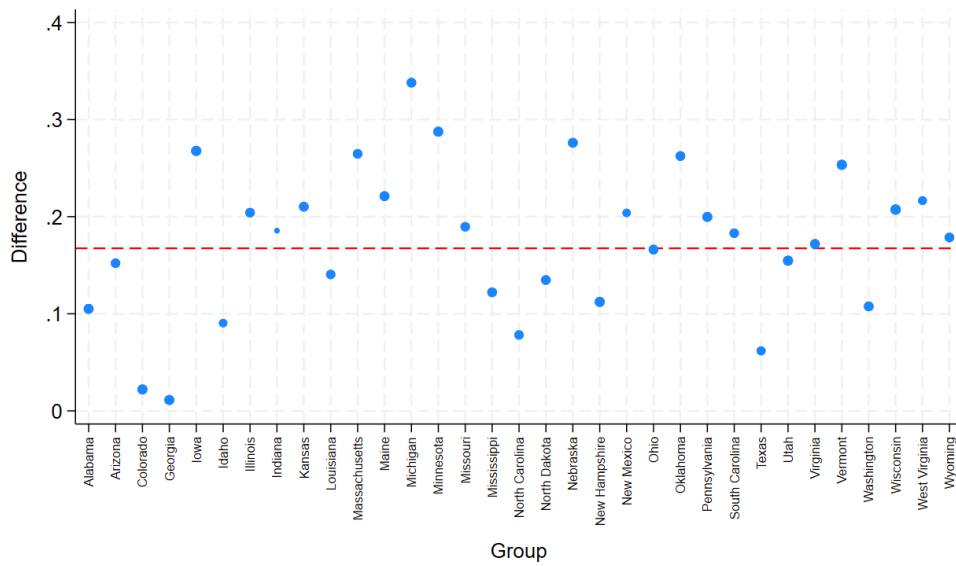
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Total graduation rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort.

Figure A-2: SDID Results - Log(Associate's Degrees Conferred)



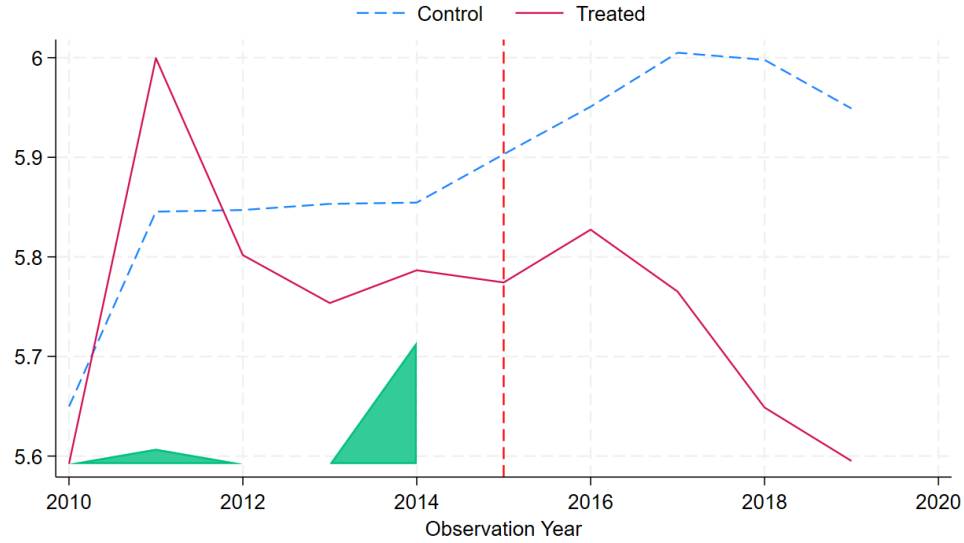
(a) Panel A: Log(Associate's Degrees Conferred)



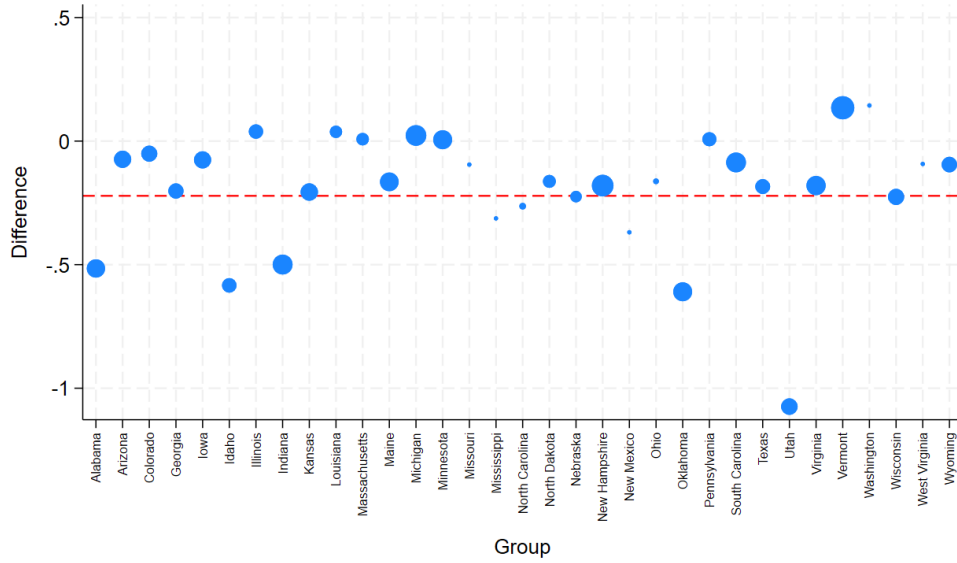
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset.

Figure A-3: SDID Results - Log(Certificates Conferred)



(a) Panel A: Log(Certificates Conferred)



(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Certificates are the sum of all certificates of two but less than four years, one but less than two years, and less than one year that were conferred in a given year.

Table A-4: SDID Education Results

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	0.0086 (0.0153)	0.0064 (0.0365)	0.0404 (0.0512)	0.0169 (0.0487)
Panel B: Exact Completed Schooling				
TN*After	-0.0064 (0.0365)	-0.0118 (0.0447)	0.0121 (0.0455)	0.0182 (0.0402)
N	259	259	259	259

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

DID analysis, the SDID analysis indicates a decrease in certificate conferral, although these results are not statistically significant.

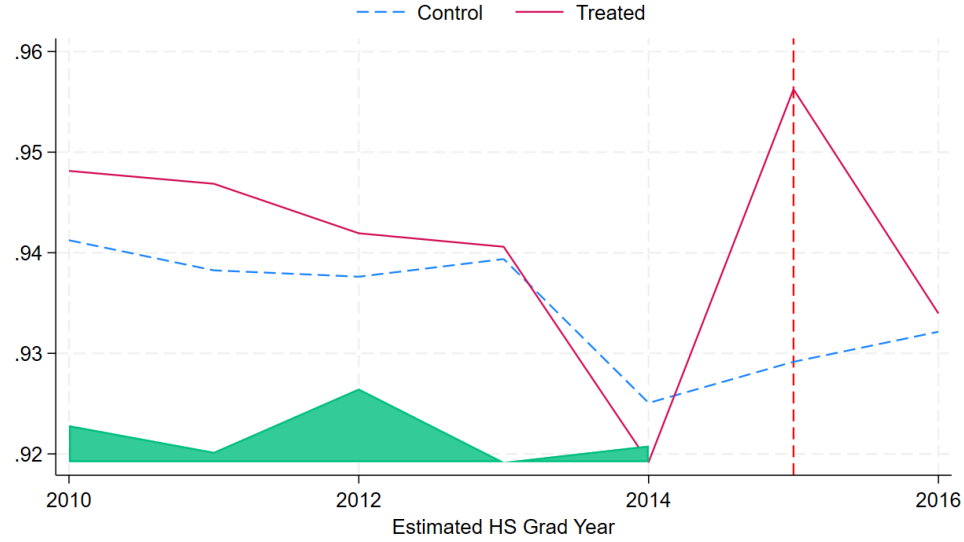
The educational attainment results from the SDID analysis can be found in Table A-4 and are presented in the same format as the DID results. While the results lack power, the point estimates are similar to those found in the DID analysis. There are small increases in a minimum of high school diploma and some college of 0.86 and 0.64 percentage points respectively. Similarly, there are decreases in a high school diploma and some college as the terminal level of schooling of 0.64 and 1.18 percentage points, as shown in Panel B. There are larger but still insignificant increases in a minimum of associate's and bachelor's degrees of 4.04 percentage points and 1.69 percentage points, which correspond to increases in associate's and bachelor's degrees as the terminal degree of 1.21 percentage points and 1.82 percentage points.

The educational attainment results from the SDID analysis can be found in Table A-4 and are presented in the same format as the DID results. While the results lack power, the point estimates are similar to those found in the DID analysis. There are small increases in a minimum of high school diploma and some college of 0.86 and 0.64 percentage points respectively. Similarly, there are decreases in a high school diploma and some college as the terminal level of schooling of 0.64 and 1.18 percentage points, as shown in Panel B. There are larger but still insignificant increases in a minimum of associate's and bachelor's degrees of 4.04 percentage points and 1.69 percentage points, which correspond to increases in associate's and bachelor's degrees as the terminal degree of 1.21 percentage points and 1.82 percentage points.

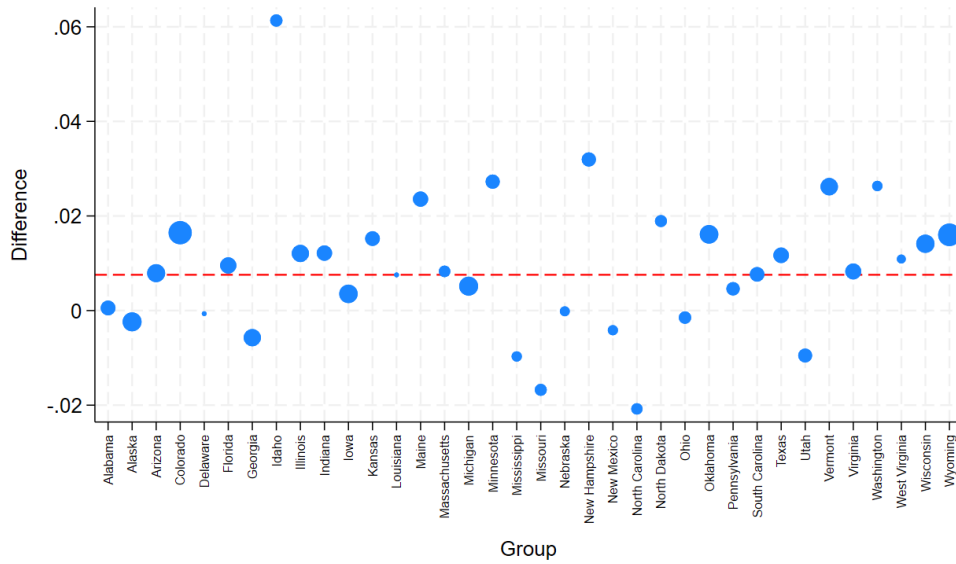
Results for income can be found in table A-5, and again point estimates are similar to those found in the DID analysis. Finally, table A-6 displays SDID results for marriage and childbirth, and results are consistent with the DID analysis. Although results from the SDID analysis are mostly statistically insignificant due to the large standard errors, the point estimates are notably very similar to the estimates found in the DID analysis. Therefore, this analysis serves as indication of the robustness of the DID results.

Results for income can be found in table A-5, and again point estimates are similar to those found in the DID analysis. Finally, table A-6 displays SDID results for marriage

Figure A-4: SDID Results - High School Diploma or More



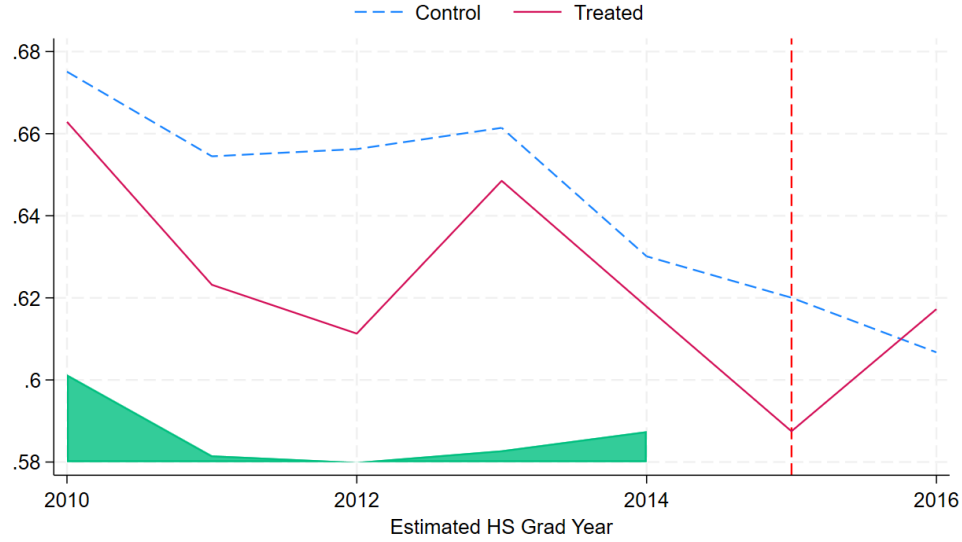
(a) Panel A: High School Diploma or More



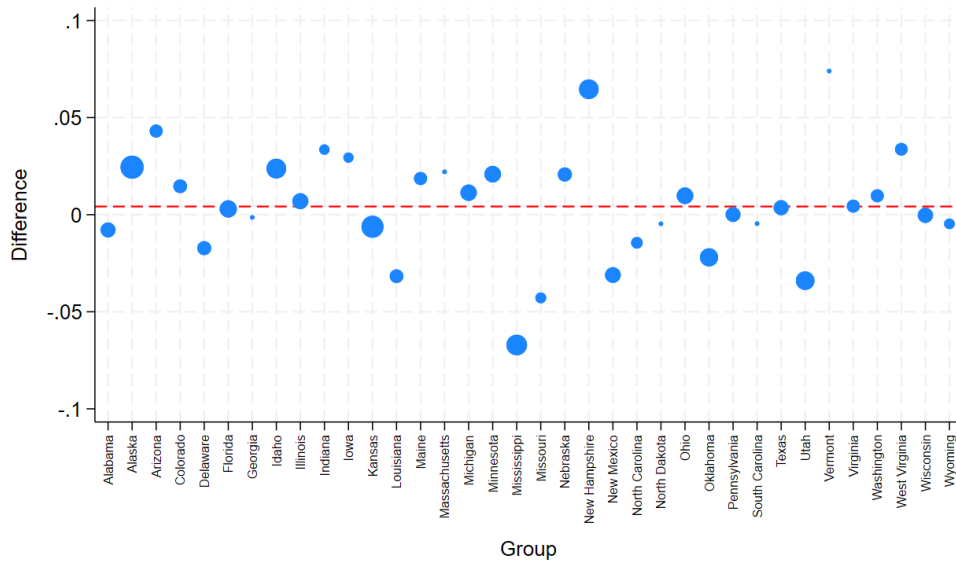
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. High School or More is a binary variable that is 1 if the individual reports completing at least a high school education.

Figure A-5: SDID Results - Some College or More



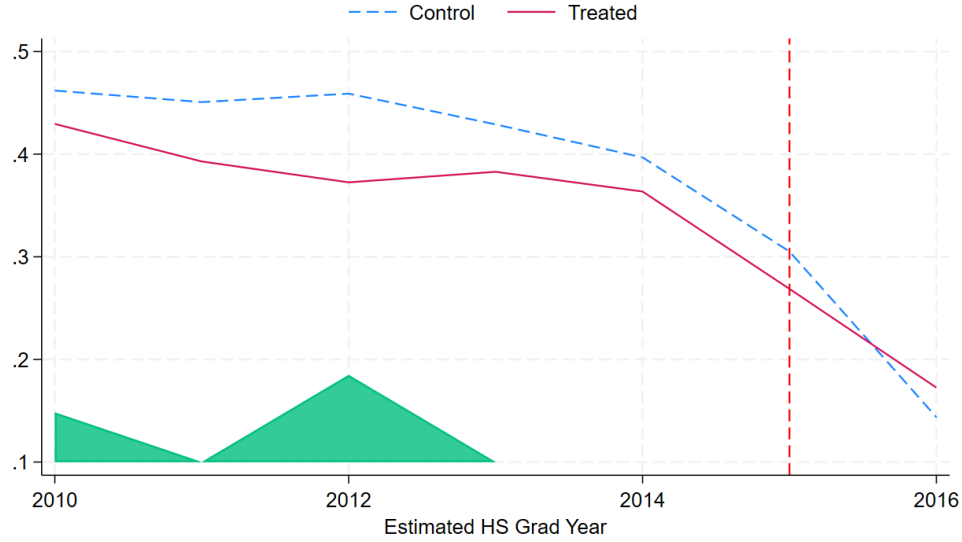
(a) Panel A: Some College or More



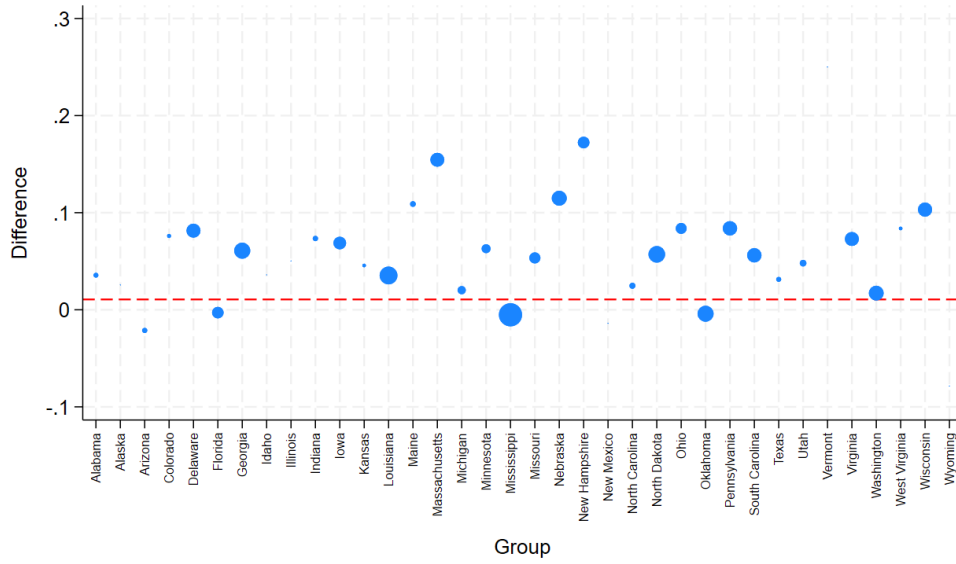
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Some College or More is a binary variable that is 1 if the individual reports completing at least some college.

Figure A-6: SDID Results - Associate's Degree or More



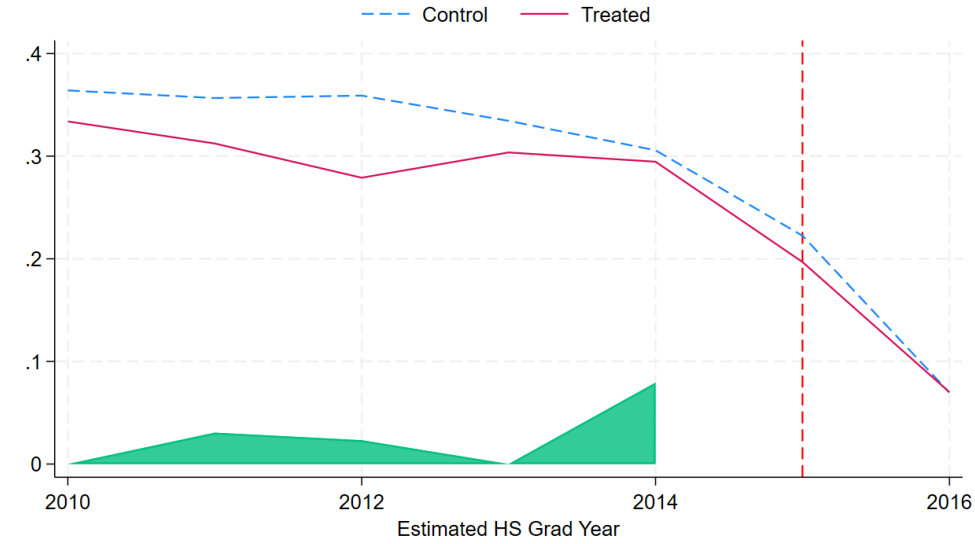
(a) Panel A: Associate's Degree or More



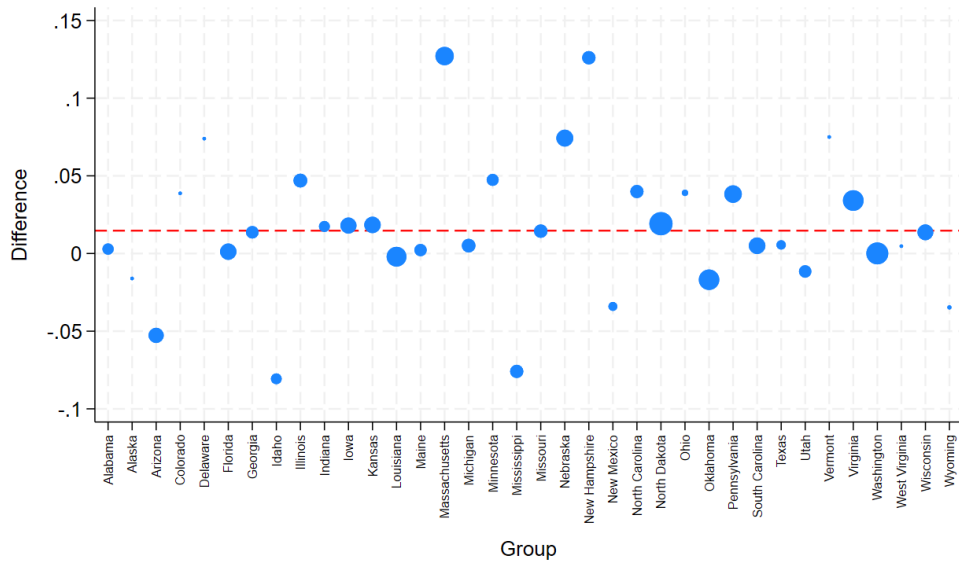
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Associate's Degree or More is a binary variable that is 1 if the individual reports completing at least an associate's degree.

Figure A-7: SDID Results - Bachelor's Degree or More



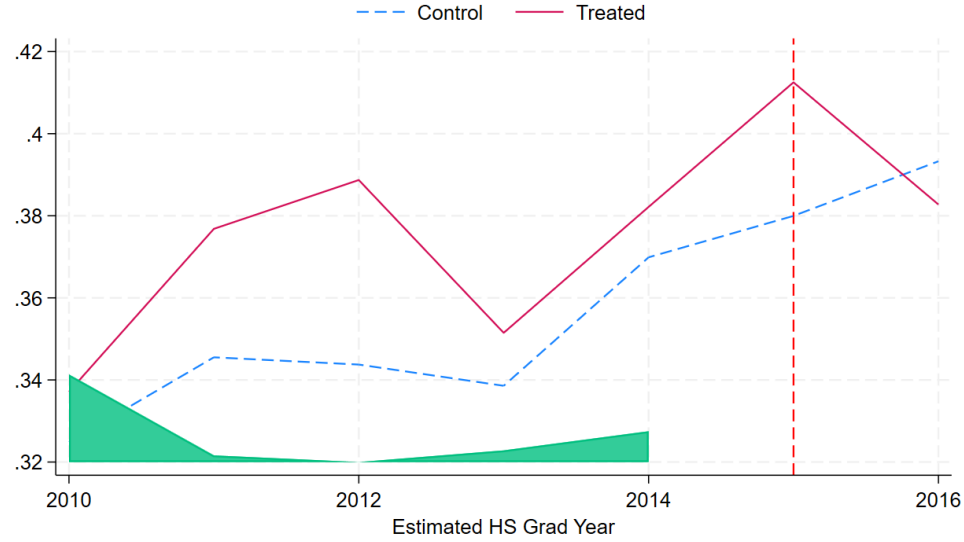
(a) Panel A: Bachelor's Degree or More



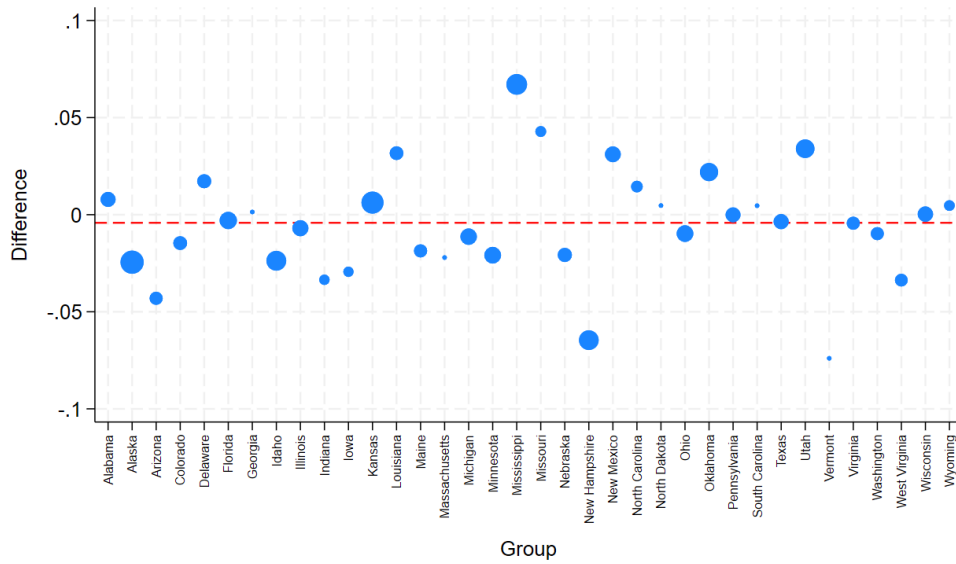
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Bachelor's Degree or More is a binary variable that is 1 if the individual reports completing at least a bachelor's degree.

Figure A-8: SDID Results - High School Diploma or Less



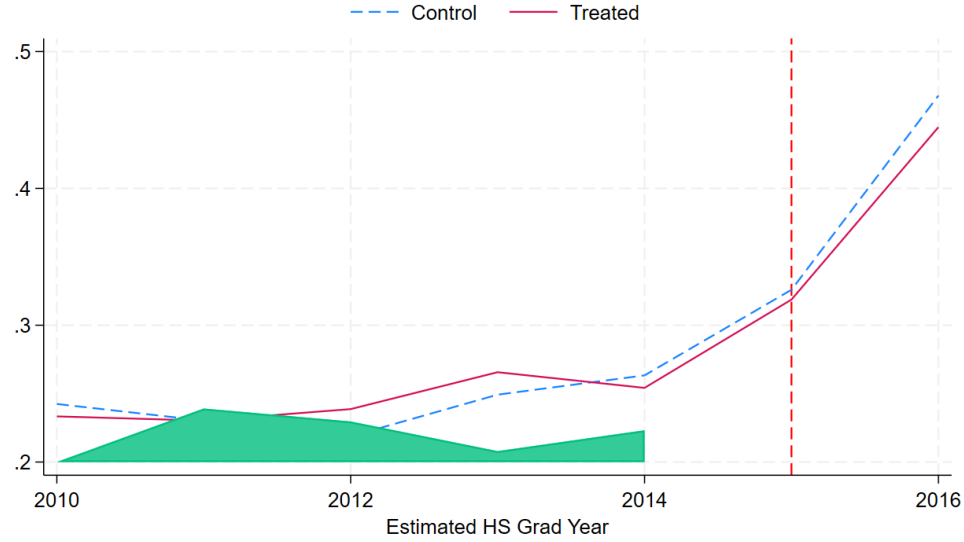
(a) Panel A: High School Diploma or Less



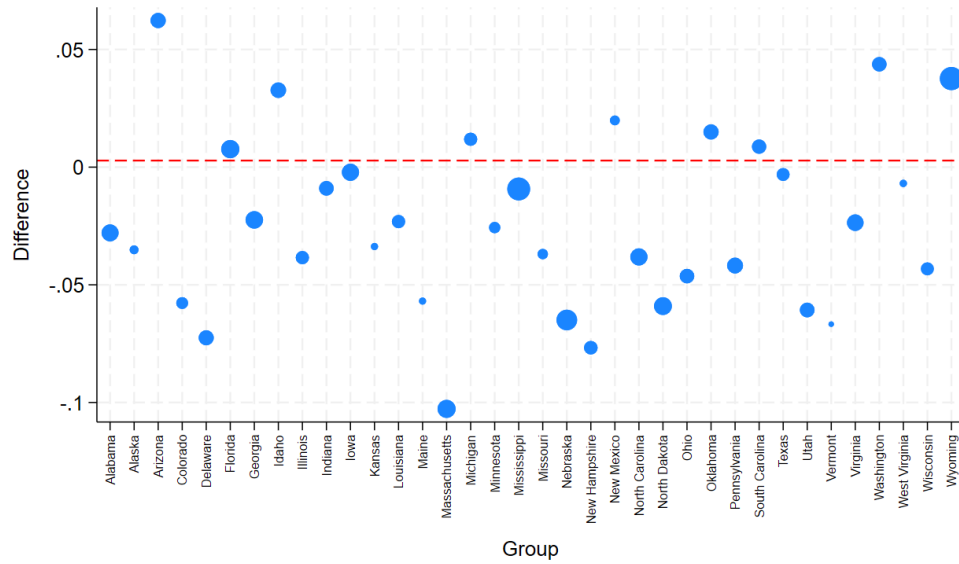
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. High School Diploma or Less is a binary variable that is 1 if the individual reports completing no more than a high school education.

Figure A-9: SDID Results - Some College



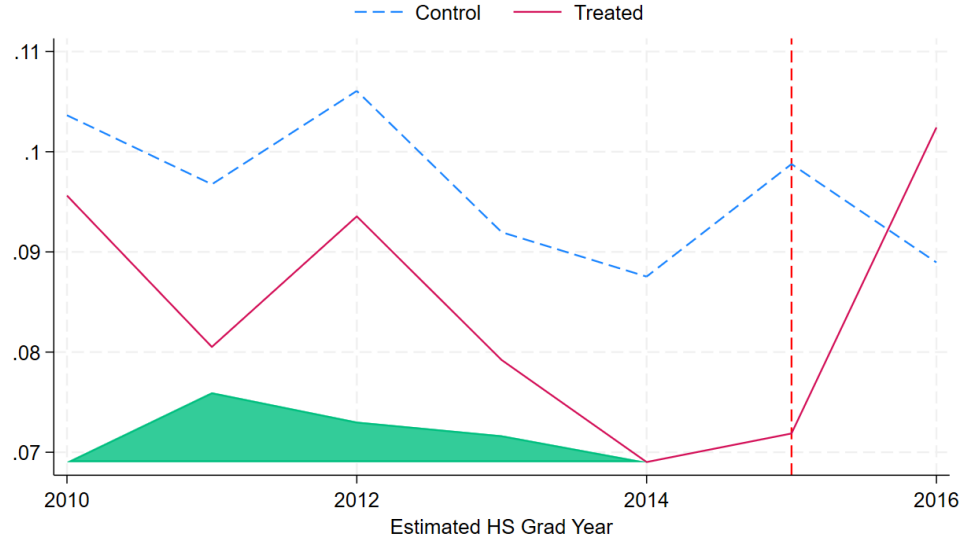
(a) Panel A: Some College



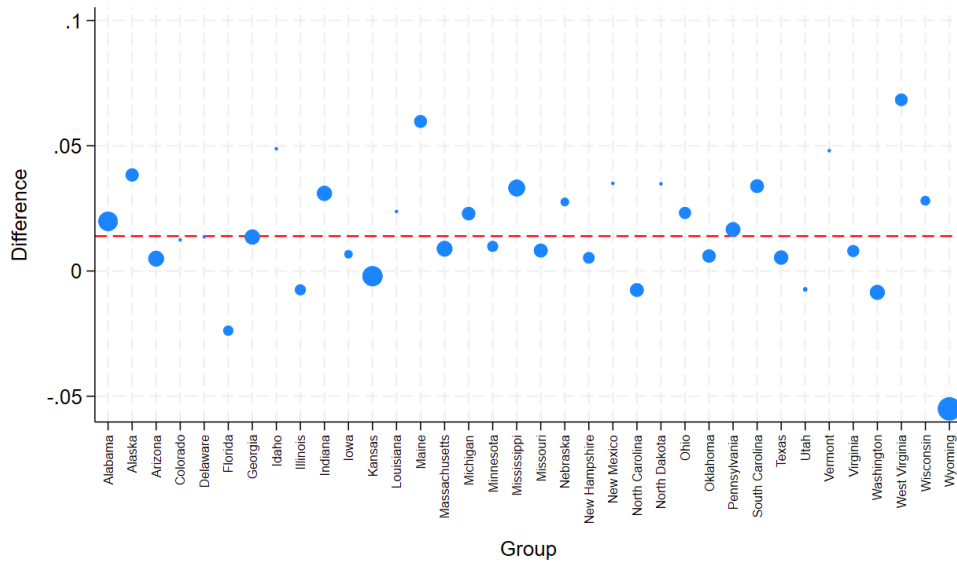
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Some College is a binary variable that is 1 if the individual reports some college as their highest level of education completed.

Figure A-10: SDID Results - Associate's Degrees



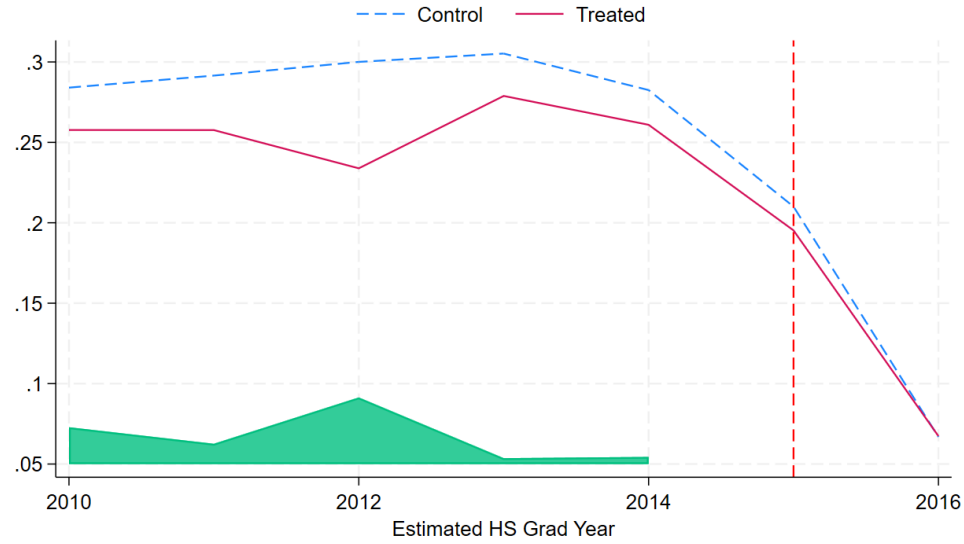
(a) Panel A: Associate's Degrees



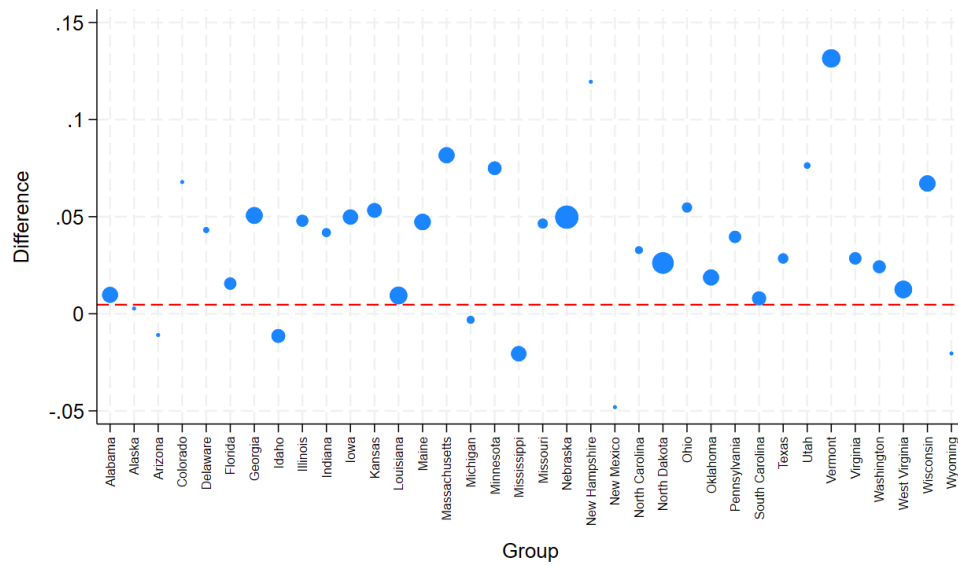
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Associate's Degree is a binary variable that is 1 if the individual reports an associate's degree as their highest level of education completed.

Figure A-11: SDID Results - Bachelor's Degrees



(a) Panel A: Bachelor's Degrees



(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. Bachelor's Degree is a binary variable that is 1 if the individual reports a bachelor's degree as their highest level of education completed.

Table A-5: Income - SDID Point Estimates

	Total Income	Log(Total Income)	Wage Income	Log(Wage Income)
TN*After	1,670 (3,090)	0.0250 (0.1073)	1,760 (2,800)	0.0377 (0.1039)
N	259	259	259	259

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Table A-6: Marriage and Family - SDID Point Estimates

	Married by Age 20	Married by Age 22	First Child by Age 20	First Child by Age 22
TN*After	-0.0051 (0.0178)	-0.0245 (0.0167)	-0.0175* (0.0097)	-0.0201 (0.0167)
N	259	259	259	259

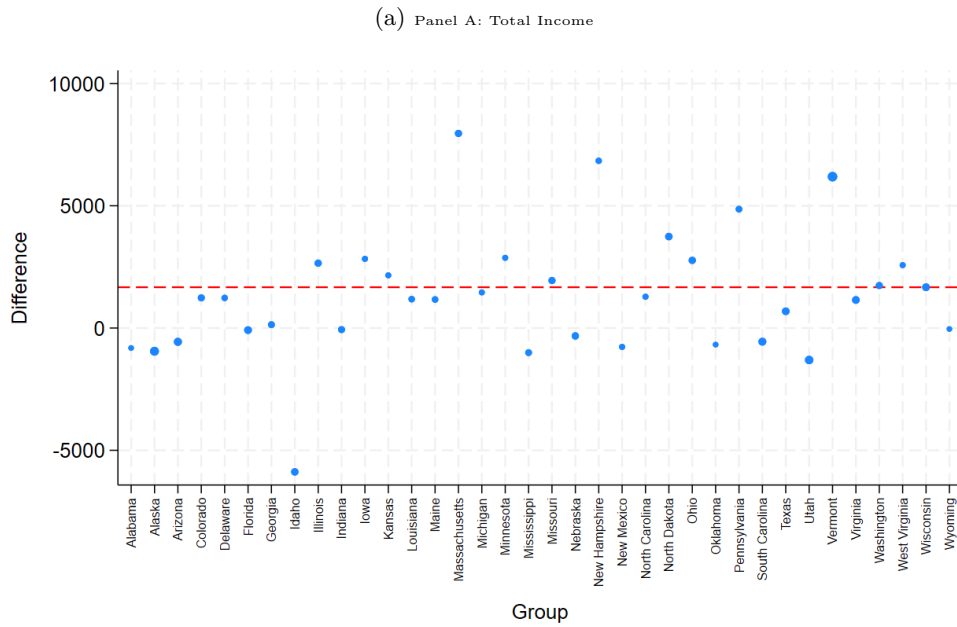
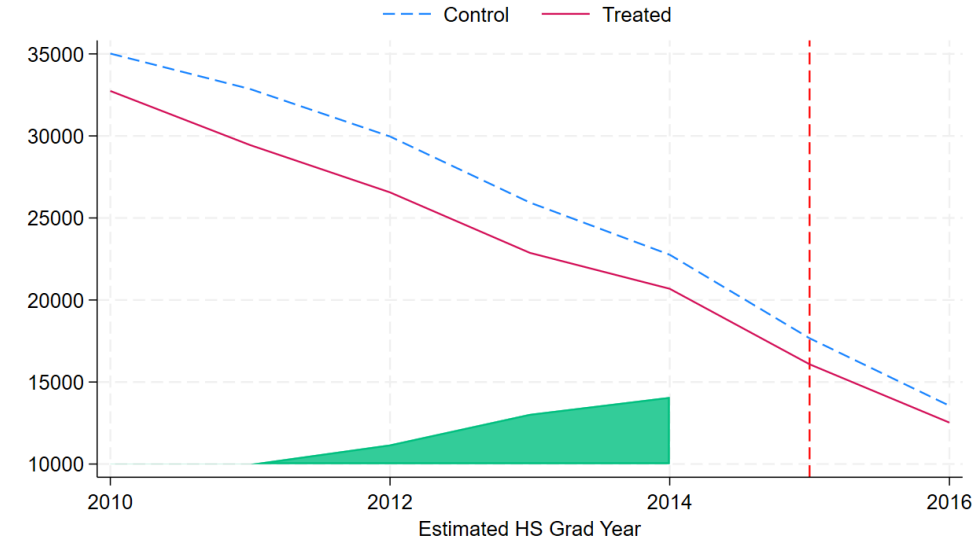
Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age "x" is a binary variable that is 1 if age married is less than or equal to "x" and 0 otherwise. Age at first child is constructed by subtracting age of eldest child from the respondent's age. First Child by Age "x" is a binary variable that is 1 if age at first child is less than or equal to "x" and 0 otherwise. Results for age 20 include the full sample because all individuals were at least 20 at time of observation, but results for age 22 are restricted to individuals who were at least age 22 at time of observation.

and childbirth, and results are consistent with the DID analysis. Although results from the SDID analysis are mostly statistically insignificant due to the large standard errors, the point estimates are notably very similar to the estimates found in the DID analysis. Therefore, this analysis serves as indication of the robustness of the DID results.

A.4 Neighboring States

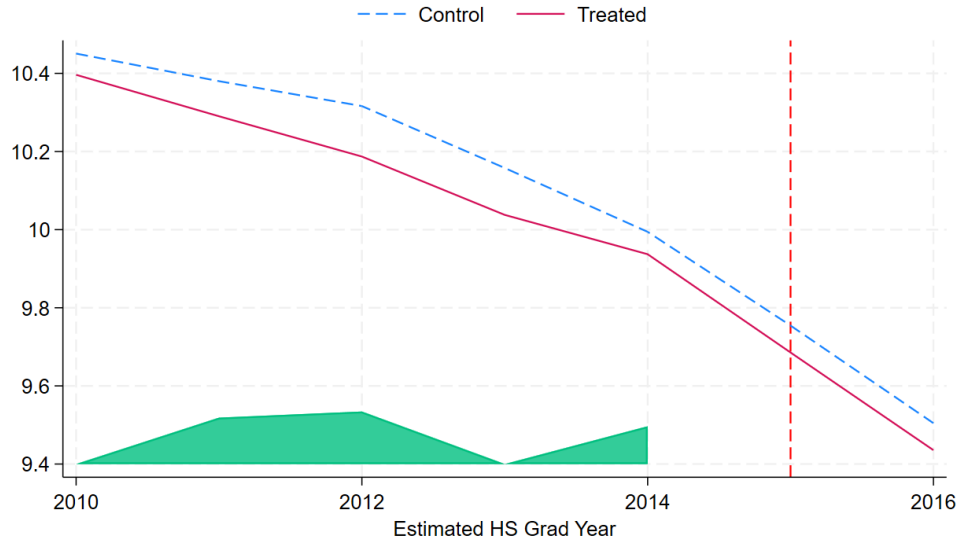
Following Dynarski (2000) and Nguyen (2020), among others, I replicate results with a DID approach using only states that border Tennessee as comparison units. The donor states are Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Although Arkansas and Kentucky also border Tennessee, they are excluded from the analysis as they enacted some form of large-scale financial aid program during the study period. States that border a treatment state are more likely to be similar to the treatment state in various dimensions (such as economic conditions, demographics, culture, and policy environment) compared to states that are farther away, so the limitation to neighboring states may provide a more reasonable counterfactual. However, students residing in counties bordering Tennessee were also eligible for Tennessee Promise. Therefore, there is likely some bias on results in this analysis due to spillover effects in the comparison states. As discussed in Section 4, the expected direction of the bias on institution-level results is unclear, but results

Figure A-12: SDID Results - Total Income

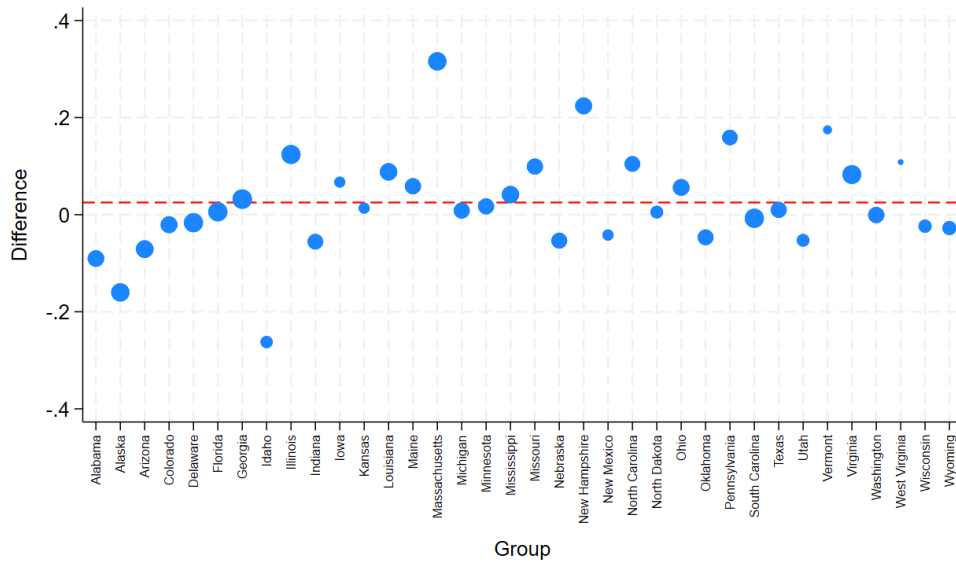


Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars.

Figure A-13: SDID Results - Log(Total Income)



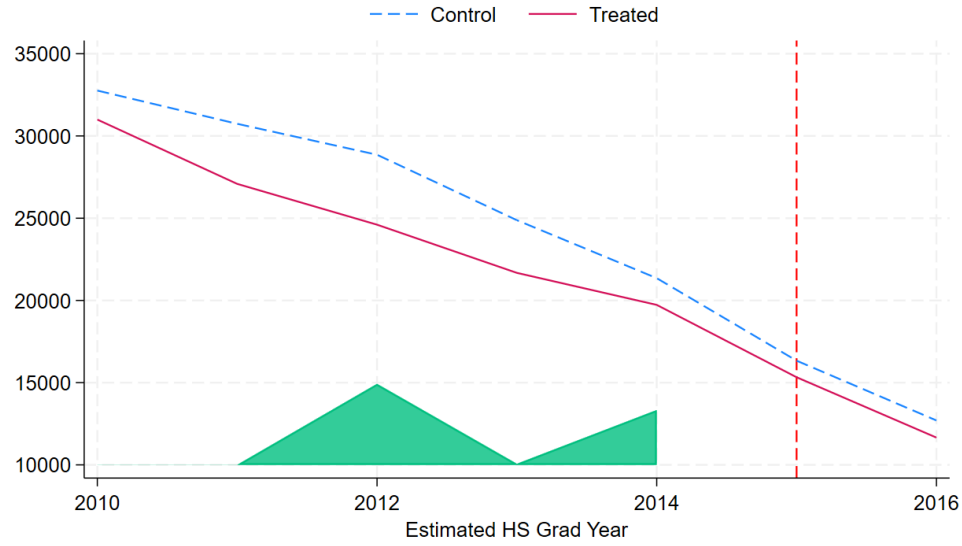
(a) Panel A: Log(Total Income)



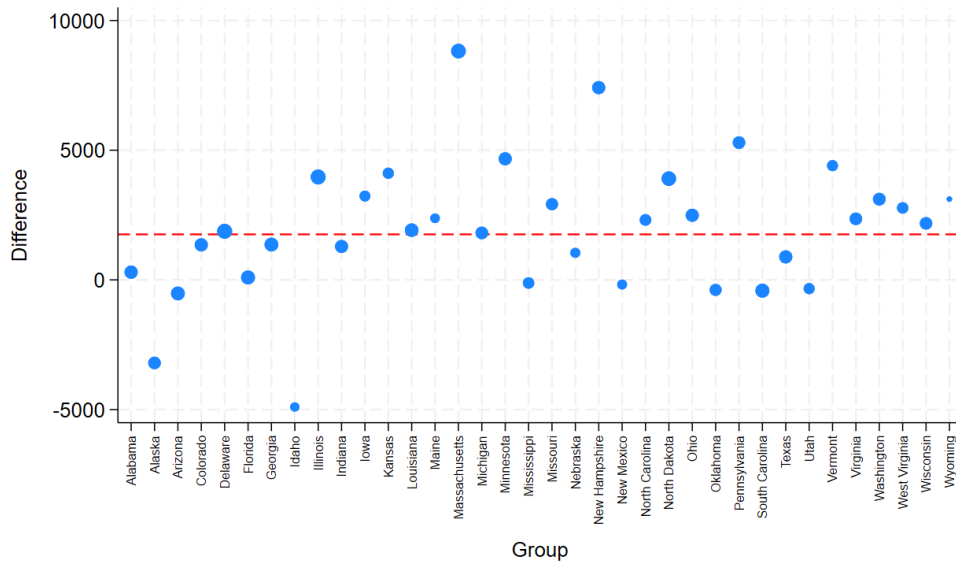
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars.

Figure A-14: SDID Results - Wage Income



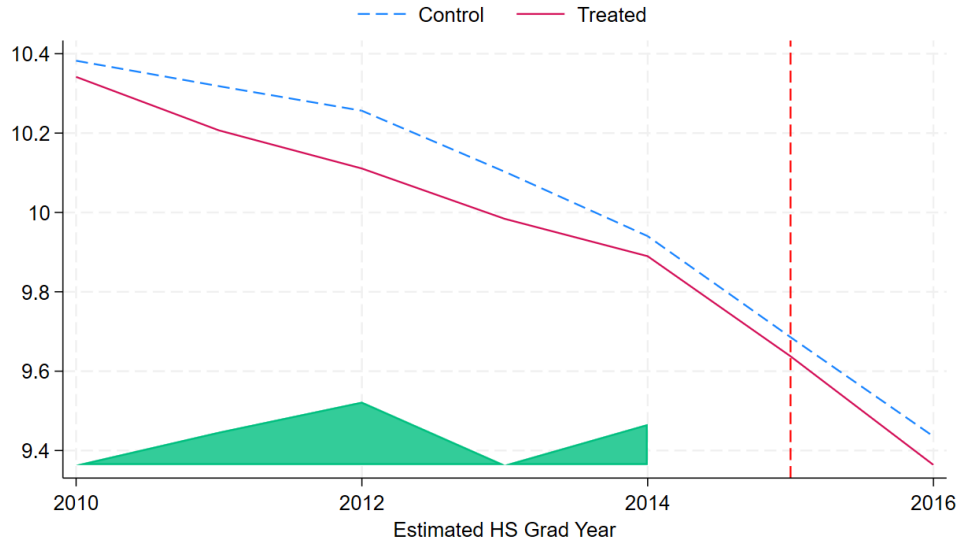
(a) Panel A: Wage Income



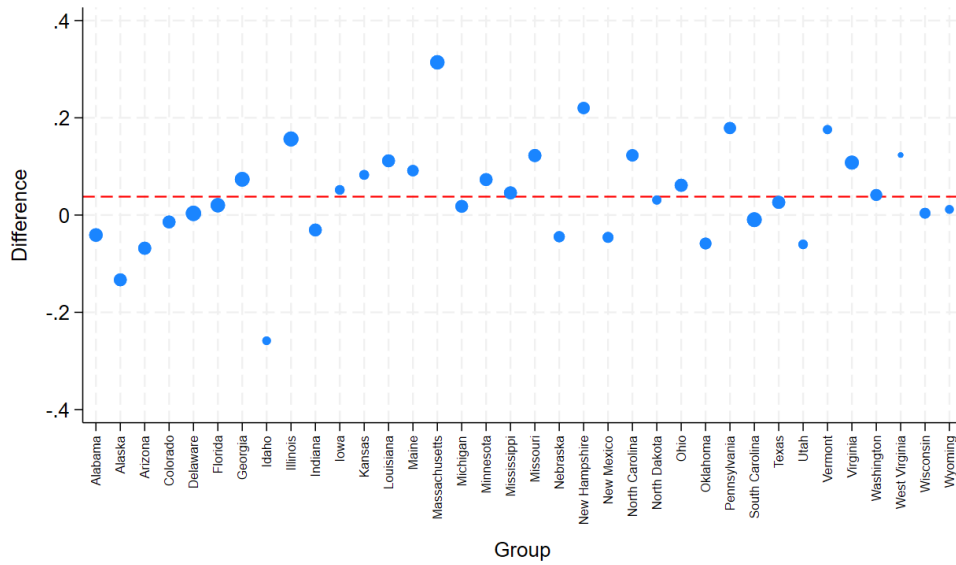
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Figure A-15: SDID Results - Log(Wage Income)



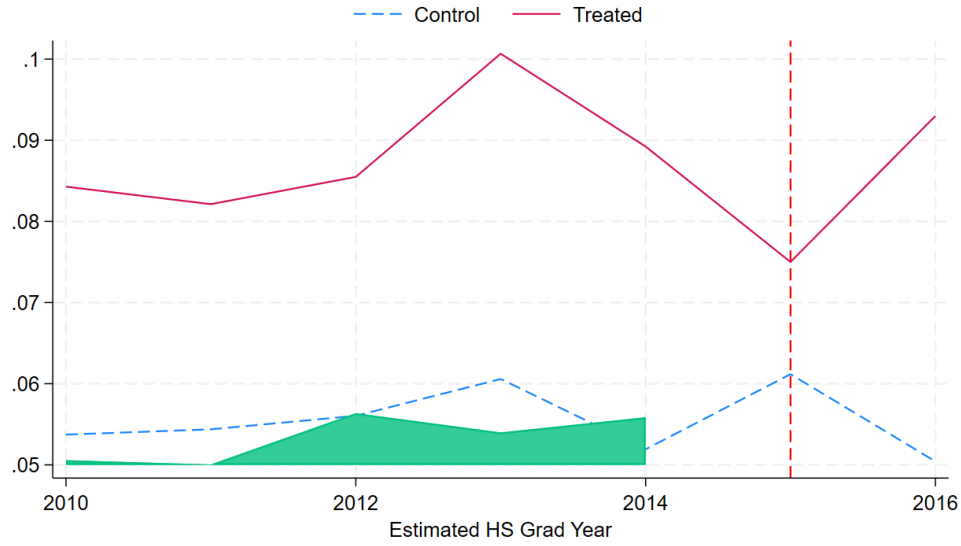
(a) Panel A: Log(Wage Income)



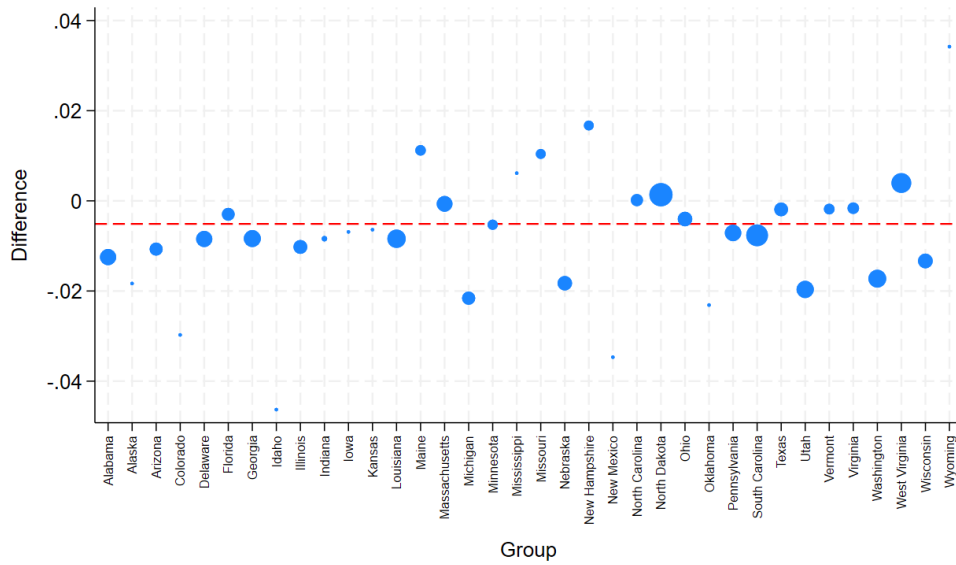
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Figure A-16: SDID Results - Married by Age 20



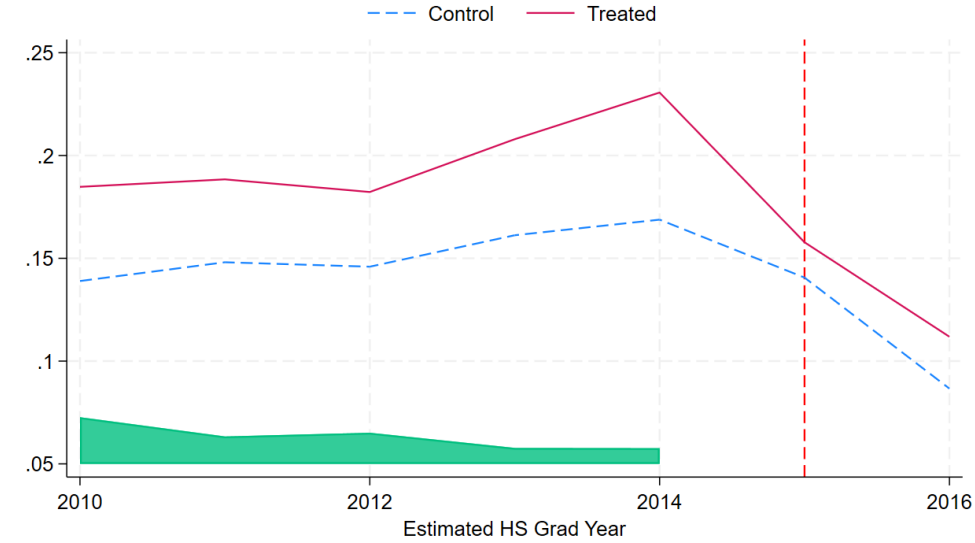
(a) Panel A: Married by Age 20



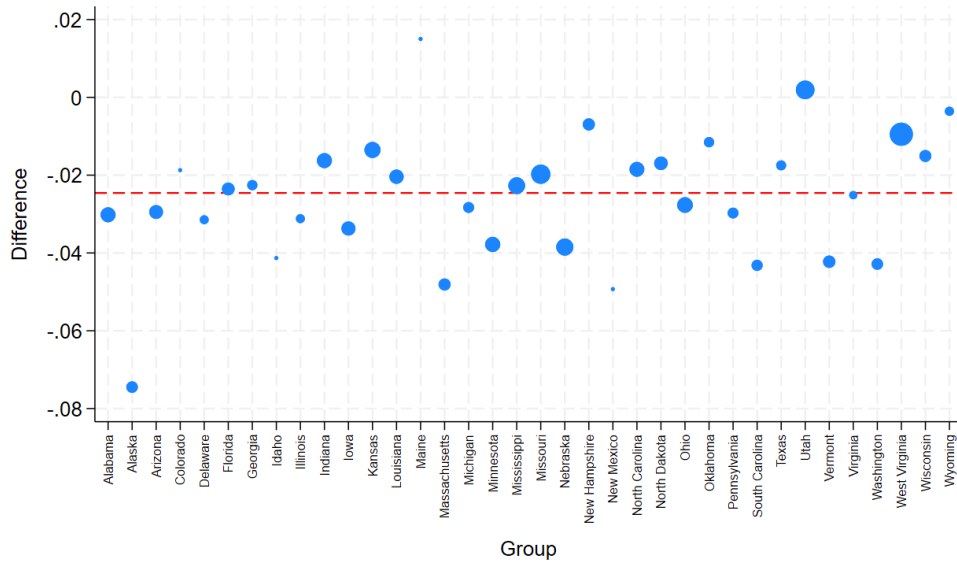
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age 20 is a binary variable that is 1 if age married is less than or equal to 20 and 0 otherwise.

Figure A-17: SDID Results - Married by Age 22



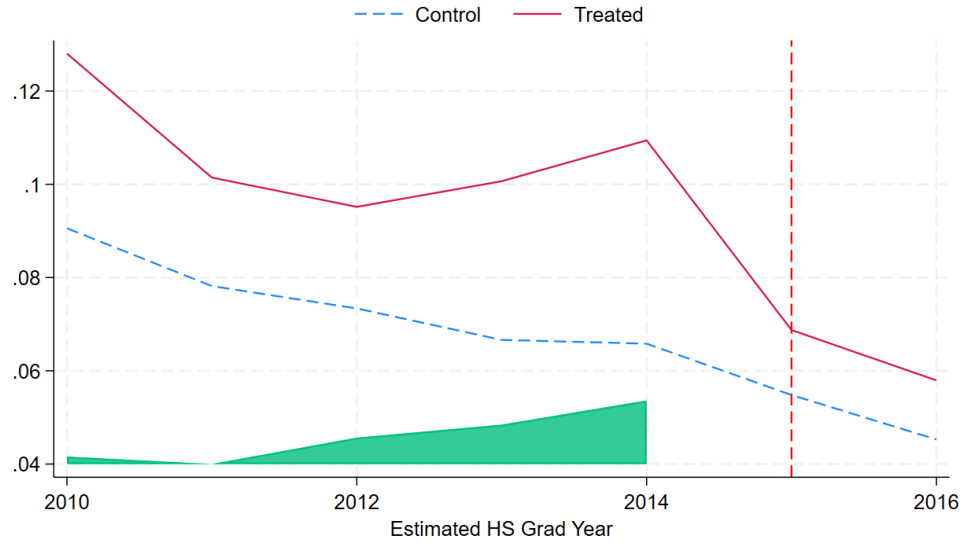
(a) Panel A: Married by Age 22



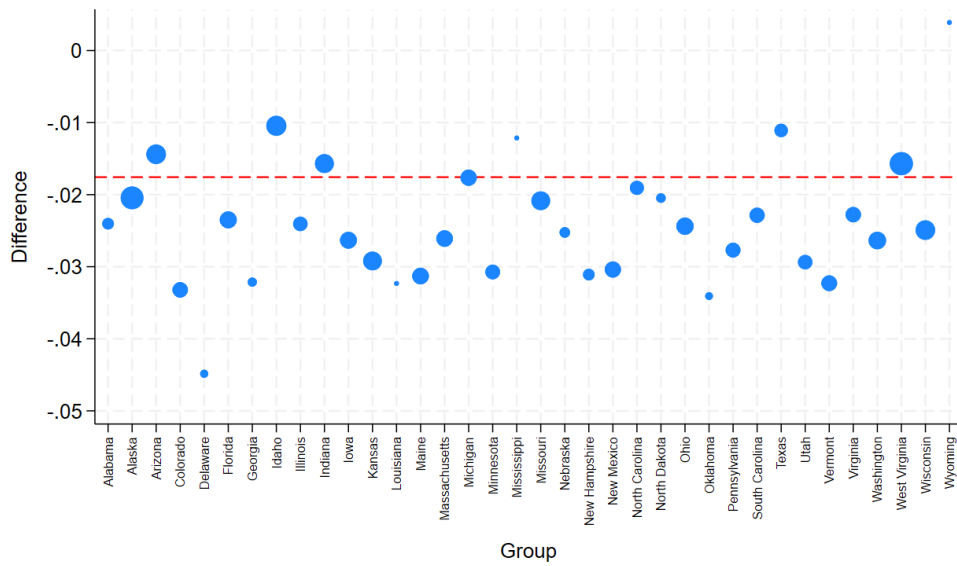
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age 20 is a binary variable that is 1 if age married is less than or equal to 20 and 0 otherwise. The sample is restricted to individuals who were at least age 22 at time of observation.

Figure A-18: SDID Results - First Child by Age 20



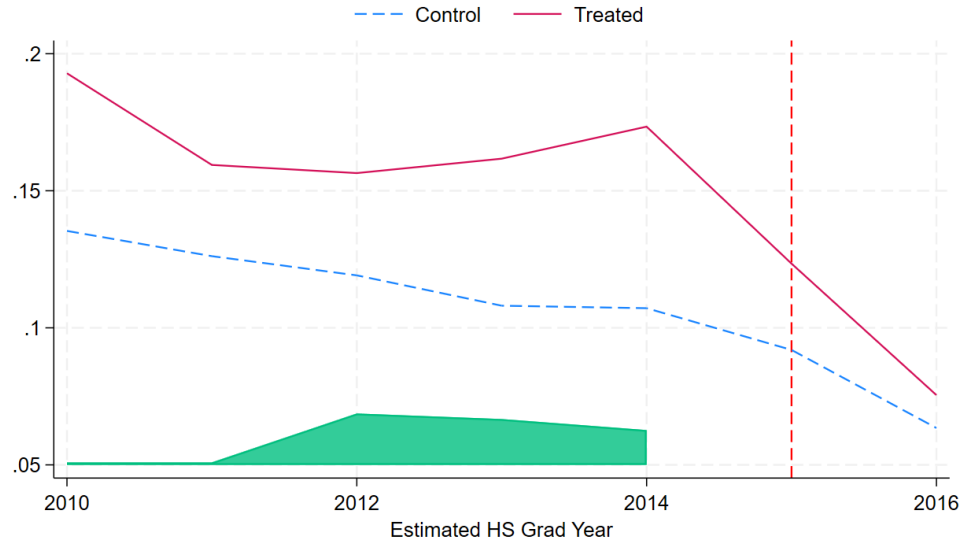
(a) Panel A: First Child by Age 20



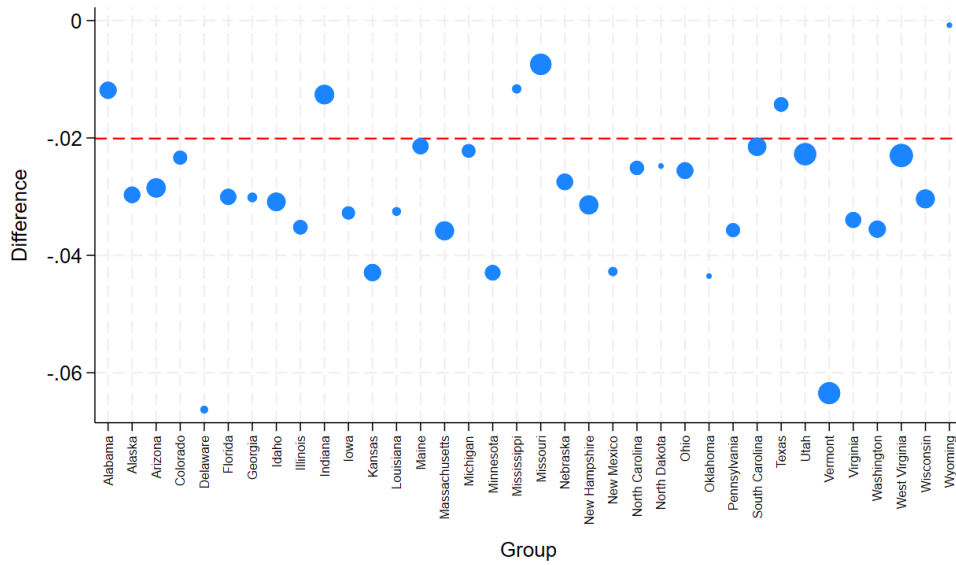
(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Age at first child is constructed by subtracting age of eldest child from the respondent's age. First Child by Age 20 is a binary variable that is 1 if age at first child is less than or equal to 20 and 0 otherwise.

Figure A-19: SDID Results - First Child by Age 22



(a) Panel A: First Child by Age 22



(b) Panel B: SDID Weights

Notes: Standard errors are calculated using the placebo standard error option in the SDID package in Stata. Data is from IPEDS, which is maintained by the National Center for Education Statistics, and is aggregated at the state level using weights from the ACS dataset. Estimated high school graduation year is calculated using birth year and quarter. Age at first child is constructed by subtracting age of eldest child from the respondent's age. First Child by Age 20 is a binary variable that is 1 if age at first child is less than or equal to 20 and 0 otherwise. The sample is restricted to individuals who were at least age 22 at time of observation.

Table A-7: Degree Conferral Results - Neighboring States

	Total Graduation Rate	Log(Associates)	Log(Certificates)
TN*After	0.0108 (0.0087)	0.0648 (0.0454)	-0.3055** (0.0910)
N	2,026	2,018	2,015

Notes: Standard errors are clustered at the state level. Data is from IPEDS, which is maintained by the National Center for Education Statistics. The comparison group is comprised of institutions in Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Total graduation rate is calculated as the total number of completers within 150% of normal time divided by the revised adjusted cohort. Certificates are the sum of all certificates of two but less than four years, one but less than two years, and less than one year that were conferred in a given year. Sample sizes vary across outcomes because not all institutions grant both associate's degrees and certificates.

Table A-8: Education Results - Neighboring States

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	-0.0097** (0.0029)	-0.0099 (0.0066)	0.0224** (0.0084)	0.0127 (0.0111)
Panel B: Exact Completed Schooling				
TN*After	0.0099 (0.0066)	-0.0324*** (0.0071)	0.0097** (0.0030)	0.0134 (0.0092)
N	26,551	26,551	26,551	26,551

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. The comparison group is comprised of institutions in Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Estimated high school graduation year is calculated using birth year and quarter. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

from an the individual analysis using ACS data should be biased downward.

An analysis of IPEDS data indicates that there were increases in graduation rates and associate's degree conferrals at Tennessee institutions compared to changes in graduation rates and degree conferrals in neighboring states, although these results are not statistically significant. There is a very large decrease in certificate conferrals of 30% following the implementation of Tennessee Promise. Using individual data from the ACS, this translates to a 2.2 percentage point increase in the percentage of treated individuals with an associate's degree or more. There is an increase in bachelor's degrees or more of 1.3 percentage points, although this result is not statistically significant. These increases in educational attainment translate to a 3.9% increase in wage income, although again these results are not statistically significant. Finally, we see similar delays in marriage and first childbirth as are observed with the full sample, indicating that these results are not caused by demographic differences across states.

A.5 Placebo Tests

I perform placebo analysis on the results using ACS data in which the 2013-2014 cohorts are considered treated. Results from placebo analysis are not consistent with the results from the true analysis, indicating that there were likely no pretreatment trends driving the

Table A-9: Income Results - Neighboring States

	Total Income	Log Income	Wage Income	Log Wages
TN*After	520.5 (747.5)	-0.0007 (0.0496)	888.6 (304.4)	0.0392 (0.0546)
N	26,551	22,927	26,551	21,303

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. The comparison group is comprised of institutions in Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

Table A-10: Marriage and Family Results - Neighboring States

	Married by Age 20	Married by Age 22	First Child by Age 20	First Child by Age 22
TN*After	0.0012 (0.0030)	-0.0234** (0.0061)	-0.0047 (0.0032)	-0.0105** (0.0031)
N	32,017	28,225	32,017	28,225

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. The comparison group is comprised of institutions in Alabama, Georgia, Mississippi, Missouri, North Carolina, and Virginia. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age "x" is a binary variable that is 1 if age married is less than or equal to "x" and 0 otherwise. Age at first child is constructed by subtracting age of eldest child from the respondent's age. First Child by Age "x" is a binary variable that is 1 if age at first child is less than or equal to "x" and 0 otherwise. Results for age 20 include the full sample because all individuals were at least 20 at time of observation, but results for age 22 are restricted to individuals who were at least age 22 at time of observation.

Table A-11: Education Results (Placebo Analysis)

	HS Diploma	Some College	Associates	Bachelors
Panel A: Minimum Completed Schooling				
TN*After	-0.0083*** (0.0029)	0.0008 (0.0031)	-0.0139*** (0.0032)	-0.0151*** (0.0033)
Panel B: Exact Completed Schooling				
TN*After	0.0060 (0.0271)	-0.0188** (0.0075)	-0.0132 (0.0094)	0.0289 (0.0306)
N	86,781	86,781	86,781	86,781

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. For the placebo analysis, 2013 and 2014 cohorts are considered treated. Educational attainment is measured using the variable EDUCD in which individuals report the highest level of education they have completed. In Panel A, outcomes are binary variables that are 1 if the individual reports completing at least that level of education. In Panel B, outcomes are binary variables that are 1 if the individual reports that level of education as their highest level completed.

Table A-12: Income (Placebo Analysis)

	Total Income	Log(Income)	Wage Income	Log(Wages)
TN*After	-1,853*** (653.00)	0.0091 (0.0275)	-1,753*** (590.80)	-0.0160 (0.0246)
N	86,781	77,846	86,781	72,559

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. For the placebo analysis, 2013 and 2014 cohorts are considered treated. Total income is measured using the variable INCTOT which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. Amounts are expressed in contemporary dollars. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.

results found in this paper. Education results found in table A-11 indicate that educational attainment may have been trending downward for these cohorts. However, it is important to note that the policy was announced in 2013, so it was implemented prior to the observing educational attainment of these cohorts and was not a response to these trends. Income results in table A-12 do not indicate any significant changes in log income or log wage income for these cohorts, although there are decreases in total income and wage income. Results in table A-13 indicate that marriage and childbirth at early ages was trending up for these cohorts. Both income and marriage and childbirth results are consistent with decreases in education for these cohorts.

The downward trend in educational attainment prior to the implementation of Tennessee Promise, but after its announcement, does not necessarily threaten the identification of program effects in a difference-in-differences (DID) analysis for several reasons. The key assumption for a valid DID analysis is that, in the absence of the treatment (in this case, Tennessee Promise), the treatment and control groups would have followed parallel trends. This assumption focuses on the pre-announcement period. If the trends between the treated (Tennessee) and control groups were parallel before the program was announced, the DID model remains robust. A temporary downward trend after the announcement but before implementation does not necessarily violate this assumption because this trend is likely due

Table A-13: Marriage and Family (Placebo Analysis)

	Married by Age 20	Married by Age 22	First Child by Age 20	First Child by Age 22
TN*After	0.0111*** (0.0017)	0.0216*** (0.0028)	0.0139*** (0.0014)	0.0217*** (0.0018)
N	108,066	108,066	108,066	108,066

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. For the placebo analysis, 2013 and 2014 cohorts are considered treated. Age married is constructed using birth year and marriage year. Only the year of the most recent marriage can be observed in the data, so this analysis is restricted to individuals who have not been married more than once but does include individuals who have never been married. Married by Age “x” is a binary variable that is 1 if age married is less than or equal to “x” and 0 otherwise. Age at first child is constructed by subtracting age of eldest child from the respondent’s age. First Child by Age “x” is a binary variable that is 1 if age at first child is less than or equal to “x” and 0 otherwise. Results for age 20 include the full sample because all individuals were at least 20 at time of observation, but results for age 22 are restricted to individuals who were at least age 22 at time of observation.

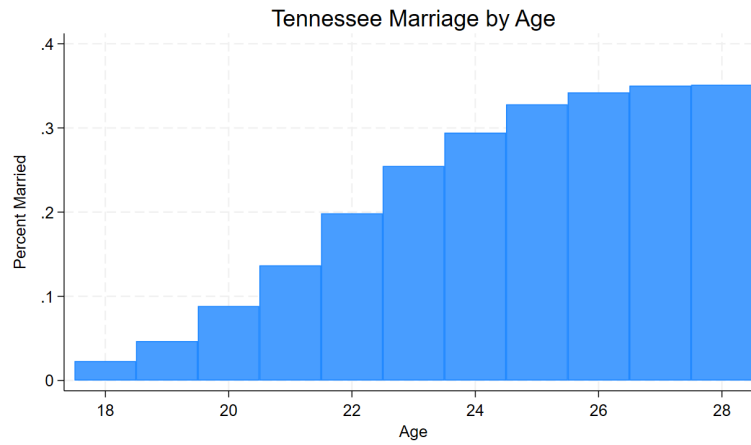
to anticipation effects or strategic behavior, which are specific to the treatment group (those expecting to benefit from Tennessee Promise). This is part of the treatment effect, not a failure of the DID model. A downward trend between announcement and implementation could reflect anticipation effects, which are common in policy changes. When students and families learn about the forthcoming program, they may alter their behavior—perhaps delaying educational decisions to benefit from future free tuition. These anticipation effects are considered part of the treatment effect because they arise due to knowledge of the policy. In fact, they can help capture the full impact of the policy: both the immediate effects after implementation and any shifts in behavior due to the program’s announcement. Even though educational attainment trends downward after the announcement, the DID framework can still isolate the post-implementation effects of Tennessee Promise. The control group does not experience a similar downward trend due to the announcement of Tennessee Promise, so the relative change after implementation can still be attributed to the policy.

A.6 Additional Income and Family Robustness

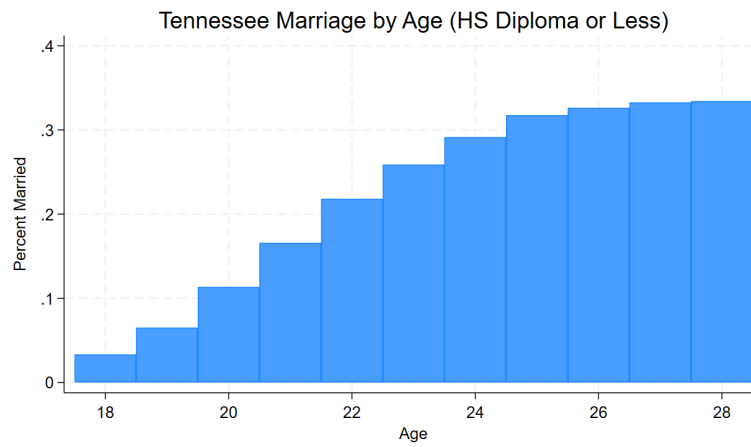
Additional analyses were conducted regarding income and marriage. First, I examine whether individuals were less likely to be “flailing”, that is neither working nor enrolled in school, in their first two years after high school graduation as a result of Tennessee Promise. If so, this could help provide motivation for the increased income we see in the short run analysis. I do indeed find a decrease in flailing of 1.4 percentage points. Additionally, treated individuals are 2.0 percentage points less likely to be currently enrolled in school in 2019, which may be a mechanism for increased income. I also analyze changes in income for treated individuals who are either still enrolled in school or have a high school diploma or less. I find near zero effects on income for these individuals, indicating that the increases in income are likely a result of increased education. The results from these analyses are found in table [A-14](#).

Additionally, it must be the case that a significant percentage of individuals would have otherwise married soon after high school in order for there to be impacts of Tennessee Promise on marriage. The histograms in figure [A-20](#) indicate that 8.8% of individuals in the pretreatment cohorts were married by age 20, and this number increases to 11.3% for individuals with a high school diploma or less. Therefore, there are individuals whose behavior could be impacted by changes in education.

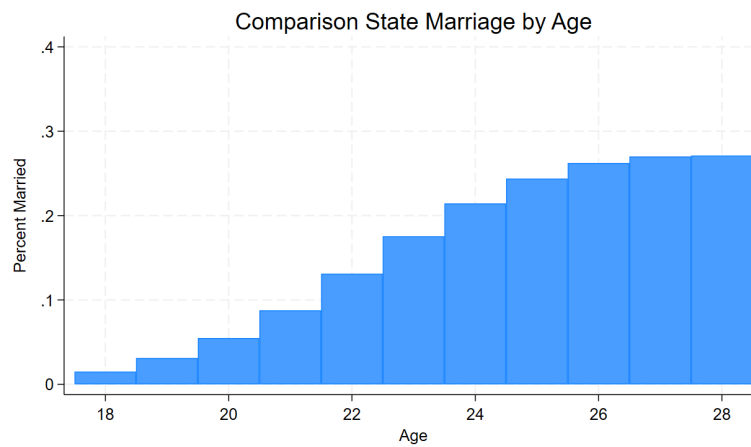
Figure A-20: Percent Married by Age Histograms



(a) Panel A



(b) Panel B



(c) Panel C

Notes: Data is from the 2019 ACS extracted from IPUMS. Histograms display the percentage of individuals married by each age in the 2010-2014 cohorts.

Table A-14: Income Results - Robustness Analysis

	Flailing After HS	Still In School	Wage Income - In School	Wage Income - HS Ed or Less
TN*After	-0.0144*** (0.0032)	-0.0195** (0.0075)	-23.38 (332.20)	70.06 (156.99)
N	187,919	151,858	38,381	52,709

Notes: Standard errors are clustered at the state level. Data is from the 2019 ACS extracted from IPUMS. Estimated high school graduation year is calculated using birth year and quarter. Flailing after high school is an indicator that is 1 if the individual is neither employed nor currently enrolled in school and 0 otherwise. Still in School is an indicator that is 1 if the individual reports being currently enrolled in school and 0 otherwise. Wage income is measured using the variable INCWAGE which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer.