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Do Students Respond to Sticker-Price Reductions?: Evidence from the North Carolina Promise

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Abstract

The North Carolina Promise is a state-level policy that reduced the cost of tuition for all students who attended one of three campuses in the University of North Carolina System starting in fall of 2018. We use IPEDS data and a synthetic control approach to examine how this tuition reduction affected enrollment and persistence at these campuses. We find that NC Promise did not increase enrollment among first-year students. However, it attracted more transfer students and increased enrollment by Hispanic students at one of the institutions. Retention rates at the three universities remained constant. We discuss implications for similar policies aimed at changing the "sticker price" at public, four-year colleges.

Do Students Respond to Sticker-Price Reductions?: Evidence from the North Carolina Promise

The rising cost of college has been well documented for several decades as the average cost of a bachelor's degree has outpaced both inflation and stagnant wages. These rising costs are prohibitive for working class, lower-income families, who make up a shrinking proportion of college students in the U.S. (Bailey & Dynarski, 2011). Need-based financial aid is one way to alleviate cost constraints and increase persistence and completion for disadvantaged students. Promise programs are another, increasingly popular, way that states and communities are working to reduce the cost of college. Promise programs vary widely in their design (Perna & Leigh, 2018), but generally address out-of-pocket college costs for students and families by covering up to 100 percent of tuition and fees for targeted students at qualifying postsecondary institutions. One key feature of these programs is that they provide clear and reliable information about college costs that allow students and families to plan for college well in advance of enrollment. In general, promise programs have been effective at increasing college enrollment with some increasing enrollment as much as 4.7 percentage points per $1,000 in promise aid (e.g., Bartik et al., 2021; Dynarski, 2000).

The State of North Carolina introduced its version of a promise program—the North Carolina Promise Tuition Plan (NC Promise)—in 2018. NC Promise is a $60 million recurring tuition subsidy that supports all undergraduates who enroll at three of the state's 16 four-year degree-granting institutions.[1] The policy reduces tuition for North Carolina residents and out-of-state students at all three universities to $500 and $2,500 per semester, respectively. In this respect, NC Promise is relatively unique among promise programs because it explicitly reduces

[1] One additional campus was added in 2022, but this recency puts it beyond the scope of this study.

tuition for all students rather than offering aid to those who qualify. While reducing the costs for all students, the size of the tuition reduction—nearly $2,500 for the three participating institutions—the effect of the policy was to make tuition free for most students who qualified for federal financial aid. As with all promise policies, a key feature of the policy is that it offers clear and reliable pricing to all students well before they have to make college enrollment decisions. Because of its design, NC Promise is most likely to be most effective at encouraging enrollment among populations of students who are sensitive to the sticker price of college.

While prior research shows that promise programs increase college enrollment, most research about these programs, and financial aid programs more broadly, focuses on reducing the net price for qualifying students (Bartik et al., 2021; Dynarski, 2000; Dynarski, 2003; Kane, 2003). NC Promise takes a subtly different—but potentially quite meaningful—approach that aligns with recent recommendations on tuition reduction or elimination at community colleges (Denning, 2017; Gandara & Li, 2020; Guarantz, 2020). NC Promise does not offer aid to help pay for college; instead, it lowers the "sticker price" of college. Given the weight students and families appear to put on sticker prices *even when net-price calculators are available* (Grodsky & Jones, 2007; Levine, 2014), this distinction is potentially significant. We are unaware of any prior empirical work outside the small literature in the community college context (Acton, 2021; Denning, 2017) and one study in the private university context (Ward & Corral, 2022) that rigorously examines tuition-reduction policies that affect sticker prices like NC Promise.

To better understand the enrollment response caused by the NC Promise tuition discount, we use synthetic control methods to address the following four research questions:

1. How did NC Promise affect the number of first-year enrollees at Promise institutions?
2. How did NC Promise affect the number of transfer enrollees at Promise institutions?

3. How do these changes in enrollment vary by racial-ethnic background?

4. Did NC Promise affect the likelihood of students re-enrolling at Promise institutions?

We find that the NC Promise did not have a sustained effect on first-year student enrollment. There was a slight initial increase in enrollment at all three institutions, but these changes did not persist in subsequent years. However, we found that transfer student enrollment increased at two of the Promise institutions, and these findings were robust to alternative specifications. All institutions saw increases in enrollment by White students, and at least one saw sizeable increase in Hispanic student enrollment. Importantly, none of these increases appeared to crowd out other students and overall retention rates remained unchanged.

Promise Programs and the North Carolina Context and Its Promise Institutions

All promise programs aim to make a college degree more affordable and typically aim to make that affordability more transparent to students relatively early in period when those students might think about attending college. Hence, they offer a "promise" of college enrollment by offering an easy-to-understand college funding mechanism that students can count on as they make their college plans. There has been tremendous growth in promise programs since a group of anonymous donors in Kalamazoo, Michigan funded all graduates of the Kalamazoo Public Schools system to attend college at little or no cost starting in 2005. Indeed, College Promise, a national initiative focused on providing free education to qualified students, has identified nearly 400 local and statewide promise programs funding attendance at 2- and 4-year postsecondary institutions across the country.

Although promise programs all share similar goals, how they achieve those goals takes many forms. Indeed, there is wide variation between programs in eligibility requirements, structure, and applicable institutions (Perna & Leigh, 2018). For example, many programs, like

the Kalamazoo Promise, target students based on where they live. Others, like the Georgia HOPE Scholarship, add eligibility criteria based on high school academic records. Most programs offer traditional financial aid via grants and scholarships, but a few reduce sticker price by lowering tuition. There are consequential differences in how this aid is offered. So called "first-dollar" programs apply to a student's college bill before other aid, such as Pell grants or other scholarships, get applied. "Last dollar" programs cover any balance in costs after those other grants and scholarships are used. Any promise program that reduces sticker price, like NC Promise, functions as a type of first-dollar program, although it does not literally provide financial aid.

Table 1 provides information on a more narrowly defined list of 150 local and statewide college promise programs specific to 4-year institutions as reported by the College Promise's interactive dashboard. Most of these promise programs are targeted at traditional-aged students (88 percent). Very few programs had requirements for community service (9 percent) or post-college residency (2 percent). There is considerable variation in minimum credit requirements, with just over half requiring that students complete between 9 and 12 credits per semester.

Insert Table 1 Here

Eighty percent of the programs are classified as last dollar or "last dollar plus," meaning students must draw upon available public funding before being awarded college promise funds. Conversely, first-dollar funding formats account for one in five programs. Promise program funding sources also vary widely, with 39 percent privately funded, 21 percent publicly funded, and 11 percent receiving both public and private funds. With the exception of functioning as a first-dollar program, NC Promise appears similar to the plurality of promise programs.

The North Carolina Context

Affordability is a cornerstone of the North Carolina public higher education system. The State Constitution requires that "the General Assembly shall provide that the benefits of The University of North Carolina and other public institutions of higher education, as far as practicable, be extended to the people of the State free of expense" (Article IX, Section 9). At the same time, declining postsecondary enrollment both nationally and locally threatened multiple regional institutions in the state, especially some of North Carolina's Historically Black Colleges and Universities (HBCUs). To further meet its constitutional obligations and bolster application and enrollment, particularly at institutions with declining enrollment, the General Assembly explored strategies to make higher education more affordable and accessible. Ultimately, it adopted the Access to Affordable College Education Act (Senate Bill 873) in 2016.

The most prominent feature of Senate Bill (SB) 873 was the North Carolina Promise Tuition Plan (NC Promise), which originally intended to reduce tuition at five campuses, including three of the state's five public HBCUs, to $500 per semester for in-state students and $2,500 for out-of-state students. Tom Apodaca, a Republican state senator, sponsored the legislation, but it drew considerable opposition from state organizations, institutional leaders, and faculty. The North Carolina NAACP and others expressed concern that the focus on three Historically Black Colleges and Universities and sought to "rewrite their identities and deprive them of tuition dollars" (Seltzer, 2016). While SB 873 proposed to cover the cost difference between the new and the old tuition, opponents were concerned about the potential fiscal cliff if the state discontinued funding (Villemain, 2021). Ultimately, two HBCUs—Fayetteville State University and Winston-Salem State University—opted out before the General Assembly passed SB 873 on May 26, 2016.

NC Promise has provided discounted tuition rate for *all students* attending one of the NC Promise 4-year institutions in-person or online whether they are newly enrolled first-time or transfer students or those already enrolled since the fall semester of 2018. It applies in each fall and spring semester—students who enroll in summer classes pay unsubsidized tuition. This program offers students universal eligibility for the subsidy before applying other forms of financial aid. Notably, students do not have to apply for NC Promise or complete additional paperwork like other grants or scholarships.

The North Carolina General Assembly allocated up to $70,000,000 to account for the potential loss in revenue from the mandated tuition decreases under NC Promise. Despite two institutions opting not to participate, the three remaining institutions were geographically spread across the state so that as many North Carolina residents as possible lived within 150 miles of at least one of the participating institutions. As part of the rollout of the program, the UNC System launched an advertising campaign beginning in 2017 to spread awareness of the program. The advertising campaign included statewide radio and tv commercials, high school and community college outreach, and informational mailers. It was highly visible across the state to potential students and their families.

Participating Campuses

NC Promise was first implemented at Elizabeth City State University (hereafter Elizabeth City or ECSU), the University of North Carolina at Pembroke (hereafter UNC Pembroke or UNCP), and Western Carolina University (hereafter Western Carolina or WCU) in Fall 2018. Elizabeth City, located in northeastern North Carolina, is a small liberal arts HBCU emphasizing natural and aviation sciences. ESCU has a top-rated band program, moderately selective

admissions (77 percent acceptance rate), and frequently partners with early college high schools. As a result of NC Promise, the yearly cost for in-state students was reduced by $1,856.

UNC Pembroke is located in southeastern North Carolina, the cultural center of North Carolina's largest American Indian tribe, the Lumbee Indians. It enrolls a high number of Native American students and qualifies as a Native American Serving Nontribal Institution. UNCP's proximity to Fort Liberty (formerly Fort Bragg) also makes it among the most military-friendly of the three NC Promise Universities. It is also the least selective among them, with an 80.6 percent acceptance rate in 2017. NC Promise reduced tuition for in-state students by $2,602 in 2018.

Western Carolina, located in the mountains of western North Carolina, has the least diverse student body and the most selective admissions of the three Promise universities. WCU serves a primarily white population and offers a comprehensive curriculum with large programs in business, nursing, and criminal justice. In 2018, NC Promise reduced tuition for in-state students by $2,971.

In 2022, the state expanded the NC Promise to Fayetteville State University, one of the original five institutions that the General Assembly identified for participation in 2016, and increased state funding for the program to up to $82.5 million in 2023. Because our main analysis does not include enrollment as recent as 2022, we do not study the effects of NC Promise on Fayetteville State University.

College Prices and Enrollment Decisions

Human capital models of college choice—the idea that students will choose to enroll when the expected benefits outweigh the costs—inform efforts to change college enrollment by reducing costs (e.g., Becker, 1993). While students weighing their college options face financial,

informational, and academic constraints (Long & Riley, 2007), the cost of attendance remains arguably the most important and studied consideration. In a recent survey, the most common answer that 18- to 30-year-olds give for not attending college is the expected cost and not wanting to take on debt (Gates Foundation, 2022).

Financial Aid Programs and College Enrollment

Historically, the primary forms of financial aid in the United States have been scholarships, grants, and loans. Scholarships and grants are offered as either merit-based, need-based, or need-blind and do not need to be repaid by the student. Loans are typically highly subsidized by the federal government and require the borrower to repay the loan after graduation or stop out. The interest rates on student loans often make it difficult for students to keep up with their repayment obligations, particularly for students who leave college before completing their degree (Cox et al., 2020; Barr et al., 2019). Around 43 million Americans carry an estimated $1.5 trillion (about $4,600 per person in the US) in federal loan debt and $119 billion (about $370 per person in the US) in private student loans (Miller et al., 2019).

However it is achieved, making college less expensive increases the likelihood a student attends college, but these effects vary according to the design of the aid program (e.g., Dynarski & Scott-Clayton, 2013; Leslie & Brinkman, 1988; Page & Scott-Clayton 2016). In general, financial aid programs are more likely to be effective at increasing enrollment when they have easily understood eligibility rules and application procedures. When financial aid programs are complex, there is generally no association between aid receipt and college enrollment (Carruthers & Welch, 2019; Rubin, 2011). The dampening effect of complexity on aid effectiveness is apparent in research evaluating receiving Pell Grants, a federally funded, need-based grant program. To receive the Pell Grant, students must complete the Free Application for

Federal Student Aid (FAFSA), which is well-known as a cumbersome and complex process. Dynarski and Scott-Clayton (2006) argue that the complexity of the FAFSA disproportionately discourages the students who are likely to benefit most from financial aid. Indeed, when students are given help completing the complex form, both college enrollment rates and the amount of aid students receive increase (Bettinger, et al., 2012).

Conversely, work on scholarship programs with simple application procedures and few eligibility requirements, like the DC Tuition Assistance Grant Program and the Georgia HOPE Scholarship, find that an additional $1,000 in aid can increase enrolment rates by 4 percentage points, on average (Kane, 2007, Dynarski, 2000). Similar results are reflected in the literature examining promise programs, which often aim for simplicity. Promise programs, such as the New Haven Promise and the Kalamazoo Promise, with simple qualification based on where students live, have been associated with enrollment increases ranging from 3 to 8 percentage points per $1,000 of aid (Bartik et al., 2021; Carruthers & Fox, 2016; Gonzalez et al, 2014). These programs are effective partly because students are well aware of the scholarships, the eligibility requirements are transparent, and the application procedures are often simple. The variation in positive effects across different types of financial aid suggests the need to understand key features of program design that lead to better student outcomes.

Financial Aid Programs and Retention

While increased college enrollment is a key measure of success for promise programs, students must remain enrolled through graduation to realize the benefits of a college degree. The challenge of helping students persist through earning a degree is particularly acute in North Carolina, which has set a specific state goal of increasing the number of North Carolinians with a college degree. Whether students remain enrolled in college is influenced by the interaction of

multiple complex factors including financial aid (Bettinger, 2004), institutional characteristics and supports (Millea et al., 2018), and first-year experiences (e.g., Noble et al., 2007). College costs are likely to be a particular concern in the decision to remain enrolled for the same set of price-sensitive students who may be likely to enroll in a Promise institution because of the cost savings NC Promise offers.

Several studies point to the positive effects of financial aid on retention (Millea et al., 2018). Financial aid can increase retention through several mechanisms like alleviating students' worries about paying for college, freeing up their time from employment to earn supplemental income to help pay for college, and reducing dropout rates (Aina et al., 2022; Bettinger, 2004).

How NC Promise May Affect Enrollment Decisions

While prior research shows how students respond when college costs are lowered after receiving certain kinds of financial aid, less research focuses on what happens when the sticker price of college is reduced, particularly at public four-year universities. NC Promise's sticker price reduction may have more salience for students as they make their college enrollment choices than the availability of grants or loans. A sticker price reduction also means that all students are eligible to benefit, not just those who meet the eligibility criteria of other programs. It also applies identically to first-year and transfer students policy in the four-year context.

Research on the effectiveness of state financial aid shows that the success of state programs varies across contexts and program design (Dynarski et al., 2018), suggesting the importance of other factors beyond cost, such as transparency and administrative burden (Rosinger et al., 2021). North Carolina reduced informational constraints for students and families by intentionally developing a transparent, easy-to-understand program. Programs with complex designs create significant barriers for students trying to understand what an aid program

is and whether they are eligible (Bettinger et al., 2012). Conversely, when students understand how much they will pay for college and how aid is distributed, they are more likely to apply (Bettinger, 2015). NC Promise is transparent in that tuition rates are clear for all students depending on their residency, and the tuition is the same the entire time they are enrolled. Furthermore, NC Promise applies automatically to all admitted students, so there are no supplemental applications or forms for students to complete, reducing the burden on students and parents.

The college enrollment benefits of lowering costs through an easy-to-understand program are contingent on students being aware of the program before important college application deadlines (Perna & Leigh, 2018). Early awareness of financial aid programs allows students to consider their options and make informed decisions (Bowman et al., 2018; Hemenway, 2018). Conversely, limited and late awareness can hinder students' ability to utilize available aid (Carruthers & Welch, 2019). The $1 million the NC General Assembly spent to publicize NC Promise via radio, television, and social media to high schoolers, community college students, and counselors may have been an essential factor in whether the program affected students' decision-making. Given these universal, easy-to-understand, and highly visible features, NC Promise was well-positioned to affect whether and where students chose to enroll in college.

Heterogeneous Effects of Financial Aid Programs

Although it applies universally to all students who enroll in one of the NC Promise institutions, prior research suggests that NC Promise may have differential effects on populations like low-income students, students of color, and students transferring from community colleges. For example, state grant aid policies are particularly beneficial for low-income students, who are often more price-sensitive than their higher-income peers (Avery & Hoxby, 2004; Dynarski,

2003; Dynarski et al., 2022; Long, 2004). Indeed, a growing literature supports the idea that promise programs positively affect enrollment, persistence, and graduation across all demographic and socioeconomic groups (Dynarski et al., 2022). For example, every $1,000 in grants awarded by the Florida State Assistance Grant corresponded with a 2.5 percentage point increase in the likelihood of eligible low-income students enrolling in college (Castleman & Long, 2016).[2] Similar results have been found with the Buffalo "Say Yes to Education" program in New York (Bifulco et al., 2019) and the Pittsburgh Promise program in Pennsylvania (Page et al., 2019).

Simple, uncomplicated programs like NC Promise appear valuable among students who sometimes struggle to find reliable sources of information about the college application and enrollment process (Dynarski et al., 2022). Students often receive details on navigating financial aid programs from their families, schools, and communities (Perna, 2006a). Unfortunately, financial aid programs that contain complex application steps (Scott-Clayton et al., 2022) or do not offer timely information (Carruthers & Welch, 2019) tend to have lower uptake, especially among first-generation and low-income students (Dynarski et al., 2022). As a result, these students are often deterred from applying for financial aid for which they are eligible (Dynarski & Scott-Clayton, 2006; Feeney & Heroff, 2013). Thus, programs like NC Promise, which do not require submitting applications other than the one to attend one of the Promise institutions, may be of particular benefit to lower-information populations historically underserved in higher education.

NC Promise may also entice more community college students to transfer into Promise institutions. Nearly 80% of community college enrollees aspire to earn a bachelor's degree but

[2] A growing number of more recent studies confirm these findings, including work on promise programs for students attending specific community colleges across the country (Gandara & Li, 2020).

less than 20% of community college students will complete a bachelor's degree within six years of enrolling (Jenkins & Fink, 2016). While most work on the relationship between financial aid and enrollment has centered on first-year, first-time students, financial support at four-year colleges is positively related to a community college students' likelihood of vertical transfer (Bell & Gandara, 2021; Crisp & Nunez, 2014; Yu et al., 2020). In North Carolina, community college students are more likely to vertically transfer when the community college they attend is near a four-year university (Umbach et al., 2019). At the same time, prohibitive university costs may deter students from enrolling (Umbach et al., 2019). Taken together, this work suggests that transfer students are more attracted to low-cost four-year options like those provided by the NC Promise.

Data and Method

We use a synthetic control design and a comparative interrupted time series to examine the effect of the NC Promise program on institution-level enrollment and retention outcomes. the synthetic control method is the most methodologically rigorous approach for constructing a comparison condition to estimate the effects of aggregate interventions where few treated units exist—a condition we face in studying NC Promise (Abadie et al., 2010). The main goal is to generate a weighted set of control institutions such that the weighted combination of those institutions matches the treated institution in terms of broad characteristics and pre-treatment outcome trends.

Data and Variable Selection

Our study utilizes institution-level data from the Integrated Postsecondary Education Data System (IPEDS). In addition to information on basic institutional characteristics, we focus on IPEDS fall enrollment data at four-year colleges and universities from the fall 2010 to fall

2019 school years, providing seven fall semesters of pre-NC Promise data and two fall semesters of data following its implementation in 2018. Although we could extend the panel by two additional years, we limit our main analysis to the two fall semesters after implementation because the COVID-19 pandemic affected college enrollment unexpectedly across institutions, states, and regions in the starting in the spring of 2020.

We focus on three primary outcomes for this work: the total number of first-time, first-year students enrolled at a college or university, the total number of new transfer students at a college or university, and the total number of students who remain enrolled from year to year. For the purposes of our analysis, we focus on enrollments by degree-seeking undergraduate students, including both first-time students and transfer students. We use fall enrollment counts both because most students begin their enrollment in the fall term and because the alternative, twelve-month enrollment counts, include summer enrollments that should not be affected by NC Promise. For comparability across institutions, we convert the enrollment totals to a log scale to express the NC Promise effect as a percent change in enrollment from the prior year. We also consider enrollment outcomes by race and ethnicity. Because of the small sample sizes of some of these groups at the Promise institutions, we combine first-year students and transfer students for this outcome. We also focus on the three largest race/ethnicity categories at the Promise institutions: White, Black, and Hispanic students.

For our retention outcome, we use the IPEDS fall-to-fall full-time retention rate, which is calculated as the percentage of total number of returning full-time students from one fall semester to the next, excluding graduates and other special cases where students are not expected to re-enroll.

Synthetic Control Method and Key Assumptions

A synthetic control approach to examine the impact of the NC Promise on institution-level enrollment outcomes is ideal for several reasons. First, the small number of Promise institutions makes it difficult to identify a sample of untreated units sufficiently similar to the treated units to serve as reasonable comparison cases. Synthetic control methods overcome this challenge of having a small treatment sample by specifying a weighted combination of institutions from a large pool of candidate comparisons to create a control group that, in their weighted composite, match each of the NC Promise institutions individually on important covariates and pre-treatment trends in the outcome (Abadie et al., 2010). This synthetic control group represents a strong counterfactual for the NC Promise institutions assuming the candidate comparison campuses were not subject to changes resulting from the NC Promise policy. Thus, when appropriately used, synthetic control methods generally yield causal treatment estimates (Abadie et al., 2010) and have been successfully used to study the effects of state policies on college enrollment outcomes (e.g., Klasik, 2013) and the effect of the promise of a higher education scholarship on school district enrollments and graduation rates (Bifulco et al., 2017).

There are many contextual requirements for a valid synthetic control study, particularly concerning threats to validity (Abadie, 2021). First, synthetic control methods are generally not strong when it comes to determining small treatment-effect sizes. Thus, in the case of NC Promise, we will only detect a statistically significant effect on enrollment if it is relatively large and persists over time. Second, synthetic control methods may struggle to detect a treatment effect if there are responses in the outcome that anticipate the treatment effect. In the case of NC Promise, this may look like students enrolling in one of the Promise institutions prior to the policy beginning to take advantage of the eventual decrease in tuition. Any anticipatory

behaviors should be apparent in pre-treatment trends, though we expect them to be minimal given the relative ease of transferring into these institutions.

Abadie (2021) also stipulates two data requirements for a valid synthetic control approach. First, there must be aggregate data on predictors and outcomes. While this typically means state-level or regional data, synthetic control can also be used, like in this case, for institution-level data (e.g., Odle, 2022; Rubin & Canaché, 2019). Second, synthetic control requires sufficient data in the pre-treatment and post-treatment years. While there is no standard number for this requirement, Abadie (2021) argues that the pre-treatment data periods must be sufficient to reveal trends before implementation to increase confidence that a change after implementation is spurious or a true result of the treatment. In our case, we use seven years of pre-treatment data (Fall 2010 to Fall 2017) and two years of post-treatment data (Fall 2018 and 2019). Two years of post-treatment day may be short, but it should be sufficient to capture short-term enrollment responses to the NC Promise policy. It is also analytically necessary to only use those years given idiosyncratic enrollment changes that resulted from the COVID-19 pandemic.

Constructing the Synthetic Control Group and Estimating the Effect of NC Promise

Synthetic control methods rest on the idea that the combination of many untreated control units serve as a better comparison case than any single control unit (Abadie, 2021). The main mechanism of this approach generates nonnegative weights for potential control units such that the weights sum to one and they jointly minimize (1) the average difference in a vector of covariates X between the treated and untreated units and (2) the average pre-treatment difference in the outcome Y between treated and untreated units. Note that this dual minimization works to more closely match covariates that are more strongly related to the outcome Y (Abadie, 2021). Given this set of weights w_j, the average treatment effect is given by

$$\widehat{ATE} = \frac{\sum_{t=1}^{T}(Y_{1t} - \sum_{j=2}^{J+1} w_j Y_{jt})}{T}$$

where t=1,…,T are each of the post-treatment time periods (in this case, years), and j=2,…J index the synthetic control units and j=1 is the treated unit. Plainly, the average difference over the post-treatment period in the outcome between the treated unit and the weighted average of the control units.

Synthetic control matches are strongest when they are created from a large pool of control institutions that are likely to be similar to the treated institutions in measurable and unmeasurable ways (Abadie, 2021). As with difference-in-difference approaches, it is common to generate the pool of candidate comparison units using geographic regions because nearby colleges may follow similar enrollment and demographic trends within similar political environments (e.g., Odle, 2022). We avoided this construction given the likely spillover effects of NC Promise—the lower tuition at NC Promise institutions may have drawn enrollment away from similar nearby schools (in fact, a secondary goal of the policy was to attract more out-of-students to the Promise institutions) making schools in the same geographic area poor comparisons. We do, however, consider geographically-determined comparison institutions as a robustness check.

Instead, our preferred pools of candidate comparison institutions were drawn from colleges and universities that had a shared Carnegie classification. The Carnegie Foundation categories colleges according to several different classification schemes, which serve as useful heuristics for grouping similar institutions in research (e.g., Crisp et al., 2019, Gonzale Canche, 2018, Engberg, 2012, Holzman et al., 2020). We focus on the Carnegie classification based on

undergraduate profile.[3] This classification scheme groups colleges according to institutional level, admissions selectivity, the percentage of students who are full-time students, and the percentage of students who transfer to the institution (Undergraduate Profile Classification, n.d.). Using this classification scheme to generate candidate control institutions means that potential control institutions are already well matched with treated institutions in terms of pre-existing student enrollment patterns.

Our analytic sample consists of the three NC Promise institutions and a synthetic control group for each institution for each outcome of interest. Our population of potential comparison institutions for the synthetic control analysis is the 558 public, four-year institutions in the United States contained in the IPEDS data. We estimate synthetic control weights separately for each treated unit, given that the three Promise institutions are not comparable in size, mission, or demographics. Under the Carnegie Undergraduate Profile Classification, ECSU and UNCP are defined as four-year, full-time, inclusive, and higher transfer-in institution. WCU is classified as a four-year, full-time, selective, higher transfer-in institution.[4] Given this classification, ECSU and UNCP have the same classification and a donor pool of 69 institutions. WCU has a donor pool of 135.

We use a wide variety of covariates to generate the synthetic control weights. We selected these variables to help us compare institutions that are similar to the Promise institutions both in terms of the types of students who apply to and enroll in them, as well as the relative availability of resources. These variables include characterizations of the student body including percent of

[3] For robustness, we also consider the Carnegie Basic Classification (based on research activity) and the Carnegie Size and Setting classification (based on level, enrollment size, and whether students tend to be residential).
[4] Under the Basic classification ECSU is categorized as a Baccalaureate College, while UNCP and WCU are both categorized as Master's Colleges & Universities with large programs. Under the Size and Setting classification ECSU is a four-year, small, and highly residential campus. UNCP and WCU are four-year, medium sized, and primarily residential campuses.

campus that are female, campus size, percent of undergraduates receiving Pell Grants, number of applicants, total undergraduate enrollment, and graduation rate. The covariates also include indicators of campus resources including student-to-faculty ratio. endowment per FTE (full-time equivalent) student, student-to-faculty ratio, and HBCU status.

Table 2 provides the analytic sample description for the primary control group classification and each NC Promise institution. This table uses synthetic control weights to generate the summary statistics for the synthetic institution for our first two outcomes in the pre-policy period, showing how well the algorithm was able to match the control group to each NC Promise institution. For ECSU, the synthetic institution for the first-year outcome is slightly larger in average fall enrollment and 100% comprised of HBCUs. For UNCP, the synthetic institution for the first-year outcome is also slightly larger in average fall enrollment but is roughly similar for the set of other institutional characteristics. For WCU, the synthetic institution created for the first-year outcome is larger in average fall enrollment and roughly similar for the other institutional variables.

Hypothesis Testing

A challenge with the synthetic control method is that standard errors are not useful because there is a single treated unit, making traditional inference-based hypothesis testing unviable (Abadie et al., 2010). To understand whether changes in enrollment detected by the synthetic control model are significant, we can construct p-values using placebo tests among the control institutions as defined by Abadie (2021). This process involves running a synthetic control analysis on each candidate comparison institution and estimating "treatment" effects for the start of NC Promise in universities where NC Promise should not have had an impact. For each of these placebo tests, we calculate the root mean squared prediction error (RMSPE) based on the

gap between the placebo control unit and synthetic control outcomes trends separately for the periods before and after the start of NC Promise. A small RMSPE before NC Promise indicates a strong synthetic control match, and a small RMSPE after NC Promise began indicates little to no enrollment changes in the placebo case.

To calculate the analog of a traditional p-value, we first eliminate any placebo case with a pre-Promise RMSPE more than five times the RMSPE of the NC Promise institution. This eliminates cases with poor synthetic matches. We then calculate the ratio of the post- to pre-Promise RMSPE for the treatment and remaining placebo cases. Here, a high ratio indicates considerable variation in enrollment after NC Promise began relative to enrollment variation before NC Promise. Thus, the reported p-values in our study are the percentage of placebo cases whose post-/pre-RMSPE ratio is larger than the one we calculated for the actual treated unit in each analysis. We consider results significant if they are extreme within this distribution (Abadie, 2021). Note, specifically, that this p-value is in part a function of the number of units in the synthetic control—low numbers of control units will generate p-values greater than conventional significance thresholds even if the treated case is the most extreme among the placebo permutations (for example, a treated case that is more extreme than 8 placebo comparisons results in a p-value of $p = 0.125$). As a result, we report the rank of our treated estimate among all placebo permutations (a two-sided comparison) as well as its rank among results in the estimated direction (a one-sided comparison) to be clear about how extreme the treatment estimate is relative to the placebo cases.

Results

We find that the NC Promise did not have an overall sustained effect on first-year student enrollment. There was a slight initial increase in first-year enrollment at all three institutions, but

these changes did not persist. However, NC Promise did result in an increased number of transfer students, effectively increasing total enrollment at Promise institutions. Alongside these changes, we find no change in retention rates. These results hold through a series of robustness checks, which we describe below.

First-Year Enrollment

Figure 1 shows the synthetic control plots for the NC Promise and the synthetic control enrollment for each of the three Promise institutions. The pre-treatment plots show that the synthetic comparison sets are similar to the Promise institutions. In all three cases, these initial gains decline by the second year of the policy. Table 3 presents the accompanying point estimates for the average synthetic control treatment effects. The average estimated gains in first-year enrollment ranged from 15 percent at UNC Pembroke to over 25 percent at Elizabeth City. However, as indicated by the p-values and the relative rank placement in their respective placebo tests, none of these increases were notably different from changes in enrollment at the comparison institutions over the same time period. At best, the 15 percent increase in first-year enrollment at UNC Pembroke reached a p-value of $p = 0.20$ from its rank as fourteenth most "extreme" among the 70 placebo permutations.

[Insert Figure 1 here]

[Insert Table 3 here]

To illustrate where the estimated changes in first-year enrollment fall among these placebo tests, Figure 1 plots the Root Mean Squared Error of the treatment estimate (plotted in [orange]) relative to each of the placebo tests. In short, it shows the average difference from a given case and its synthetic comparison. Ideally, the values to the prior to the implementation of NC Promise should all be close to zero, indicating a strong synthetic match. In contrast, if it is

significant, the treated condition should deviate from zero in the post-treatment period while the placebo cases should all continue close to zero. Because the placebo cases show a lot of variation in the post treatment period, it is difficult to rule out that the changes in first-year enrollment that occurred at the three Promise institutions were a result of NC Promise and not akin to changes in enrollment at comparison institutions that should not have been affected by the NC Promise policy.

Additionally, note that UNC Pembroke and Western Carolina each have relatively small root mean prediction errors (RMSPE), indicating a strong synthetic match, but the RMSPE for Elizabeth City is 0.145, which is relatively large given the size of the estimated effect of NC Promise. Perhaps because of its relatively rarity as a small, liberal arts HBCU, the synthetic algorithm struggled to find a strong match for Elizabeth City throughout our analysis.

Transfer Enrollment

Figure 2 shows the time series plots of Promise and synthetic control institution transfer student enrollments, while Table 3 again shows the average estimated synthetic control treatment effect. All three campuses show large increases in transfer student enrollment in 2018 and 2019 after NC Promise began. As with the estimate of changes in first-year enrollment, the synthetic match is relatively weak for Elizabeth City, and strong for both UNC Pembroke and Western Carolina, as indicated by the RMSPEs. In part given the quality of these pre-treatment synthetic matches, the increases in transfers at UNC Pembroke and Western Carolina appear significant, while the increase at Elizabeth City does not.

[Insert Figure 2 here]

Transfer enrollment increased 41 percent at UNC Pembroke ($p = 0.12$), which was the ninth most extreme change in enrollment relative to the pre-treatment period among the 70

comparisons, and the second most extreme among the 35 placebo comparisons that demonstrated increases in transfer enrollment. Likewise, the 32 percent increase in transfer enrollment at Western Carolina ($p = 0.01$) was the second most extreme among 136 placebo comparisons, and the most extreme among the 58 comparisons with strict increases in transfer enrollment.

Changes in Student Demographics

Within these increases in transfer student enrollment, and even within the lack of statistically significant changes in first-year student enrollment, there may have been shifts in the demographic characteristics of the students who enrolled in each of the Promise institutions, depending on whether they differentially responded to the NC Promise tuition change. Recall that because of the relatively low number of students in some racial-ethnic categories, our analyses of these shifts focus on total changes in enrollment among first-year and transfer students combined (all "new" students). The results of this analysis are visually presented in Figure 3, with the corresponding treatment point estimates presented in Table 4.

[Insert Table 4 here]

White student enrollment increased at Elizabeth City after NC Promise was implemented. Here, we see White enrollment increased by 45 percent ($p = 0.1$), a recovery after declines in prior years. This change is illustrated in the Panel A of Figure 3, which shows a close match in the pre-period between Elizabeth City and its control and an increase at Elizabeth City after NC Promise began, while White student enrollment at the control institutions declined. Based on the placebo test graph, ECSU has the most extreme increase in White student enrollment after the policy, and the seventh most extreme change of any of the 70 placebo cases.

There is evidence of increases across all three demographic groups at UNC Pembroke. Panel B of Figure 3 shows increases in enrollment across all three demographic groups.

Specifically, White student enrollment increased by 25 percent (p = 0.13), Black student enrollment increased by 23 percent (p = 0.07), and Hispanic student enrollment increased by 64 percent (p = 0.21). The increase in Hispanic student enrollment has a relatively low p-value, but it is the fourth most extreme increase among the 26 placebo tests that also indicated increases in enrollment.

Finally, Panel of Figure 3 illustrates a notably increase in White students (14 percent; p = 0.015) at Western, but no apparent changes in Black or Hispanic student enrollment. The change in White students was the second most extreme change of any of the 136 placebo tests.

It is worth noting that none of our estimates for changes in Black or Hispanic students indicate a decrease in enrollment, regardless of the significance of the result. Thus, we see no evidence that enrollment changes induced by NC Promise lead to any crowding out of those traditionally underrepresented populations.

[Insert Figure 3 here]

Retention

Because NC Promise lowered the cost of attendance for both new and continuing students, it may affect retention, the year-to-year re-enrollment of already enrolled students, particularly for students who struggle to afford to continue their studies. As shown in Table 5, and graphically, in Figure 4, we find no evidence that NC Promise affected retention rates at any of the three promise institutions. All estimates for the change in retention rates were less than +/- four percentage points and none appeared significant in comparison to placebo cases. These results indicate, on the one hand, that the tuition changes resulting from NC Promise did not seem to induce any more students to stay enrolled at the Promise institutions than otherwise would have. On the other hand, it indicates that the new students who enrolled at the Promise

institutions as a result of NC Promise remained enrolled, presumably as successfully, as the students who had enrolled at the Promise institutions prior to the NC promise policy.

Robustness Checks

To check that our results are not dependent either on choices we made as researchers or on outlying, but influential, characteristics of the data, we run several robustness checks to bolster the conclusions from our results. We take three approaches to assessing the robustness of our results. First, we use a "leave-one-out" process where we drop each of the top contributors to our synthetic controls one at a time from the donor pool and repeat the analysis to ensure no single comparison unit drives the results. Second, we check that our choice of time period and any idiosyncratic trends do not affect our results by repeating the analysis using smoothed time trends that average multiple years together rather than including every year in the analysis. Finally, we make sure that our results are robust to our choice to use institutions with the same Carnegie Undergraduate Profile Classification as our primary donor pool by first repeating the analyses using different Carnegie Classification schemes and second by using comparison groups based on geography. In short, none of these checks change our conclusions in substantive ways. Tables and figures from these checks are available in the Appendix.

Leave-One-Out Checks

Appendix Figures A1-A3 show the results of the leave-one-out tests. Here we left out each of the top 10 contributors to the synthetic match in our main analysis based on their assigned weight.[5] In each figure, the solid black line remains the trend for the treated institution, the dark dotted line indicates the synthetic control as originally calculated, and the [orange]

[5] In cases where more than ten institutions had positive weights, those outside of the top ten regularly had weights less than 0.01, thus contributing to less than one percent of the final synthetic control. In short, the contribution of these comparisons to the overall estimate of the average treatment effect is minimal.

dotted lines show the results of the leave-one-out analyses. Almost uniformly, the leave-one-out analyses do not change our overall conclusions about changes in first-year or transfer enrollment, or enrollment among Black, White, and Hispanic students—the largely trend in the same direction and with roughly the same magnitude. The tests are somewhat murky for Elizabeth City, though this is a result of the continuing challenge the synthetic control has in finding an appropriate comparison for that institution. Our main conclusion about an increase in White students holds, and we formed no strong conclusions about the remaining outcomes.

Temporal Checks

Many of the pre-NC Promise trends in our outcomes were not smooth and it is possible that the models generated synthetic controls that were good at mimicking idiosyncratic changes in the pre-treatment trends at the cost of finding good matches for the overall trend. To explore the sensitivity of our estimates, we construct synthetic controls using two different combinations of pre-treatment years as opposed to data from the full seven-year pre-treatment period (i.e., Fall 2010 to 2017). The first alternative, displayed in Table A1, matches on the institutional averages from 2010-2013 and then from 2014-2017. The second alternative, displayed in Table A2, averages institutions over every two years in the data. By averaging over multiple years in the pre-treatment trends, we are able to smooth some of the more extreme or anomalous years for both the treatment and control institutions. This robustness check can improve the pre-treatment match and lend confidence to the validity of the synthetic control institution in each model (Abadie, 2021).

Here we find qualitatively similar results to our primary findings. Both sets of models are clear that transfer enrollment increased, as well as enrollment among White students. They have

slightly more uncertainty about whether there were changes in Black and Hispanic student enrollments at UNC Pembroke or elsewhere, but all estimates are still large and positive.

Donor Pool Checks

Following best practices for synthetic control methods (Abadie, 2021), we used the Carnegie Undergraduate Profile classification to start with a candidate donor pool for the synthetic matches that was already reasonably well matched to the Promise institutions. Given the strength of our matches in the main analyses, particularly at UNC Pembroke and Western Carolina, we feel confident in these choices. However, we demonstrate here that this choice of donor pool did not affect our main findings.

First, we repeat our analysis using two different Carnegie classifications—the Size and Setting classification, and the Basic classification. These results are displayed in Table A3. In Panel A, the Size and Setting comparisons confirm our main findings about NC Promise leading to an increase in transfer student enrollment, but not first-year enrollment. This comparison group also confirms our conclusions about increases in White students at all three campuses, but shows no evidence of increases in Black student enrollments. There is suggestive evidence that Hispanic student enrollment increased at UNC Pembroke ($p = 0.179$). In Panel B, results from the comparison to similar Carnegie Basic institutions follow similar patterns in confirming no change in first-year student enrollment and an increase in transfer student enrollment. This comparison, however, shows positive, but not significant increases in white student enrollment and some evidence of significant increases in Black student enrollment at Western Carolina ($p = 0.058$) and Hispanic student enrollment at UNC Pembroke ($p = 0.029$)

Second, we use geographic regions to form the donor pool for our synthetic matches. Institutions in the same geographic region may be impacted by similar regional trends in

enrollment or costs. Institutions in the same region may also be responding to similar policy decisions and student demands, making them good candidates for matching on potentially unobserved variables impacting enrollment and retention. We avoided focusing on this comparison because institutions in North Carolina's own region, particularly ones comparable to the Promise institutions, may have faced spillover effects from NC Promise, even if they were not the policy's intended target. However, here we check how our results hold up to that comparison, as well as to comparisons using other geographic regions.

We first repeat the analysis using public four-year institutions in the Southeast region as defined by the Bureau of Economic Analysis. This includes all public institutions in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia. We do this again using all public four years institutions in the Northeast and Mid-Atlantic regions: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Delaware, Washington, DC, Maryland, New Jersey, New York, and Pennsylvania. We refer to this comparison set as the North region. Lastly, we create a set of synthetic control institutions using the remaining states not included in the Southeast or the North region analyses. We refer to this group as the West region.

Table A4 reports the results for the synthetic control analyses using the Southeast donor pool. As in our other checks, these results largely support the findings using the Carnegie Classification donor groups. Relative to a synthetic match constructed from public universities in the Southeast, NC Promise did not affect first-year enrollment at the Promise institutions. There is evidence that transfer enrollment increased at UNC Pembroke ($p = 0.124$) and Western Carolina ($p = 0.162$), though these results are not as extreme in the distribution of placebo permutations. We again see that White student enrollment increased at Elizabeth City ($p = 0.035$)

and UNC Pembroke (p = 0.043), and Hispanic enrollment increased at UNC Pembroke (p = 0.068). There was no evidence of increases in Black student enrollment, though all estimates are positive.

Finally, Table A5 displays the results for the effect of NC Promise on enrollments using the remaining two geographic region donor groups. Panel A reports estimates where the North region served as the donor pool, and Panel B does the same where the West region served as the donor pool. These donor pools are arguably our least preferred because institutions they contain neither share a similar economic or political context with the Promise institutions, nor were they chosen to share specific characteristics with the Promise institutions. Still, the comparison with the North region suggests NC Promise resulted in increases in transfer enrollment at UNC Pembroke and Western Carolina, while the West comparison shows the increase just at UNC Pembroke. Other estimates of changes in transfer enrollments are large and positive. Both comparisons indicate increases in White student enrollment at Western Carolina, while only the North comparison shows a significant increase at UNC Pembroke. The North comparison also suggests an increase at Hispanic student enrollment at UNC Pembroke, confirming earlier patterns. The remaining changes we estimated were all positive, but not significant.

Discussion

Although its design does not look like other well-known "promise" programs like the Kalamazoo Promise, NC Promise represents an important test of how a universal and highly visible decrease in public university sticker price tuition affects students' college enrollment choices. Although it did not make tuition completely free, the program has more in common with "free college" proposals than many promise policies, particularly for students who qualify for

need-based financial aid. Our synthetic control study provides the first glimpse into the effect of lowering the sticker price of a four-year, public university context.

Four things are apparent from our findings. First, first-year student enrollment was relatively unaffected by NC Promise implementation. Second, there were notable increases in transfer student enrollment at the non-HBCU campuses affected by the policy, and the HBCU showed consistently positive results in this category. Third, although the policy did not generally affect the demographic composition of the affected universities, it did increase Hispanic student enrollment at the campus that serves one of the more racially diverse areas of North Carolina. Finally, despite the changes in enrollment that we see, there were no discernable changes in student retention at the three Promise institutions, which we take as a positive finding because the policy could have easily induced less academically-prepared students to enroll. We discuss these findings in turn.

Despite what appeared to be an initial boost in the first year after the policy began, first-year student enrollment remained largely unchanged at each of the three Promise institutions. One possible explanation for this null finding is that the tuition change caused by NC Promise was small relative to the total cost of attendance—including fees and expected food and housing costs—particularly for the in-state students that comprise the vast majority of student enrollments at the Promise institutions. The size of a financial aid package matters for increasing enrollment, and similarly, the size of the decrease in cost of attendance at a Promise institution matters (Dynarski, 2003; Page & Scott-Clayton, 2016). Thus, the decrease in tuition may not have been substantial enough to alter the preferences of price-sensitive students, though there may have been differential responses between in- and out-of-state students that are worth further

study—our current data does not allow us to investigate changes among in- versus out-of-state student enrollment.

Additionally, we know that students tend to attend college close to home (Long, 2004; Niu & Tienda, 2008; Rouse, 1995; Turley, 2009; Skinner, 2019), particularly students attending less-selective colleges like the Promise institutions (Hoxby, 2009, Klasik & Zahran, 2022). Thus, the decrease in cost of attendance may not have been substantial enough to persuade students to travel farther from home to attend one of the Promise institutions. Rather, it appears students who would have likely attended a Promise institution anyway enjoyed more affordable tuition than before.

Although the policy does not appear to have been significant enough to affect the enrollment patterns of first-year students, the fact that it resulted in notable increases in transfer student enrollment suggests an important way such policies may increase educational opportunity for the non-traditional students that tend to enroll in community colleges. The increase in transfer student enrollment at the Promise institutions may have resulted in part because the changes in tuition at the Promise institutions put the total cost of attendance for students not living at home at levels comparable to the nearby community colleges that regularly send a large number of transfer students to the three Promise campuses. That is, successful transfer to a Promise institution would have resulted in very little change to what a student was already paying for a community college education.

As the data become available, future research will need to evaluate the degree-completion rates of these transfer students given that the lower-income students who the Promise policy likely incentivized to transfer often complete their degrees at lower rates than higher income students (Jenkins & Fink, 2016). Even though Promise may have cleared financial barriers for

community college students seeking a bachelor's degree, the bureaucratic and academic barriers to transfer, such as unclear pathways and credit loss, may remain (Jabbar et al., 2022, Jenkins & Fink, 2015).

Despite this increase in transfer access, there does not appear to have been widespread increases in racial diversity on the Promise campuses. With the exception in the growth of enrollment of Hispanic students at UNC Pembroke, we did not consistently observe overall increases in enrollment in White, Black, or Hispanic students at Elizabeth City or Western Carolina. Part of this result may stem from the characteristics of the Promise institutions and the local populations they serve. As an HBCU located in a part of the state with a high Black population, Elizabeth City was probably unlikely to add additional racial and ethnic diversity to its campus population. Conversely, as a Predominantly White Institution in the predominantly White western mountain region of the state, Western Carolina was probably limited in how much new racial and ethnic diversity it could draw, particularly if students did not want to travel far from home to attend college.

Finally, we did not find that the NC Promise was associated with changes in the rates at which students remained enrolled in Promise institutions. On the one hand, policy makers may find this result disappointing because the lower cost of attendance at Promise institutions should have made it easier for students to afford to remain enrolled, suggesting that retention rates should have increased. On the other hand, although we did not see substantial changes in enrollment among non-transfer students or by racial/ethnic categories, it is possible enrollment patterns shifted among categories of students we were not able to study such as by student income or level of academic preparation for college. These students may have had a lower likelihood of remaining enrolled in college, so the overall stability of retention rates at the

Promise institutions students suggests that NC Promise may have helped these students succeed at rates comparable to students who enrolled prior to the start of NC Promise.

Conclusion

The results of this study provide early evidence of the NC Promise's contribution toward the state's access and attainment goals. This study comes at a crucial time for NC policymakers, as the policy has received national media attention (e.g. Brown, 2022) and the legislature has announced an expansion of the policy to Fayetteville State University. Furthermore, this study will be one of the first to quantify the impact of programs that reduce sticker prices at public four-year colleges. Our findings here represent just the start of understanding the effects of this program. Ultimately, it will be important to understand whether NC Promise helped students complete college degrees. Unfortunately, the short amount of time NC Promise has been in place and the COVID-19 disruption make it difficult to study these outcomes at this time. Future work should also dig into the financial implications of NC Promise. For example, lower tuition may lead students to take out fewer loans, leaving them with lower levels of debt at graduation than they otherwise would have. The one effect of promise that is clear, however, is that it appears to open a new path to a four-year degree for community college students. And that itself is promising.

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Table 1

Design Features of College Promise Programs

	United States		NC Promise
	N	Percent	
Target Population			
Traditional-Aged Students	132	0.88	√
Non-Traditional Students	6	0.04	√
Special Populations Only	1	0.01	√
Other	11	0.07	…
Community Service Requirement			
Yes	14	0.09	…
No	134	0.89	√
Unknown	2	0.01	…
Post-College State Residency Requirement			
Yes	3	0.02	...
No	147	0.98	√
Minimum Enrollment Requirement			
None	15	0.10	…
3-6 credits	19	0.13	…
9-12 credits	76	0.51	√
15 credits	10	0.07	…
Full time	2	0.01	…
Unknown	37	0.25	…
Funding Source			
Public	31	0.21	√
Private	59	0.39	…
Public / Private	17	0.11	…
Second Payer	1	0.01	…
Unknown	42	0.28	…
Type			
First Dollar	8	0.05	√
Last Dollar	93	0.62	…
Last Dollar +	27	0.18	…
Scholarship	16	0.11	…
Unknown	6	0.04	…

Notes: Data from College Promise's interactive map on promise programs across the United States (https://www.mypromisetool.org/). We synthesized reports retrieved on February 20, 2023.

Table 2

Descriptive Statistics on NC Promise Institutions and Synthetic Control Matches Prior to the Start of NC Promise (2010-2017)

	ECSU	Outcome-Specific Synthetic Control		UNCP	Outcome-Specific Synthetic Control		WCU	Outcome-Specific Synthetic Control	
		First-Year Enrollment	Transfer Enrollment		First-Year Enrollment	Transfer Outcome		First-Year Enrollment	Transfer Enrollment
Admissions and Enrollment									
Total Applicants	2,368	3,639	821	3,751	7,984	6,346	15,914	12,485	11,365
Average Enrollment Count									
Total	2,076	2,537	1,493	5,390	8,147	8,171	8,274	12,817	11,588
First-Year	357	420.7	291	1,073	1,418	1,329	1682	2,154	1,934
Transfer	149	213	157	542	900	938	812	1,453	1,187
Full-Time	1,922	2069	1,295	4,451	6,956	7,238	7131	11,022	10,025
Women	1,218	1710	824	3,266	4,706	4,956	4450	6,530	6,138
Adults (>24)	392	882.8	624	1,506	2,037	1,792	1584	2,119	2,006
Race/Ethnicity Count of New First Time & Transfer, Undergraduates									
Black or African American	351	516	43	555	651	278	145	346	236
Hispanic	10	11	7	86	652	1,100	137.4	763	632
White	80	36	358	632	597	519	1989	1,872	1,608
Institutional Characteristics									
Student-to-Faculty Ratio	14.62	17.77	14.94	15.25	18.50	20.45	16.00	18.30	19.68
Full Time Retention Rate	73.25	57.61	63	67.25	69.16	72.89	77	81.97	77.24
Total Annual Graduates	568	508	308	1,005	1,252	1,052	1,451	1,800	1,813
Endowment per FTE	$2,962	$2,910	$17,220	$3,052	$3,423	$2,927	$6,272	$6,804	$4,524
HBCU Status	100%	100%	42%	0%	50%	21%	0%	0%	0%
Undergraduates on Pell	1,516	1,838	870	3,072	4,540	4,875	3,228	5,020	4,596

Notes: Table presents summary statistics for each NC Promise institution and the outcome-specific synthetic control institution drawn from the pool of colleges that share a Carnegie Undergraduate Classification with the Promise institution. Enrollment counts are of degree-seeking undergraduates reported in the IPEDS fall enrollment total.

Table 3

The Effect of NC Promise on Enrollments Using Carnegie Undergraduate Profile

	First Year Enrollment					Transfer Enrollment				
	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
Elizabeth City	0.255	0.743	52/70	35/41	0.145	0.499	0.514	36/70	13/25	0.153
UNC-Pembroke	0.154	0.200	14/70	12/41	0.000	0.411	0.129	9/70	2/36	0.020
Western Carolina	0.225	0.816	111/136	54/67	0.000	0.320	0.015	2/136	1/58	0.000

Notes: Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. To aid in the interpretation of these p-values, the table also presents the rank of the post-/pre-RMSPE ratio at the Promise institution among the placebo estimates among all institutions in the synthetic control donor pool (two-sided) and among all ATE estimates that are in the same direction (positive/negative) as the ATE at the Promise institution (one-sided). RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table 4

The Effect of NC Promise on Enrollments Using Carnegie Undergraduate Profile by Student Subgroups

White

	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
Elizabeth City	0.456	0.100	7/70	3/36	0.016
UNC-Pembroke	0.252	0.129	9/70	4/36	0.000
Western Carolina	0.143	0.015	2/136	2/73	0.003

Black

	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
Elizabeth City	0.088	0.929	65/70	37/38	0.215
UNC-Pembroke	0.230	0.071	5/70	4/38	0.000
Western Carolina	0.120	0.324	44/136	2/64	0.019

Hispanic

	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
Elizabeth City	0.840	0.700	49/70	12/25	0.511
UNC-Pembroke	0.639	0.214	15/70	4/26	0.000
Western Carolina	0.102	0.941	128/136	70/76	0.089

Notes: Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. To aid in the interpretation of these p-values, the table also presents the rank of the post-/pre-RMSPE ratio at the Promise institution among the placebo estimates among all institutions in the synthetic control donor pool (two-sided) and among all ATE estimates that are in the same direction (positive/negative) as the ATE at the Promise institution (one-sided). RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table 5

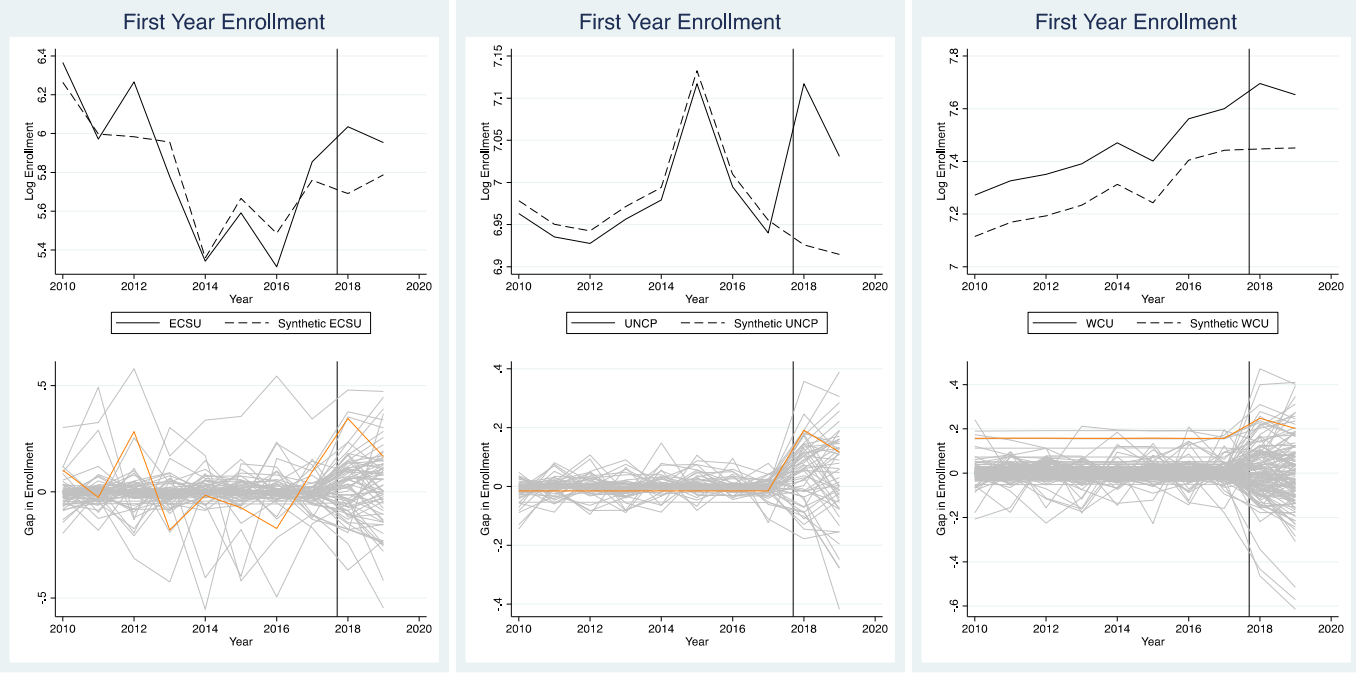
The Effect of NC Promise on Percent of Students Re-Enrolling in Following Year

	Retention Rate				
	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
Elizabeth City	-0.216	0.971	68/70	33/33	2.405
UNC-Pembroke	3.840	0.486	34/70	13/32	1.407
Western Carolina	0.266	0.440	44/100	23/53	0.227

Notes: Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. To aid in the interpretation of these p-values, the table also presents the rank of the post-/pre-RMSPE ratio at the Promise institution among the placebo estimates among all institutions in the synthetic control donor pool (two-sided) and among all ATE estimates that are in the same direction (positive/negative) as the ATE at the Promise institution (one-sided). RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Figure 1

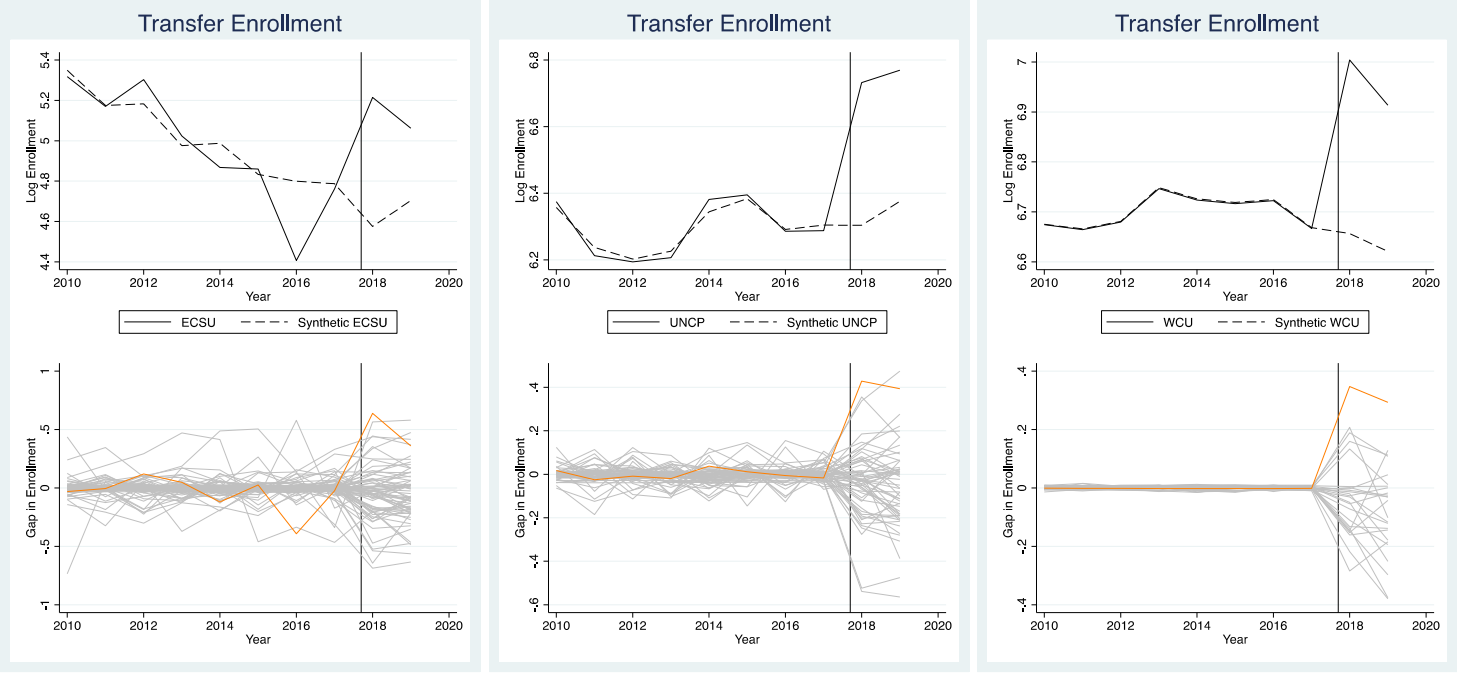
Synthetic Control and Placebo Graphs for the Effect of NC Promise on First Year Enrollment



Note. Top row presents the trend in log enrollment at each NC Promise institution with the trend in log enrollment each institution's synthetic control. Bottom row presents placebo tests for statistical significance with the difference between log enrollment at the Promise institution and its synthetic control in orange and the difference between log enrollment at the placebo institutions and their synthetic controls in gray. The vertical line indicates the start of NC Promise prior to the 2018-19 academic year.

Figure 2

Synthetic Control and Placebo Graphs for the Effect of NC Promise on Transfer Enrollment

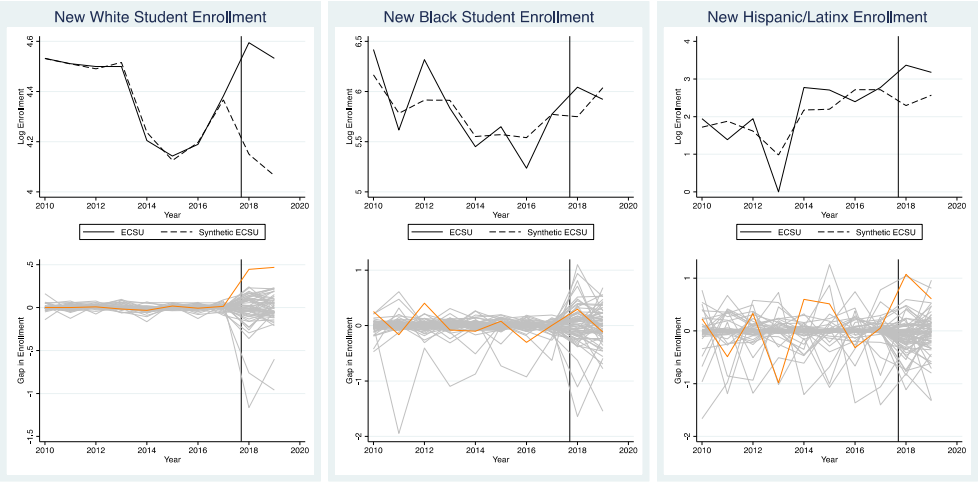


Note. Top row presents the trend in log enrollment at each NC Promise institution with the trend in log enrollment each institution's synthetic control. Bottom row presents placebo tests for statistical significance with the difference between log enrollment at the Promise institution and its synthetic control in orange and the difference between log enrollment at the placebo institutions and their synthetic controls in gray. The vertical line indicates the start of NC Promise prior to the 2018-19 academic year.

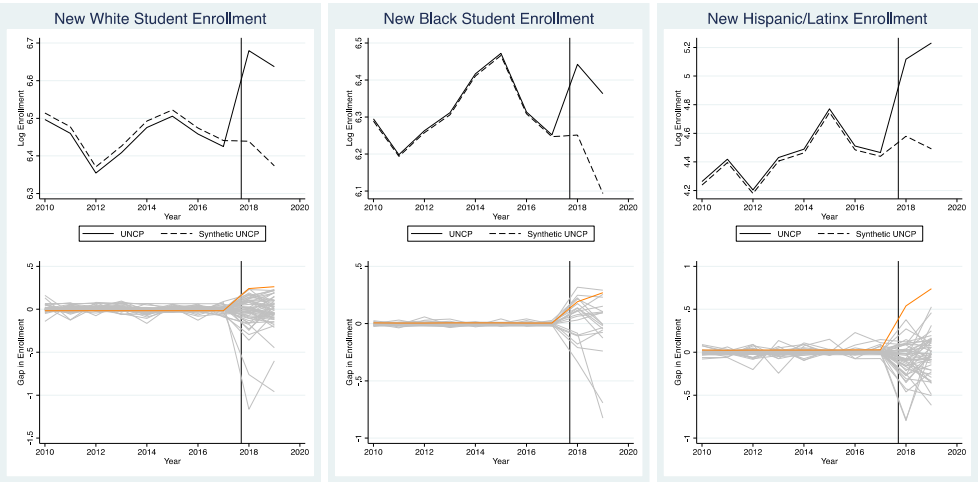
Figure 3

Synthetic Control and Placebo Graphs for the Effect of NC Promise on New Student Enrollment by Race/Ethnicity

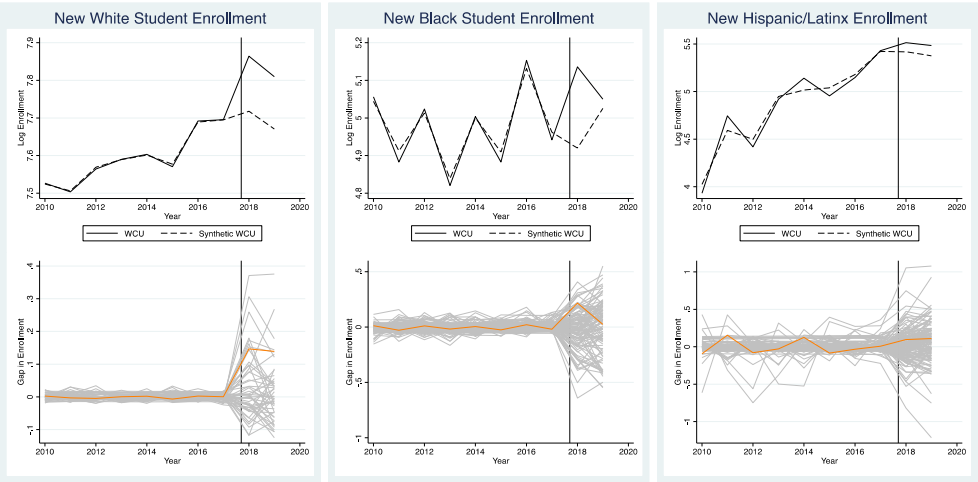
Panel A



Panel B



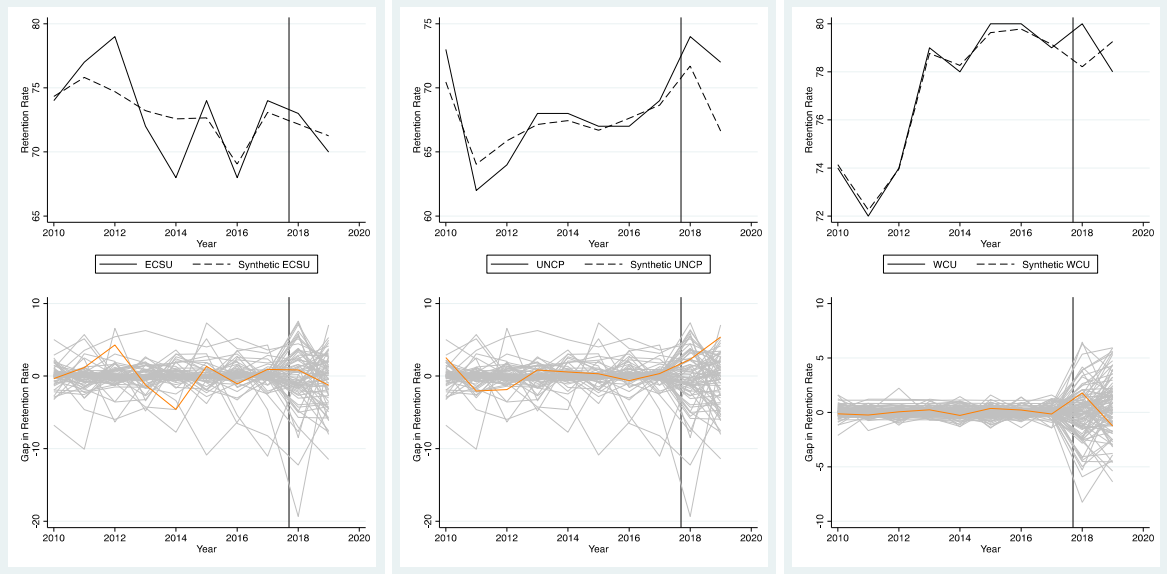
Panel C



Note. Panels A, B, and C give the changes in new student (first-year and transfer students combined) by race/ethnicity at ECSU, UNCP, and WCU, respectively. Within each panel, the top row presents the trend in log enrollment of new White, Black, and Hispanic/Latinx students at the respective Promise institution with the trend in comparable log enrollment each institution's synthetic control. The bottom rows presents placebo tests for statistical significance with the difference between log enrollment at the Promise institution and its synthetic control in orange and the difference between log enrollment at the placebo institutions and their synthetic controls in gray. The vertical line indicates the start of NC Promise prior to the 2018-19 academic year.

Figure 4

Synthetic Control and Placebo Graphs for the Effect of NC Promise on Student Retention



Note. Top row presents the trend in retention rates at each NC Promise institution with the trend in retention rates each institution's synthetic control. Bottom row presents placebo tests for statistical significance with the difference between retention rates at the Promise institution and its synthetic control in orange and the difference between log enrollment at the placebo institutions and their synthetic controls in gray. The vertical line indicates the start of NC Promise prior to the 2018-19 academic year.

Appendix

Supplementary Tables and Figures from Robustness Checks

Table A1

Temporal Sensitivity Check for the Effect of NC Promise on Enrollments, Four-Year Averages

	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
First-Year					
Elizabeth City	0.323	0.271	19/70	12/39	0.191
UNC-Pembroke	0.154	0.129	9/70	8/42	0.057
Western Carolina	0.167	0.14	19/136	8/66	0.048
Transfer					
Elizabeth City	0.197	0.514	36/70	19/36	0.191
UNC-Pembroke	0.471	0.014	1/70	1/37	0.071
Western Carolina	0.299	0.007	1/136	1/71	0.041
White					
Elizabeth City	0.608	0.029	2/70	1/38	0.162
UNC-Pembroke	0.279	0.029	2/70	1/38	0.051
Western Carolina	0.275	0.037	5/136	3/74	0.059
Black					
Elizabeth City	0.298	0.642	45/70	23/39	0.284
UNC-Pembroke	0.080	0.771	54/70	28/38	0.099
Western Carolina	0.195	0.412	56/136	28/60	0.134
Hispanic					
Elizabeth City	0.814	0.314	22/70	12/40	0.652
UNC-Pembroke	0.320	0.229	16/70	12/40	0.214
Western Carolina	0.317	0.375	51/136	31/84	0.211

Note. Pre-treatment institutional characteristics and outcomes averaged over 2010-13 and 2014-17. Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. To aid in the interpretation of these p-values, the table also presents the rank of the post-/pre-RMSPE ratio at the Promise institution among the placebo estimates among all institutions in the synthetic control donor pool (two-sided) and among all ATE estimates that are in the same direction (positive/negative) as the ATE at the Promise institution (one-sided).

RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table A2

Temporal Sensitivity Check for the Effect of NC Promise on Enrollments, Two-Year Averages

	ATE	p-value	Rank (two-sided)	Rank (one-sided)	RMSPE
First-Year					
Elizabeth City	0.282	0.400	28/70	19/44	0.199
UNC-Pembroke	0.269	0.071	5/70	4/49	0.071
Western Carolina	0.168	0.169	23/136	11/71	0.045
Transfer					
Elizabeth City	0.203	0.457	32/70	17/34	0.196
UNC-Pembroke	0.535	0.014	1/70	1/36	0.068
Western Carolina	0.286	0.007	1/136	1/73	0.036
White					
Elizabeth City	0.633	0.043	3/70	2/42	0.171
UNC-Pembroke	0.431	0.014	1/70	1/43	0.044
Western Carolina	0.277	0.059	8/136	5/74	0.060
Black					
Elizabeth City	0.207	0.657	46/70	25/39	0.264
UNC-Pembroke	0.142	0.129	9/70	4/40	0.054
Western Carolina	0.090	0.750	102/136	44/58	0.120
Hispanic					
Elizabeth City	0.767	0.385	27/70	15/38	0.653
UNC-Pembroke	0.517	0.014	1/70	1/40	0.109
Western Carolina	0.246	0.515	70/136	42/77	0.187

Note. Pre-treatment institutional characteristics and outcomes averaged every two years. Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. To aid in the interpretation of these p-values, the table also presents the rank of the post-/pre-RMSPE ratio at the Promise institution among the placebo estimates among all institutions in the synthetic control donor pool (two-sided) and among all ATE estimates that are in the same direction (positive/negative) as the ATE at the Promise institution (one-sided). RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table A3

The Effect of NC Promise on Enrollments Using Alternative Carnegie Classification Donor Pools

	Panel A: Carnegie Size & Setting			Panel B: Carnegie Basic		
	First-Year			**First-Year**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.268	0.286	0.714	0.099	0.282	0.857
UNC-Pembroke	0.123	0.000	0.358	0.153	0.000	0.219
Western Carolina	0.138	0.022	0.337	0.044	0.000	0.190
	Transfer			**Transfer**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.374	0.184	0.179	0.492	0.224	0.114
UNC-Pembroke	0.464	0.023	0.095	0.406	0.015	0.044
Western Carolina	0.370	0.000	0.126	0.345	0.000	0.109
	White			**White**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.575	0.203	0.071	0.081	0.287	0.943
UNC-Pembroke	0.399	0.000	0.011	0.263	0.000	0.255
Western Carolina	0.189	0.016	0.095	0.155	0.018	0.190
	Black			**Black**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.605	0.519	0.500	0.345	0.361	0.629
UNC-Pembroke	0.162	0.000	0.442	0.166	0.015	0.292
Western Carolina	0.199	0.017	0.242	0.294	0.006	0.058
	Hispanic			**Hispanic**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.814	0.754	0.357	0.860	0.537	0.143
UNC-Pembroke	0.633	0.020	0.179	0.513	0.008	0.029
Western Carolina	0.036	0.080	0.916	0.094	0.073	0.839

Note. Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table A4

The Effect of NC Promise on Enrollments using Southeast Region Donor Pool

	First-Year		
	ATE	RMSPE	p-value
Elizabeth City	0.220	0.144	0.818
UNC-Pembroke	0.050	0.005	0.310
Western Carolina	0.036	0.011	0.524
	Transfer		
	ATE	RMSPE	p-value
Elizabeth City	0.420	0.109	0.496
UNC-Pembroke	0.441	0.016	0.124
Western Carolina	0.318	0.000	0.162
	White		
	ATE	RMSPE	p-value
Elizabeth City	0.329	0.000	0.035
UNC-Pembroke	0.234	0.000	0.043
Western Carolina	0.134	0.000	0.789
	Black		
	ATE	RMSPE	p-value
Elizabeth City	0.186	0.221	0.892
UNC-Pembroke	0.026	0.000	0.709
Western Carolina	0.044	0.014	0.760
	Hispanic		
	ATE	RMSPE	p-value
Elizabeth City	0.388	0.416	0.902
UNC-Pembroke	0.737	0.000	0.068
Western Carolina	0.033	0.161	1.000

Note. Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Table A5

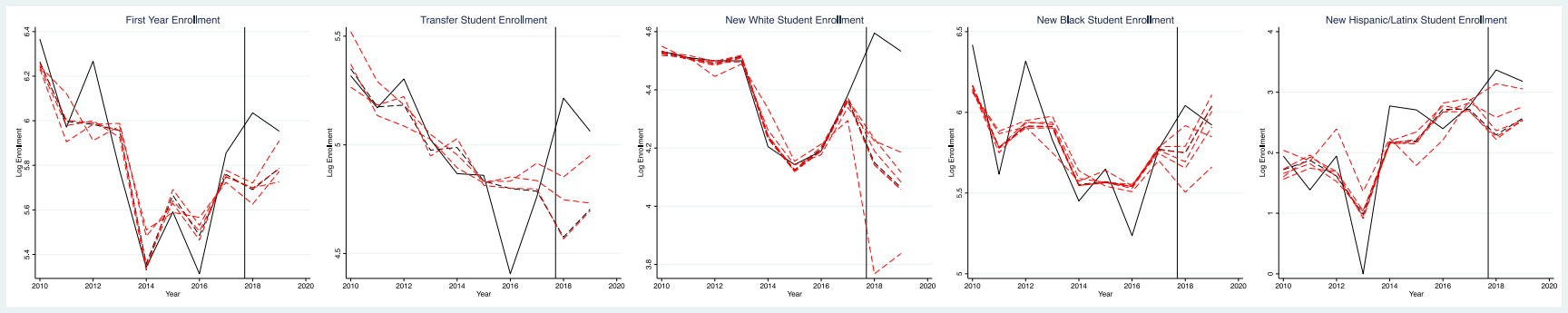
The Effect of NC Promise on Enrollments using Alternative Geographic Region Donor Pools

	Panel A: North Region			Panel B: West Region		
	First-Year			**First-Year**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.138	0.243	0.962	0.368	0.222	0.570
UNC-Pembroke	0.137	0.000	0.564	0.060	0.000	0.887
Western Carolina	0.124	0.000	0.808	-0.032	0.000	0.948
	Transfer			**Transfer**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.626	0.126	0.371	0.273	0.109	0.654
UNC-Pembroke	0.533	0.022	0.094	0.573	0.000	0.064
Western Carolina	0.400	0.000	0.155	0.391	0.000	0.359
	White			**White**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.341	0.086	0.423	0.354	0.086	0.402
UNC-Pembroke	0.304	0.000	0.042	0.420	0.000	0.406
Western Carolina	0.168	0.001	0.097	0.130	0.001	0.130
	Black			**Black**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.191	0.300	0.943	0.368	0.192	0.719
UNC-Pembroke	0.419	0.023	0.170	0.188	0.004	0.162
Western Carolina	0.323	0.032	0.312	0.205	0.000	0.573
	Hispanic			**Hispanic**		
	ATE	RMSPE	p-value	ATE	RMSPE	p-value
Elizabeth City	0.492	0.501	0.848	0.786	0.463	0.743
UNC-Pembroke	0.375	0.007	0.033	0.744	0.000	0.384
Western Carolina	0.001	0.098	1.00-	0.138	0.068	0.676

Note. Average Treatment Effect (ATE) expressed in terms of log enrollment totals. p-value calculation described more thoroughly in the main body of the text and roughly represents the proportion of placebo tests that result in effect estimates as or more extreme than the effect estimate at the Promise institution. RMSPE gives the root mean squared prediction error of the synthetic match, with smaller values indicating a stronger pre-treatment match between the Promise institution and the outcome-specific synthetic control.

Figure A1

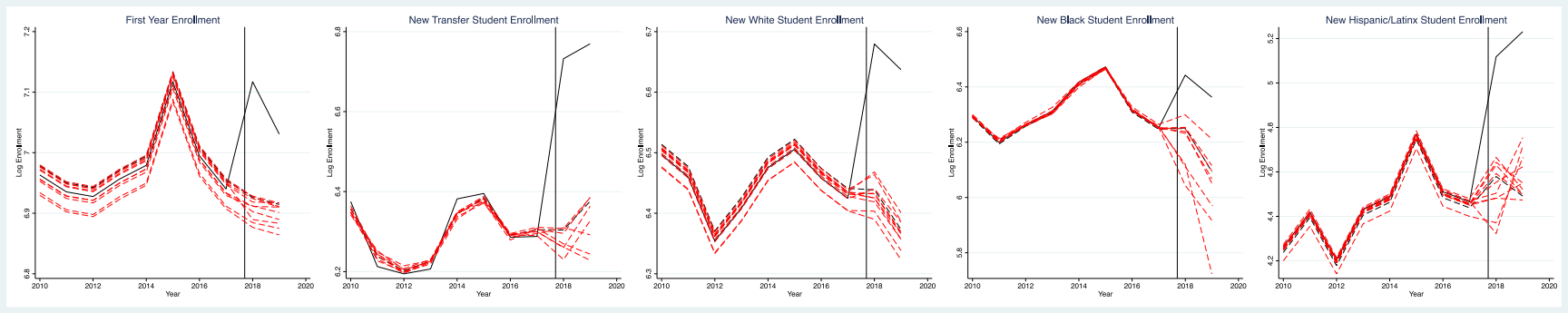
Leave One Out Analysis for Elizabeth City



Note. Solid line indicates the outcome trend of Elizabeth City. Dotted-gray line indicates the trend in the outcome of the synthetic control match used in the analyses. Dotted orange lines indicate synthetic matches with one of the top-ten highest weighted institutions in the synthetic match left out.

Figure A2

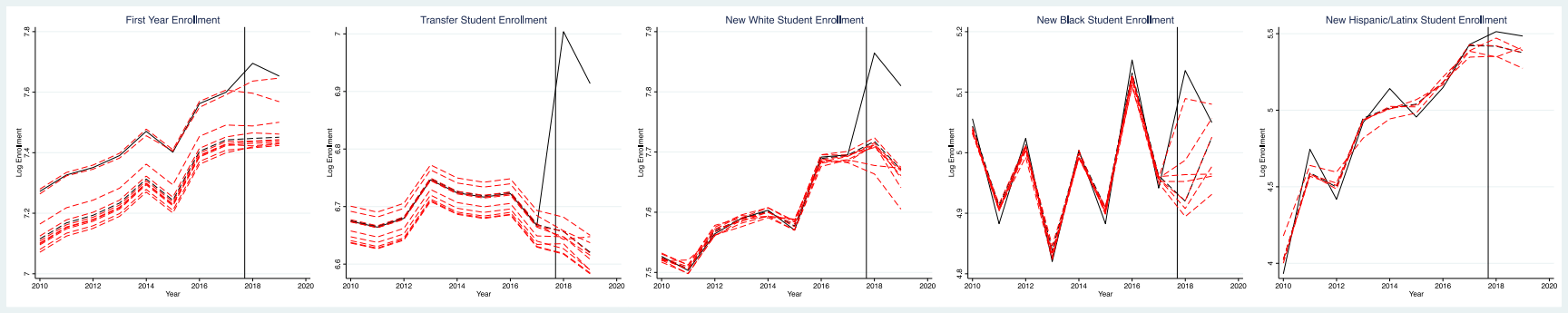
Leave One Out Analysis for UNC-Pembroke



Note. Solid line indicates the outcome trend of UNC-Pembroke. Dotted-gray line indicates the trend in the outcome of the synthetic control match used in the analyses. Dotted orange lines indicate synthetic matches with one of the top-ten highest weighted institutions in the synthetic match left out.

Figure A3

Leave One Out Analysis for Western Carolina



Note. Solid line indicates the outcome trend of Western Carolina. Dotted-gray line indicates the trend in the outcome of the synthetic control match used in the analyses. Dotted orange lines indicate synthetic matches with one of the top-ten highest weighted institutions in the synthetic match left out.