

ABSTRACT

BARGER, RENEE WETLI. The Impact of Co-Admissions Agreements on Two-Year to Four-Year Transfer Student Success: A Difference-in-Differences Study (Under the direction of Dr. Stephen Porter and Dr. David English.).

For students that enroll in community colleges with the aspiration to transfer to a 4-year institution and earn a bachelor's degree, navigating the complexities of the transfer process can stymie their ability to achieve their educational goals. One solution implemented by community colleges and universities to support transfer students through the transfer process is the adoption of co-admissions agreements. Co-admissions agreements are partnerships between community colleges and universities that guarantee admission to the university for community college students that meet certain requirements, such as earning an associate's degree and a minimum GPA at the community college. Co-admissions agreements typically also offer participating students access to university advisors and campus resources prior to transferring.

Co-admissions agreements are an increasingly popular solution to support transfer students; in North Carolina, the focus of this study, 20% of the community college and university pairs in the state have a co-admissions agreement. The majority of these agreements were signed in the last six years. Despite their popularity, the impact of co-admissions agreements on transfer student outcomes has not been extensively examined, particularly their effect on the number of students that transfer between the institutions. This study aimed to close that gap in the literature by focusing on transfer student volume as an outcome of co-admissions agreements.

Using data from the University North Carolina System Office on students who transferred between academic years 2010-2011 and 2020-2021, I used a quasi-experimental difference-in-differences approach to isolate the impact of co-admissions agreements on the number of students that transfer between the institutions with an agreement. I identified

community college and university pairs, or transfer pathways, that signed a co-admissions agreement during the time period of my study as the treatment group. Community college to university transfer pathways that did not implement an agreement served as the control group. I used a two-way fixed effects variation of difference-in-differences to allow for variation in the timing of my treatment and included inverse-propensity weights based on the likelihood of receiving treatment to balance my treatment and control groups.

In addition to examining the overall number of transfer students as an outcome, I also examined the number of students that transferred who were American Indian, Black, or Hispanic/Latinx, Pell recipients, or adult learners. This allowed me to determine if co-admissions agreements have a differential impact on students traditionally underserved in the transfer process. I also examined the number of students that transferred with an associate's degree as an outcome, as many of the co-admissions agreements in North Carolina require participants to earn an associate's degree prior to transferring.

Overall, my findings indicate that co-admissions agreements did not impact the number of students that transfer along pathways with an agreement. They also did not impact the number of students who transferred from any of my demographic sub-groups. However, transfer pathways with a co-admissions agreement did see an increase in the number of students transferring after first earning an associate's degree. This result suggests that while co-admissions agreements may not induce more students to transfer, they could be influencing more transfer students to earn an associate's degree before they transition to a university. These findings could have important implications for community college or university practitioners considering entering into a co-admissions agreement and policymakers interested in smoothing the transfer process and increasing educational attainment in their state.

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The Impact of Co-Admissions Agreements on Two-Year to Four-Year Transfer Student Success:
A Difference-in-Differences Study

by
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CHAPTER 1: INTRODUCTION

Many students begin their postsecondary education at a community college with the intent of transferring to a four-year institution and earning a bachelor's degree. Public 2-year colleges are the largest sector in higher education, accounting for 44% of undergraduate enrollments and 8.2 million students in year-round enrollment (Community College Research Center, n.d.). As many as 80% of these students intend to transfer and earn a bachelor's degree (Jenkins & Fink, 2015). However, only 32% of community college students transfer to a four-year institution, and 42% of those who transfer earn a bachelor's degree, resulting in just 13% of all students who first enroll at a community college earning their bachelor's degree within six years of enrollment (Shapiro et al., 2017b).

The lack of bachelor's degree attainment among community college students may stem from the difficulty students face in navigating the complex transfer process and uncertainties about which transfer pathway they should pursue (Bailey et al., 2015; Handel & Williams, 2012; Hodara et al., 2017; Taylor & Jain, 2017; Scott-Clayton, 2011; Schudde et al., 2020). Students must balance both state-level transfer policies and inter-institutional policies that govern how they move between institutions and specific degree programs and how their individual credits will transfer (Bailey et al., 2015; Hodara et al., 2017). A desire to maintain institutional autonomy in degree program planning and a variety of degree options for students, hallmarks of American higher education, creates difficulty in providing transfer students with a clear path to a bachelor's degree (Taylor & Jain, 2017). In addition, the difference between the intended implementation of state and institution-level transfer policies and how they are actually enacted can cause even more confusion for students (Falconetti, 2008; Grote et al., 2020).

Co-admissions agreements have emerged as one solution to overcome these structural barriers that lead to low transfer and bachelor's attainment rates among community college students. Sometimes referred to as dual admissions agreements, joint admissions agreements, and transfer admissions guarantees, these programs aim to support community college students who intend to complete a bachelor's degree. Co-admissions agreements guarantee admission to a particular four-year institution if students meet the program requirements, typically completing their associate's degree, maintaining a certain GPA, and/or graduating within a certain time frame (ECS, 2015; Morris & Cox, 2016). These programs also offer additional supports to community college students while they are enrolled at the community college, including advising from both the community college and the four-year institution, access to events and facilities on both campuses, career and financial aid counseling, application fee waivers, and joint applications (ECS, 2015; Morris & Cox, 2016; Ullman, 2011). By offering these additional supports, co-admissions programs intend to support students as they navigate the complexities of transfer created by state and institutional policies. The programs ultimately aim to increase transfer and bachelor's degree completion rates for community college students (Ullman, 2011).

Despite higher education's embrace of co-admissions agreements, little empirical evidence of their effectiveness exists. Some recent research and evaluation data from individual programs suggests that co-admissions agreements may have an impact on transfer students' motivation to transfer, sense of belonging at the university, and their comfort with the transfer process (Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020; Phillips, 2014). Co-admissions agreements may also influence the level of collaboration between participating institutions and the rates at which students participating the programs transfer and earn bachelor's degrees (Boyd, 2018; Higdon, 2018; Knepfle & McCaskill, 2022; Phillips, 2014;

Ullman, 2011; University of Connecticut, 2021). However, the evidence is mixed, and all studies to date have only examined one partnership between an individual university and community college, limiting their generalizability and the understanding of how co-admissions agreements impact state transfer systems as a whole. This lack of comprehensive research illustrates the importance of better understanding the effectiveness of co-admission agreements as a tool for improving transfer student outcomes.

The low rate of bachelor's degree attainment among community college students also has serious implications for equity among bachelor's degree holders. Community colleges have a commitment to serve historically underrepresented students as open-access institutions and are more likely to enroll students underserved by higher education in general, including first-generation college students, low-income students, and American Indian, Black, and Hispanic/Latinx students (AACC, 2021; Ginder et al., 2017). Both adult learners (Ma & Baum, 2016) and students from rural areas (Jaeger et al., 2015) also enroll in community colleges more often than other higher education institutions. Despite this commitment to serve historically underrepresented students, those same students are less likely than others to transfer and earn a bachelor's degree. Students who are high income, Asian, and White transfer to four-year institutions at higher rates than other students (Shapiro et al., 2017b; Shapiro et al., 2018), and are more likely than other students in higher education to complete a degree, regardless of their starting institution (Shapiro et al., 2017a; The Pell Institute & PennAHEAD, 2018). These gaps have been exacerbated by the COVID-19 pandemic, and recent data shows that while upward transfer overall fell only modestly in the 2020-2021 academic year (-1.3%), American Indian and Black students faced a much steeper decrease (-4.1% and -6.1%, respectively) (Bobbitt et al., 2021). These persistent and growing gaps in transfer and bachelor's degree attainment point to a

need for more effective solutions in supporting community college students with an intent to transfer.

North Carolina faces many of the same challenges in supporting transfer students that are seen nationally. Only 24% of students who start at a community college in North Carolina transfer to a four-year institution, much lower than the national average 33% of students across all states (Jenkins & Fink, 2016). While bachelor's completion rate for community college students almost matches the national rate at 40% (Jenkins & Fink, 2016), significant disparities still exist across race/ethnicity and socioeconomic lines (Whatley et al., 2021). Public institutions in North Carolina have enthusiastically pursued co-admissions agreements as a solution, with 15 of 16 public universities and 57 of 58 community colleges participating in at least one agreement (CFNC, 2021). The recent growth in popularity of these agreements has been considerable in North Carolina—over 85% of the agreements have been signed within the last five years. Given the rise in prevalence of co-admission agreements, it is imperative to understand how these partnerships impact the effectiveness of the transfer process across the state.

Overview of the Literature

The literature on the impact of co-admissions agreements on transfer student outcomes is limited and somewhat mixed. Some studies demonstrate the benefits to students, such as increased motivation to transfer and a greater likelihood of earning a bachelor's degree (Boyd, 2018; Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020). However, other studies have found that students who participate in a co-admissions program are no more likely to see positive academic outcomes, such as degree attainment or a higher GPA, than students who do not participate (Parr, 2009; Smith, 2014). Other studies have not examined whether a causal relationship exists between co-admissions agreements and the number of students who transfer

between the institutions with the agreement. This study attempts to fill this gap by focusing specifically on the relationship between co-admissions agreements and transfer as an outcome.

Study Purpose and Research Questions

The purpose of this study was to examine the impact of co-admissions agreements between community colleges and public universities in North Carolina on the number of students transferring along the pathway between the partner institutions. By using University of North Carolina (UNC) System data on transfer students covering transfer pathways from the 58 North Carolina community colleges to eight universities, this study provides generalizable knowledge about the overall effectiveness of this kind of transfer partnership. By examining the impact of co-admissions agreements across several institutions rather than one partnership between a single community college and university, this study captures the overall impact co-admissions agreements have on transfer within a state system of higher education. I utilized a difference-in-differences estimation strategy to answer the following main research question and sub-questions:

1. To what extent do co-admissions agreements impact the number of students that transfer between the partnering community college and university?
 - a. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student race and ethnicity?
 - b. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student socioeconomic status?
 - c. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student age?

- d. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by whether or not the student earned an associate's degree prior to transferring?

North Carolina Context

Understanding the context of North Carolina's higher education system and its other policies and programs focused on transfer is essential to understanding how co-admissions agreements impact the overall transfer ecosystem of the state. North Carolina has 16 public universities and 58 community colleges, overseen by separate governing boards for the University of North Carolina (UNC) System and the North Carolina Community College System (NCCCS) (ECS, 2020). Each system has its own policies related to transfer most relevant to that system. Many of the policies regarding the specifics of the process of transferring are reflected in cooperative agreements between the systems rather than state legislation or system policies because the community colleges and universities are governed by separate boards. This includes inter-institutional agreements like co-admissions agreements. It also includes statewide agreements between the two systems.

One statewide agreement that has the potential to augment or hinder the success of co-admissions agreements is the Comprehensive Articulation Agreement. The Comprehensive Articulation Agreement (CAA) was first established in 1997 and most recently revised in 2014 (CAA, 2020). The agreement governs the transfer of credit between all community colleges and all UNC System institutions for students that graduate from a community college with an Associate in Arts or an Associate in Science. Students that earn one of these associate's degrees with a cumulative GPA of 2.0 are guaranteed admission to one of the 16 UNC institutions with junior status, along with meeting the university's general education requirements (CAA, 2020).

Granting students junior status and general education credits can improve degree efficiency and minimize loss of credits (Worsham et al., 2021). Considering that giving students a clearer path to their degree is one of the goals of co-admissions agreements, the presence of the CAA in North Carolina may make co-admissions programs more effective. However, the CAA does not guarantee that credits will transfer to a particular degree program. UNC institutions must create baccalaureate degree plans (BDPs) that reflect how community college credits apply to a particular degree (CAA, 2020; UNC System, 2022c). With 16 UNC institutions and an average of 80 degree programs at each, community college advisors must manage an estimated 1,280 unique degree pathways (Hodara et al., 2017). This abundance of degree pathways may create difficulty for community colleges and universities providing joint advising to co-admissions program participants, particularly for institutions involved in multiple partnerships. Finally, while the CAA guarantees admission to one of the UNC institutions for A.A. or A.S. earners, it does not guarantee admission to a particular university (CAA, 2020). Because co-admissions agreements do provide a guarantee to enroll at a specific university, they may offer the promise students need to motivate them to transfer that is missing from the statewide agreement (Shugart & Harrison, 2011).

While the CAA only applies to students with an A.A. or A.S. degree, six statewide articulation agreements also exist for other associate's degree linked to specific degree programs. These Uniform Articulation Agreements cover transfer students who earn an associate's in early education, nursing, engineering, music, theater, or the visual arts. As with the CAA, the UAAs guarantee that students who complete the related associate's degree will meet the general education requirements and the entrance requirements of that specific bachelor's degree program

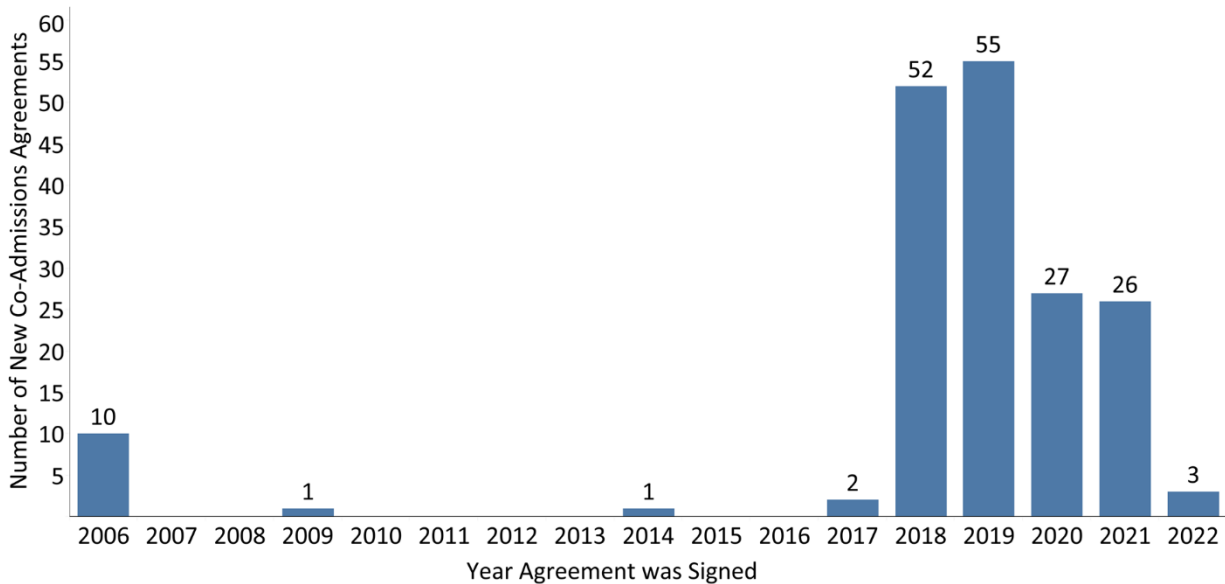
at all public universities that offer the program (Worsham, 2022). However, students are not guaranteed admission to the degree program at a specific university (UNC System, 2022a).

Co-Admissions Agreements in North Carolina

In addition to the background provided on North Carolina’s higher education structure and transfer policies, a summary of the landscape of all co-admissions agreements gives the context needed to understand their impact. Most community colleges and public universities in North Carolina participate in at least one co-admissions partnership; 15 of the 16 UNC System universities and 57 of 58 community colleges have at least one agreement. There are 187 distinct community college to university transfer pathways that have an associated co-admissions agreement. Most community colleges and universities also participate in more than one partnership. The widespread adoption of these transfer partnerships is mostly due to an explosion in the number of partnerships signed over the last several years (see Figure 1).

Figure 1.

Number of Co-Admissions Agreements Signed Each Year in North Carolina



Note: Based on publicly available data. A small percentage (5.3%) of partnerships did not have publicly accessible information recording the year the agreement was signed.

Among the possible explanations for the proliferation of agreements are a focus on transfer as a strategic goal for the UNC System and the individual universities, a desire to build off of the strengths of the CAA, utilizing co-admissions agreements as an enrollment management tool for universities, and policy diffusion across North Carolina's public institutions. Transfer features as prominent part of the UNC System's strategic plan. The plan states that in order reach its completion targets, the UNC System must "...expand the pipelines to nontraditional students and adult learners" and that "community college transfer students will be a major part of that effort" (UNC System, 2017). Support of transfer students is also referenced as an important part of fulfilling the System's goal of improving access to higher education for more North Carolinians. The emphasis on transfer students is mirrored in several of the strategic plans of the individual universities, including specific goals to increase the number of transfer students enrolled, establish programs tailored to transfer students, and strengthen partnerships with community colleges (East Carolina University, 2022; UNC Pembroke, 2012; UNC Wilmington, 2016; Western Carolina University, 2021).

The implementation of co-admissions agreements may also be an effort to capitalize on the benefits of the CAA (with its most recent revision in 2014). While articulation agreements and co-admissions have similar goals of supporting transfer students, articulation agreements focus on making the process of transferring easier by simplifying credit transfer (Roksa & Keith, 2008) and co-admissions agreements intend to increase the number of students that successfully transfer and earn bachelor's degrees. The UNC System strategic plan highlights this point, stating that while the CAA smooths the transition for students intending to transfer, "North Carolina lags in the proportion of community college students who actually transfer" and "a more systematic approach is needed to ensure that potential transfer students receive robust

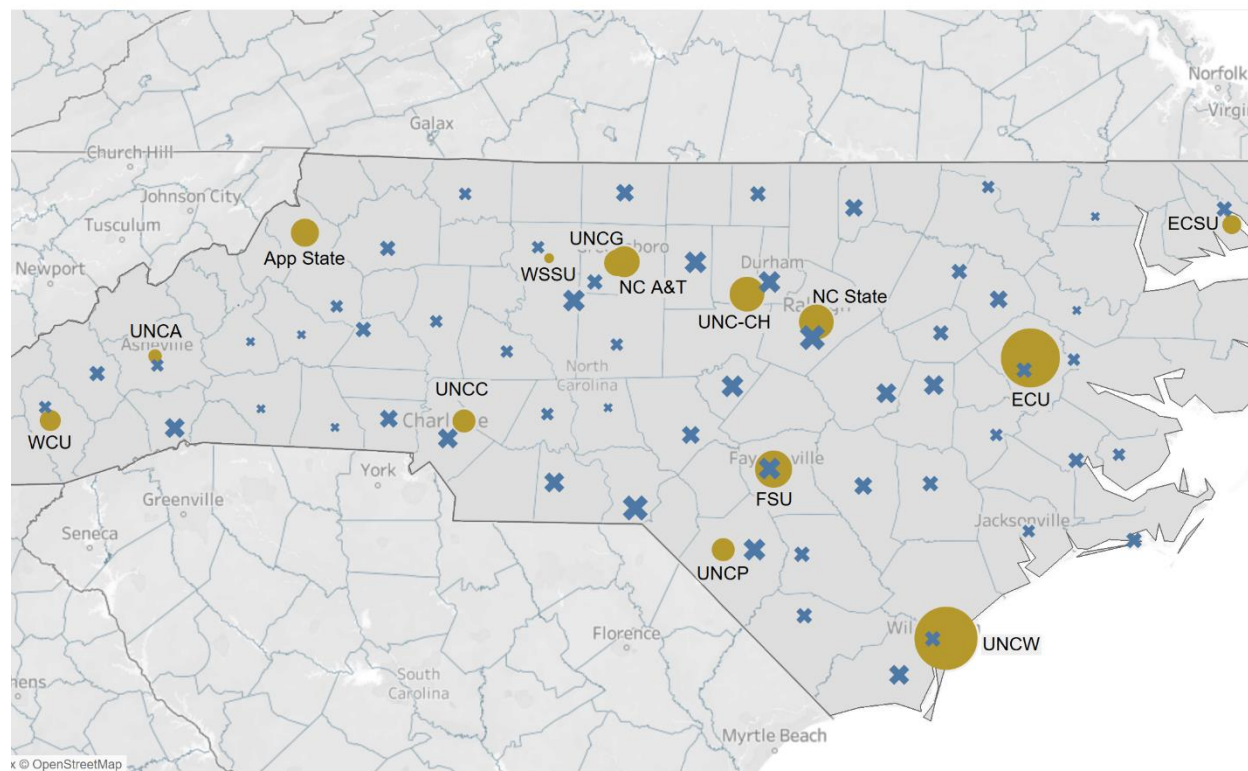
advising about pathways early in their college careers” (UNC System, 2017). In news articles about their agreements, several institutions mention the ability of their co-admissions programs to achieve the goal of increasing transfer rates specifically by leveraging the CAA’s capacity to make the transfer process easier for students (Southeastern Community College, 2020; UNC Asheville, 2019; Western Carolina University, 2019).

Universities may also enter into co-admissions agreements as an enrollment management tool. Recruiting more transfer students could be a strategy to supplement declining enrollment or increased attrition among first-year students (Dowd et al., 2008; Furbeck, 2011). Transfer students typically apply to fewer universities than first-year students, and therefore have a higher proportion of actual enrollees from accepted applicants. This higher yield rate can be useful in enrollment planning (Furbeck, 2011). The yield rate may be even higher for students participating in co-admissions programs. Co-admissions participants have identified their transfer institution early on in their postsecondary career and started building a relationship with that institution, making co-admissions agreements an attractive tool to boost enrollment. Implementing a co-admissions program could be a strategy not just for supplementing falling first-time enrollment but creating sustainable growth of the undergraduate population overall (A. E. Shivar, personal communication, October 24, 2022; Jenkins et al., 2014). There is considerable overlap between the community colleges partners that are a part of each agreement and the top transfer feeder colleges for each university (UNC System, 2022b; see Appendix H), further evidence of universities’ strategy to use co-admissions agreements as a way to maximize transfer student enrollment. Community colleges and universities that are close geographically also tend to be co-admissions partners, as transfer students are more likely to attend both a community college and university close to their home (Furbeck, 2011). Figure 2 demonstrates

that community colleges that are closer to more universities are likely to enter into a greater number of co-admissions agreements (for further evidence of the importance of geographic proximity in co-admissions partnerships, see the maps for each individual co-admissions program in Appendix A).

Figure 2.

Locations of Institutions with Co-Admission Agreements and Number of Agreements



Type of Institution
 ✖ Community College
 ● University

Notes: Marks for community colleges and universities appear larger based on the number of co-admissions agreement partners associated with that institution (more partners, larger mark). The scale for the number of partnerships ranges from 0 to 47.

Finally, the number co-admissions agreements in North Carolina may have expanded rapidly in the last several years due to the effects policy diffusion across the public institutions.

Policy diffusion occurs when government entities that are a part of the same social system adopt a policy that is an emulation of a policy adopted by another member of that system (Berry & Berry, 2007). Policy diffusion can occur for several reasons: policymakers see their peers at other institutions adopting the policy, policymakers are in competition with other institutions in the same system for resources, or policymakers are incentivized to adopt a policy by a more powerful governmental entity (Berry & Berry, 2007). All three of these mechanisms may have impacted the adoption of co-admissions agreements in North Carolina. Public universities and community colleges are each unified under a state system, making them likely to imitate institutions they see as peers. Personal conversations with administrators of the programs at two universities revealed the design of their programs was influenced by programs at other institutions (B. Humphrey, personal communication, November 2, 2022; H. Hill, personal communication, October 28, 2022). Many press releases and new articles covering the co-admissions programs prominently featured signing ceremonies and/or joint press conferences with the presidents each community college and university announcing the new partnership (see Appendix B). This visibility of peer leaders adopting a policy innovation may have influenced other presidents to do the same.

The diffusion of co-admissions agreements across North Carolina may also be the result of competition across universities for transfer students. Universities compete with each other for transfer students as part of their enrollment management process (Furbeck, 2011), and may adopt co-admissions agreements if they perceive other universities' agreements as a threat to their pipeline of transfer students (A. E. Shivar, personal communication, October 24, 2022). As previously stated, universities were likely to partner with community colleges that are already

prominent feeder institutions for them, possibly as an attempt to preserve their enrollment pipeline.

The influence of a larger government entity could also have contributed to the diffusion of co-admissions agreements. In addition to emphasizing the recruitment of transfer students as key to achieving its goals for student access, the UNC System Strategic Plan highlights the co-admissions program at UNC-Chapel Hill as an “institutional innovation” in support of improving student access (UNC System, 2017). UNC-Chapel Hill’s program was the first among the UNC System institutions, founded in 2006. The Strategic Plan began in 2017, the year before the number of co-admissions agreements signed began to spike at other universities. The pressure from the System level to focus on supporting transfer students and the suggestion to implement co-admissions programs may have spurred their adoption among other institutions.

Design of Co-Admissions Agreements in North Carolina. While the co-admissions agreements vary in their requirements for participation and the benefits they include, all the agreements between public institutions in North Carolina align on two program elements. First, the guarantee of admission once students meet certain requirements is a central component of all agreements. Second, all universities offer program participants access to university advisors prior to transfer to make their bachelor’s degree path clearer and ensure that more credits will transfer. The program designs vary somewhat beyond these two commonalities but are still very similar.

Almost all the programs require participants to complete an associate’s degree before they can enroll in the university. Most universities also require a certain GPA for students to take advantage of the admissions guarantee. Many programs offer additional academic and social

Table 1.*Details of Co-Admissions Agreements Included in Study*

University	Agreement Name	CC Degrees Covered	Guaranteed Admission	GPA Requirement	Full-Time Requirement at CC	Application Timeframe	Eligibility Timeframe	Academic Advising
Appalachian State University	Aspire Appalachian Co-Admission Program	AA, AS, and AAS	Yes	2.25	Yes	At least 2 semesters left at CC	Associate's degree completed within 3 years of application	On-site academic advising from university and an assigned advisor from the community college.
East Carolina University	Pirate Promise	AA, AS, AE, AFA, ADN, some AAS degrees	Yes	2.50	Yes	1st year at CC	None	A dedicated transfer coach and joint academic advising from the university and community college.
Elizabeth City State University	Co-Admissions Program	AA and AS	Yes	2.00	No	None	None	Joint academic advising from the university and community college.
University of North Carolina at Asheville	Direct Admission Programs	AA and AS	Yes	2.00	No	None	None	Access to faculty and staff at university to facilitate transition.

Table 1 (continued).

University of North Carolina at Greensboro	Spartan Passage	AA and AS	Yes	2.00	Yes	Recommends at most 24 CC credits	None	Coordinated, on-site advising at the university.
University of North Carolina at Pembroke	BraveStep	N/A	Yes	None	No	None	After 30 credits complete at CC	Joint academic advising from the university and community college.
University of North Carolina at Wilmington	Pathway to Excellence Program	AA, AS, and AE	Yes	2.50	No	None	None	Joint academic advising from the university and community college.
Western Carolina University	Guaranteed Admissions Partnership Programs	AA and AS	Yes	2.50	No	None	Must enroll at WCU within 1 year of earning associate's degree	A transfer student success advisor from the university who collaborates with community college advisors.

supports beyond university advising, including collaborative advising from the university and community college, coordinated financial aid support, and access to university resources, facilities, and events. Table 1 includes a description of the design of the co-

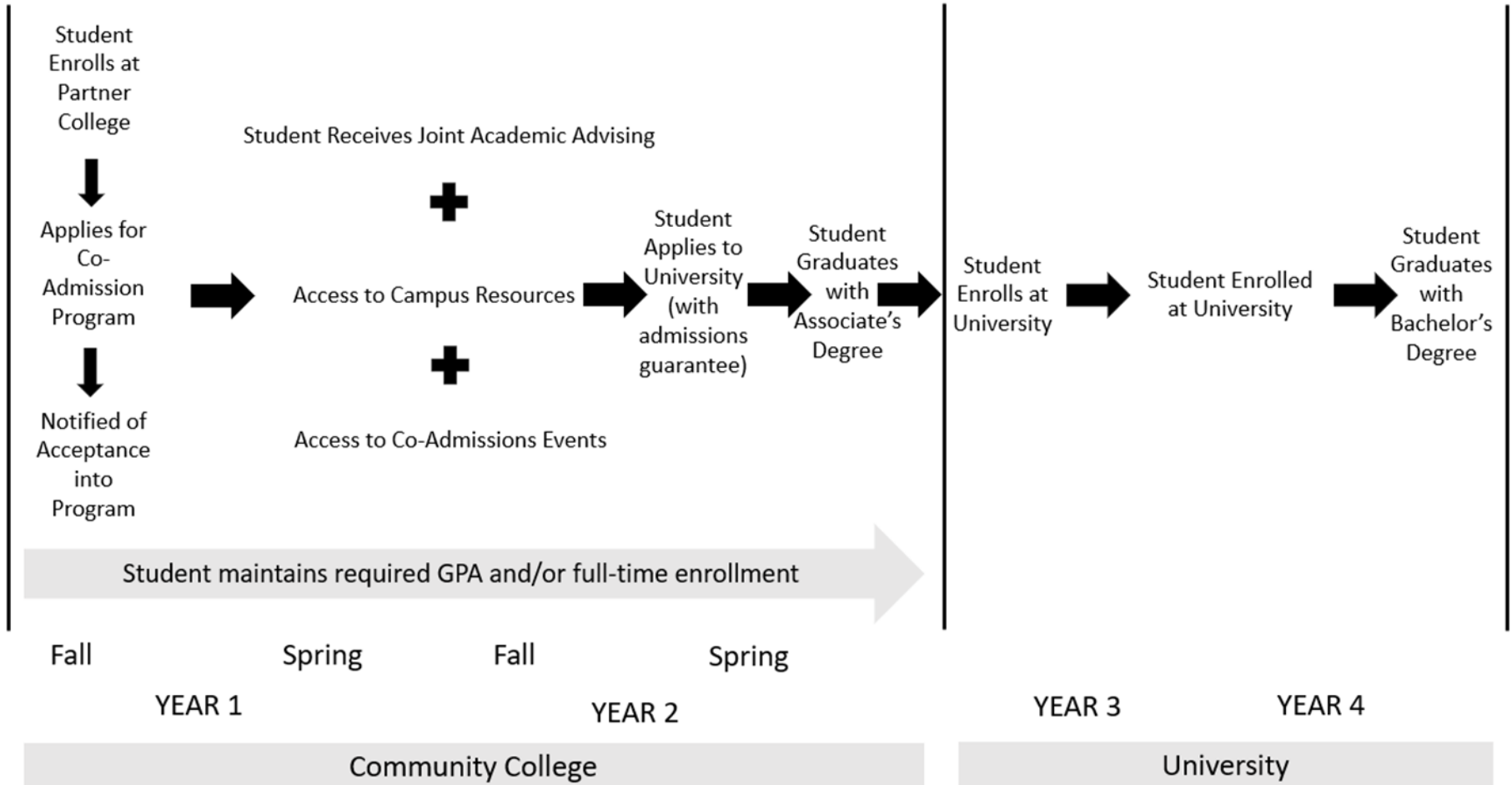
admissions programs included in this study. Most of the programs require students to earn an associate's degree before transferring and require a community college GPA between 2 and 2.5. Three of the programs require students to enroll full-time at the community college. Three of the programs require students to apply before earning too many credits at the community college (typically within their first year enrolled at the community college) and three programs also expect students to enroll at the university within a certain timeframe.

Students' experiences participating in the co-admissions programs may vary based on these differences in community college GPA and enrollment requirements and timing of the program application and enrollment at the university. However, students who follow a standard 2+2 pathway to their bachelor's degree (2 years at the community college and 2 years at the university) would follow a similar pathway through a co-admissions program.

Figure 3 shows an archetypal journey of a transfer student through a co-admissions program. A student first enrolls at one of the partner community colleges with the intent to transfer to a university. During their first semester at the community college, they find out about one of the co-admissions programs at a university, either through marketing from the community college or university, advice from their community college advisor, or a campus visit from university co-admissions program staff (B. Humphrey, personal communication, November 2, 2022; H. Hill, personal communication, October 28, 2022). The student then completes a short, online application stating their intent to participate in the program. They would typically be notified of their acceptance into the program by the end of that same semester. Although joining the co-admissions program offers students a guarantee of acceptance, they are not required to commit to enrolling at that university in order to participate in the program.

Figure 3.

Example Student Pathway through a Co-Admissions Program



After the student becomes a participant in the co-admissions program, they have access to all the program benefits for the rest of their time at the community college. These benefits include access to some campus facilities, resources, and events, co-admissions programmatic events specifically for participants, and joint academic advising from their community college and university. Students' utilization of these benefits is usually optional, and universities generally do not track how many students participate in campus events or use campus resources (B. Humphrey, personal communication, November 2, 2022; H. Hill, personal communication, October 28, 2022). Students' ability to capitalize on these benefits has also been limited in the past several years due to the effects of the COVID-19 pandemic. In addition, students determine the amount of interaction they have with their advisors. Programs vary in whether the community college or university advisor is the student's main point of contact, with the primary advisor reaching out to staff at the other institution with questions, as necessary.

Once the student reaches their final semester at the community college, they apply to the university. If they have met all the program requirements, they will be guaranteed admission. Many programs also waive the application fee for students in their co-admissions programs. The student then graduates and enrolls at the university their following semester. At this point, their experience is similar to any other transfer student: their community college credits are evaluated under applicable articulation agreements, they participate in transfer student orientation, and they enroll at the university. After two years at the university (or longer, depending on the student's program and the amount of credit they are able to transfer), they graduate with their bachelor's degree. Students' experiences in co-admissions programs may vary based on factors such as when they apply for the program, whether or not they enroll full-time at the community college or university, how often they take advantage of the program benefits, how many of their credits

transfer, and whether or not they change their major. However, examining a “standard” student journey through a co-admissions program will aid in interpreting the results of this study.

Knowing the resources that community colleges and universities each contribute to support the operations of their co-admissions agreements may also be helpful in understanding the results of this study. Institutions do not commit many financial or other resources to their co-admissions programs. The initial investment in the program involves the drafting of the MOU between the institutions and presidents’ time commitment for the signing ceremony. Typically, existing staff within the university’s admissions office take on the responsibilities of managing the program and advising participants. Universities also produce marketing materials for the program and cover the cost of on-campus co-admissions events. Many universities waive the application fee for co-admissions participants. Community colleges must commit even fewer resources to support the program, generally, producing their own marketing materials. The community colleges also provide access to academic advisors for program participants, but as community college students, the participants’ advisement falls under the advisors’ existing job responsibilities.

Significance

This study can provide insights to policymakers and practitioners alike while adding to the body of research on transfer students. Practitioners at universities can use this study to better understand the effects of entering into a co-admissions agreement on their transfer student enrollment, the outcomes for their transfer students, and their ability to enroll a more diverse transfer student body. Policymakers can gain a better understanding of the implications of requiring or encouraging co-admissions partnerships on the overall productivity of the transfer function in their state. In addition, while much of the research on transfer students focuses on

bachelor's degree attainment as the sole outcome, improving rates of transfer is an important step in improving transfer student success overall. Co-admissions agreements are unique intervention because they offer support to students before they transfer as well as during the transfer process and could be more likely to impact transfer rates. This study goes beyond the research focused on transfer student bachelor's degree attainment by examining transfer as an outcome of co-admissions agreements. While co-admissions agreements typically do not have a specific goal of improving transfer outcomes for students who are historically underrepresented in higher education, they may still be beneficial to those students. By examining the outcome separately by race and ethnicity, socioeconomic status, and age, I was able to determine if co-admissions agreements could be used to close equity gaps in transfer student success, a perspective that is missing from previous research on co-admissions agreements. Finally, this study adds to the literature on co-admissions agreements by providing an estimate of their causal relationship with transfer student outcomes by using quasi-experimental methods, which are not applied in previous studies.

Overview of the Methods

I used the quasi-experimental difference-in-differences method to estimate the effect of co-admissions agreements on the number students transferring between partner institutions. I used data from the University of North Carolina System Office on students who transferred from one of the 58 North Carolina Community Colleges to one of the eight universities included in the study between the academic years 2010-2011 and 2019-2020. The units of analysis for this study are pairs of community colleges and universities between which students transfer, which I will refer to as transfer pathways throughout the study. The transfer pathways that had co-admissions agreement established during the period of the study served as the treatment group, and those

that did not establish a co-admissions agreement served as the controls. To answer the research sub-questions, I also examined as outcomes the number of transfer students who are American Indian, Black, or Hispanic/Latinx, the number of transfer students who are recipients of Pell grants, the number of students who are adult learners (defined as being age 25 and older), and the number of transfer students who earned an associate's degree prior to transferring.

Overview of Results

Results from my main models indicate that co-admissions agreements led to an increase in students transferring along treated transfer pathways and an increase in the number of students transferring with an associate's degree. However, only the results for transfer students with an associate's degree were consistent across sensitivity analyses. Together, these findings suggest that co-admissions agreements do not have an impact on the overall number of students transferring along a community college to university pathway, but they do have an impact on the likelihood students will earn an associate's degree before transferring. Neither my main models nor the sensitivity analyses provided evidence that co-admissions agreements had a particular effect on the number of transfer students broken down by race/ethnicity, Pell recipient status, or adult learner status.

Overview of Discussion

In the discussion, I propose several possible explanations for the null results I observed for all transfer students and transfer students broken down by race/ethnicity, Pell recipient status, and adult learner status, including the potential effect of the co-admissions programs' designs and differences between program design and implementation. I also discuss the observed impact on the number of students who transfer with an associate's degree and the potential benefits of that effect. Finally, I conclude with recommendations for institutional leaders and practitioners

and policymakers interested in pursuing co-admissions agreements as an intervention to support transfer students and implications for future research on co-admissions agreements.

Summary

This chapter covered the need for more research on co-admissions agreements, a description of the state context for this study, the purpose of this study and the research questions, and a brief overview of the methods, results, and discussion. The results of this study shed light on the effectiveness of co-admissions agreements in promoting community college students' ability to transfer to a four-year institution. With the increase in popularity of co-admissions agreements as a solution to the structural problems with transfer, this study can provide useful insights to both policymakers and practitioners. The remainder of this dissertation is broken up into four chapters. Chapter 2 covers the extant literature on transfer student outcomes and research specific to co-admissions agreements, as well as providing a description of the theory of change used for this study. Chapter 3 describes the proposed methods, model, assumptions, and limitations for this study. Chapter 4 includes the results from the main models, sensitivity analyses, and robustness checks. Chapter 5 contains a discussion of the results and the implications for policymakers, practitioners, and future research.

CHAPTER 2: LITERATURE REVIEW

Introduction

This literature review covers research on factors that affect students' likelihood of successfully transferring from a community college to a four-year institution. The goal is to create an understanding of how co-admissions agreements fit into the larger transfer landscape, how co-admissions programs address challenges that transfer students face, and how they build upon existing solutions. I first introduce my theory of change for co-admissions agreements and their impact on the volume of students that transfer between institutions. The theory of change is based on the overall research on transfer student success and the research specific to co-admissions agreements. Next, I outline the research on student characteristics and behaviors and institutional characteristics that have an impact on transfer student outcomes. I then discuss the structural barriers that students face in attempting to transfer and earn a bachelor's degree and the barriers community colleges and universities encounter in coordinating their efforts to better support transfer students. I follow the discussion of barriers with some of the existing solutions to overcoming these barriers. I conclude with a description of the research specific to co-admissions agreements as a solution to structural obstacles.

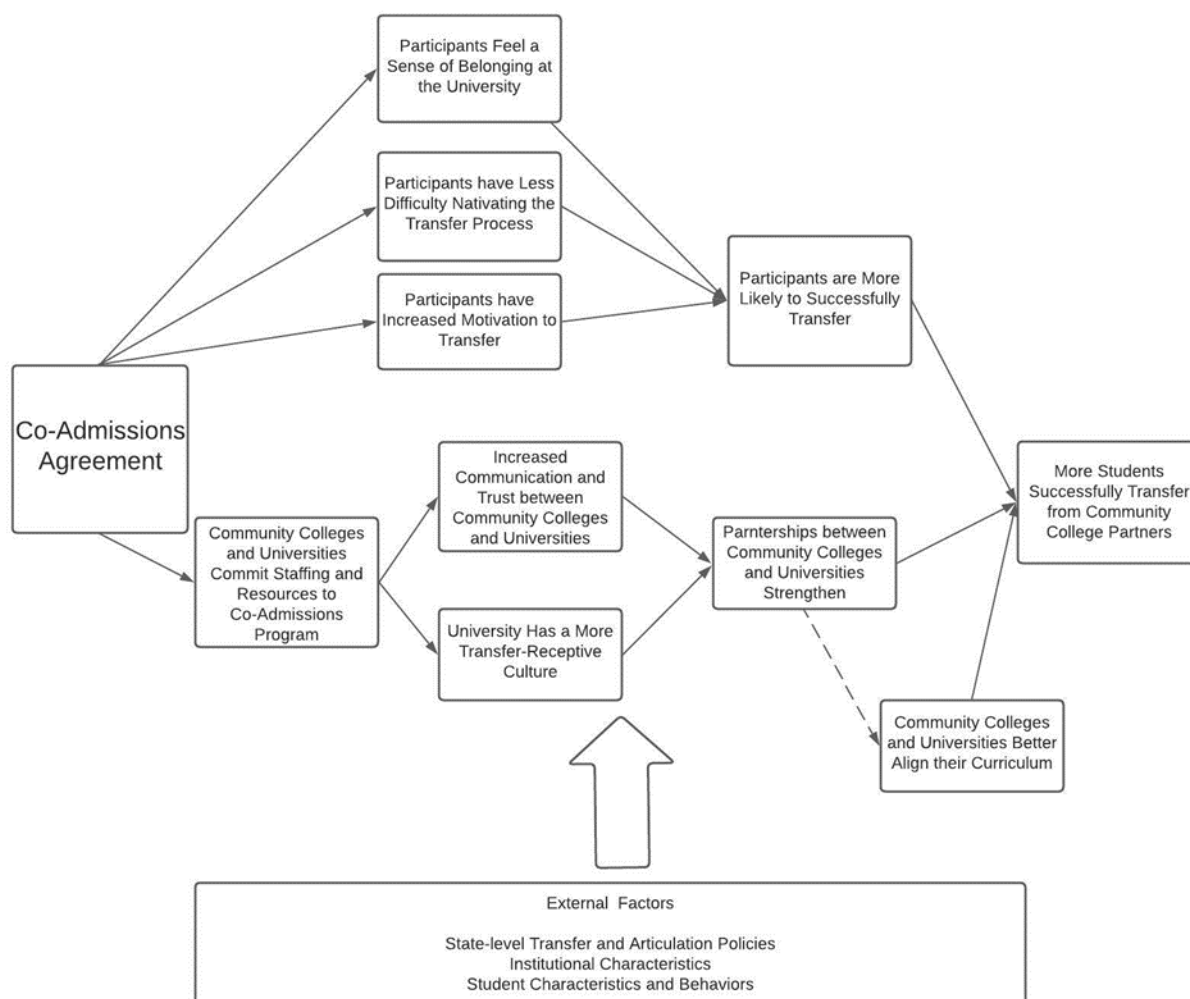
Theory of Change

The previous research on transfer student outcomes, the structural barriers transfer students face, and the solutions to overcome these barriers, allowed me to develop a theory of change to understand how co-admissions agreements might impact the number of students that transfer between the community college and university with the agreement. In addition to relying on previous research, I conducted a document analysis of press releases, news articles, MOUs, and other program documents relevant to the co-admissions agreements included in this study,

detailed in Appendix B. The document analysis revealed the common goals of these co-admissions agreements, further informing the intermediate and long-term outcomes in my theory of change. A diagram of the theory of change is represented in Figure 4. This theory of change provided me with guidance on the design of my study, including the outcomes I chose to study and the covariates I included as controls in my model.

Figure 4.

Theory of Change for Co-admissions Agreements



The bottom of the theory of change diagram illustrates the effect that factors external to a co-admissions agreement, including the characteristics and behaviors of students who transfer

from the community college to the university, institutional characteristics, and state transfer and articulation policies, can have on the volume of students transferring between a community college and a university. Although these factors are not changed by the presence of a co-admissions agreement, they should be controlled for in any study of co-admissions agreements because of their potential impact on the number of students that transfer between institutions. Institutional characteristics and state articulation policies have the potential to influence other elements of the theory of change as well. Characteristics of the community colleges and universities can impact their likelihood of entering into a co-admissions agreement. State articulation policies can support the effectiveness of co-admissions agreements by ensuring that participants can transfer more of their credits.

The body of the theory of change diagram demonstrates how the intermediate effects of co-admissions agreements lead to the long-term outcome of increasing the number of students that transfer between institutions. The diagram shows how co-admissions programs can support participants to transfer by increasing their sense of belonging at the university while they are enrolled at the community college. Previous research on co-admissions agreements indicates that participants feel more comfortable in the university environment (Nichols et al., 2020), and co-admissions programs included in this study commonly state increasing participants' sense of belonging at the university as a goal. The diagram also shows that co-admissions agreements can improve the ease with which students navigate the process of transferring between institutions, another commonly cited goal of the programs in this study. Studies of other co-admissions programs have shown that participants feel more comfortable with the transfer process and have more confidence in their ability to succeed (Grote et al., 2022; Lukszo et al., 2022). Simplifying the transfer process for co-admission participants may be particularly important as the

complexity of transfer process is one of the most significant barriers student face (Scott-Clayton, 2011; Handel & Williams, 2012; Jenkins et al., 2014). In addition, the promise of admission to a university can increase students' motivation to transfer (Nichols et al., 2020). Together, these three factors, participants' sense of belonging at the university, their ease of navigating the transfer process, and their increased motivation to transfer makes them more likely to transfer and leads to an increase in the number of transfer students from the community college partners.

In addition to co-admissions agreements' effects on program participants, the integration of academic and administrative processes and personnel between the institutions should strengthen the overall transfer relationship between community colleges and universities with the agreement. Both the community college and university commitment staffing and resources to support the agreement, which should lead to increased communication and trust between the two institutions and a culture at the university that is more receptive to transfer students. The stronger partnership should lead to a greater number of students who transfer from the partner community colleges to the university, including students that did not participate in the co-admissions program. Improved partnerships between the community colleges and universities with agreements could lead to the added benefit of better alignment of the curriculum between the college and university, even though this is not a direct goal of co-admissions agreements. This improved alignment could then, in turn, lead to more students who successfully transfer to the university.

Overview of Transfer Student Outcomes

Research examining the bachelor's degree attainment gap between community college transfer students and native students (students who enrolled as freshman) at four-year institutions has generally focused on the student characteristics and behaviors more likely to lead to success

in transferring and graduating (Doyle, 2009; Kopko & Crosta, 2016; Long & Kurlaender, 2009; Melguizo & Dowd, 2009; Monaghan & Attewell, 2015; Wang, 2009). Researchers have also investigated the qualities of the community college (and less frequently, the four-year institution) to understand which factors are most likely to produce transfer student bachelor's degrees (Carrell & Kurlaender, 2016; Clotfelter et al., 2013; Jenkins & Fink, 2016; Umbach et al., 2019; Wassmer et al., 2004). Many researchers have tried to identify which student and institutional characteristics explain the bachelor's degree attainment gap (Long & Kurlaender, 2009; Melguizo & Dowd, 2009; Monaghan & Attewell, 2015). However, some researchers have suggested that the degree attainment gap may instead be the result of structural barriers transfer students face as the result of state and institutional policies and practices (Schudde et al., 2020; Taylor & Jain, 2017). The impact of these structural barriers demonstrates the potential of effective policies and practices to reduce gaps and the importance of identifying such interventions to better support transfer students.

While the focus of this study is to explore the potential impact of co-admissions programs, which target structural barriers, it is still helpful to understand which student and institutional characteristics have an effect on transfer student success. Including these characteristics in my models allowed me to control for differences in the institutions and student bodies included in the treatment and control groups. Institutional characteristics may also influence which community colleges and universities are likely to have stronger partnerships (Xu et al., 2018). In addition, examining these student and institutional characteristics may aid in understanding how co-admissions programs operate, as they encourage student behaviors associated with success and capitalize on institutional attributes that lead to stronger partnerships. Finally, as reflected in the theory of change, student and institutional characteristics

have the potential to affect the success of co-admissions agreements and their ultimate impact on the number of students that transfer.

Student Characteristics Impacting Transfer Student Success

Both student demographic characteristics and student behaviors while enrolled at the community college level have been associated with students' likelihood of transferring and earning a bachelor's degree. While this study is focused on transfer as an outcome, examining studies that focus on bachelor's degree attainment as well can lead to a better understanding of which characteristics are related to transfer student success, especially where the literature on transfer as an outcome is less robust.

Several researchers have found that student socioeconomic status (SES) may play an important role in transfer student success, as students who are higher SES have higher rates of transfer and degree attainment (LaSota & Zumeta, 2016; Melguizo & Dowd, 2009; Wang, 2009; Wang, 2012). Age may also be a factor in transfer success. Two studies have shown that as a student's age increases, they become less likely to transfer to a four-year institution (LaSota & Zumeta, 2016; Wang, 2016). However, the impact of age on earning a bachelor's degree is not as clear, with some studies showing no impact (Doyle, 2009; Mourad & Hong, 2011), a negative relationship (Kopko & Crosta, 2016), or a positive relationship (Umbach et al., 2019). Finally, while the association between race and ethnicity and transfer student success has been extensively examined, the true effects are unclear. Although the racial transfer and bachelor's attainment gaps are apparent, results of analyses of the direct impact of race and ethnicity on both transfer and bachelor's attainment are decidedly mixed, with some studies revealing no impact (Mourad & Hong, 2011; Umbach et al., 2019; Wang, 2016) and others demonstrating a

negative relationship with outcomes for Black and other underrepresented minority students (Clotfelter et al., 2013; Crisp & Nuñez, 2014; Kopko & Crosta, 2016; Wang, 2012).

Students' behaviors while enrolled at their community college can also influence their likelihood of transfer and bachelor's attainment. Transfer intent, or students' ambition to transfer and earn a bachelor's degree, has a strong, positive association with both transfer and bachelor's degree attainment (Alfonso, 2006; LaSota & Zumeta, 2016; Wang 2009; Wang, 2016). The intent to transfer and its influence on the likelihood of transferring may be particularly important to understanding the impact of co-admissions agreements, as co-admissions programs can increase participants' motivation to transfer (Grote et al., 2022; Lukszo et al. 2022; Nichols et al., 2020). Academic preparedness, as demonstrated by a higher community college GPA, can positively influence transfer student outcomes as well (Crisp & Nuñez, 2014; Kopko & Crosta, 2016; Long & Kurlaender, 2009; Monaghan & Attewell, 2015; Mourad & Hong, 2011; Umbach et al., 2019; Wang, 2009). Enrollment intensity has a positive effect, as full-time community college students are more likely to transfer (LaSota & Zumeta, 2016; Wang, 2016), but this effect appears to fade and have no influence on bachelor's attainment (Doyle, 2009; Wang, 2009).

Institutional Characteristics Impacting Transfer Student Success

Both characteristics of a community college and the four-year institution receiving its transfer students can influence transfer student outcomes; however, the literature in this area is sparser than the literature concentrated on student characteristics. Students who successfully transfer come more often from community colleges with an academic focus rather than an occupational one, community colleges in urban and suburban areas, and community colleges with a higher average socioeconomic status across their student population (Jenkins & Fink,

2016; Xu et al., 2018). The community college size, measured in student enrollment, in contrast, does not have a significant association with likelihood of transfer (Crisp & Nuñez, 2014; Wassmer et al., 2004). Community college size may positively influence bachelor's degree attainment, but the evidence is mixed (Carrell & Kurlaender, 2016; Umbach et al., 2019). A greater physical distance between the community college and four-year institution in the transfer pathway can negatively impact both the likelihood of transferring and earning a bachelor's degree (Carrell & Kurlaender, 2016; Xu et al., 2018). For four year-institutions, the most salient factor is the selectivity of the institution, with students being more likely to succeed at moderately or highly selective institutions (Xu et al., 2017; Xu et al., 2018). Controlling for these institutional characteristics that can affect the number of students that transfer between institutions is key to isolating the impact of co-admissions agreements.

Structural Barriers to Transfer Student Success

Research on transfer students has largely overlooked the importance of institutional policies and practices in promoting student success (Bers & Younger, 2011; Handel, 2011; Poisel & Joseph, 2011; Schudde et al., 2020), even though the transfer problem may be a structural one, driven by a lack of regularity in curriculum across institutions and a lack of guidance and support for transfer students (Schudde et al., 2020). Understanding transfer as a structural issue points to the importance of identifying inter-institutional practices, such as co-admissions agreements, that are potentially effective in better coordinating across institutions and supporting students.

Barriers to Transfer Students

The transfer process is defined by complexity; transfer students must navigate a plethora of choices including their program of study at the community college, the courses they will take

there, their bachelor's degree program, and the four-year institution to which they will transfer (Scott-Clayton, 2011; Handel & Williams, 2012; Jenkins et al., 2014). Transfer students have difficulty choosing courses that align well with their future degree and career goals and courses that are likely to transfer to their future institution (Scott-Clayton, 2011). Credit loss can be the biggest barrier to transfer student success and having a substantial number of credits that will not transfer can make students feel deflated or blame themselves (Bailey et al., 2015; Taylor & Jain, 2017). States and institutions often attempt to create more structured pathways for students so they can be assured their credits will transfer. However, because many students are uncertain about their ultimate goals, they may not take advantage of these pathways early enough for them to be effective (Bailey et al., 2015; Hodara et al., 2017)

In addition, the complex transfer process is one that many students must manage themselves. Advising capacity limits make it difficult for students to receive individualized support (Handel & Williams, 2012; Hodara et al., 2017; Taylor & Jain, 2017; Wang, 2020). Community college advisors may not be familiar with the rules for credit transfer and degree programs at every four-year destination, but universities usually limit the amount of advising they offer to community college students before they transfer, sometimes altogether refusing to offer services to non-students (Hodara et al., 2017; Schudde et al., 2020). Students must therefore find information about how their credits will transfer on their own, but such information can be difficult to find or inaccurate (Bers & Younger, 2011; Furbeck, 2011; Hodara et al., 2017; Schudde et al., 2020). This lack of guidance places a particular burden on students historically underrepresented in higher education, who may have a harder time navigating the system alone (Scott-Clayton, 2011; Wang, 2020).

A common goal of co-admissions programs in North Carolina is to ease the transition for transfer students as they move from the community college to the university, which should ultimately lead to more students transferring between the institutions (as demonstrated in the theory of change). Co-admissions programs attempt ease the transition by providing transfer students with access to advising by the university prior to transfer, which helps students navigate the many options they have for degree programs and course selections and reduces the likelihood that they will lose credits when transferring.

Barriers to Coordinating Across Institutions

Higher education is highly decentralized and places a high value on institutional autonomy to set curriculum and admissions standards, which contributes significantly to the complexity of the transfer process (Taylor & Jain, 2017; Schudde, 2020). As a result, states vary widely in how much oversight and structure they give to their transfer systems. Much of the transfer process is driven by alignment between individual institutions rather than the entire system, limiting the transferability of courses (Hodara et al., 2017). In addition, true system cohesion may demand more than the alignment of courses, requiring a deeper alignment of people and processes across institutions (Shugart & Harrison, 2011).

Decentralization and a focus on institutional autonomy can result in a disconnect between policy and practice, making state-level reforms difficult to implement successfully (Bailey et al., 2015; Falconetti, 2008; Grote, 2020). State-level policies can require four-year institutions to accept more transfer credit, however, institutions still encounter tensions between enrollment management policies focused on crafting a freshman class and transfer enrollment goals (Falconetti, 2008; Furbeck, 2011; Grote, 2020). In addition, state-level reforms often include limited accountability or financial incentives to enroll more transfer students (Dowd et al., 2008;

Jenkins et al., 2014; Taylor & Jain, 2017). Four-year institutions might also have capacity constraints, especially for high-demand programs, which make it difficult to prioritize transfer students (Furbeck, 2011; Grote et al., 2020; Handel & Williams, 2012; Neault & Piland, 2014). Because co-admissions agreements guarantee admission to community college participants, they may be able to overcome some of the issues with university capacity constraints and tension with other enrollment management policies.

Some community colleges and four-year institutions are in competition for the same students or have conflicting academic cultures that make the level of collaboration needed for stronger transfer pathways difficult (Handel & William, 2012; Jenkins et al., 2014; Schudde et al., 2020). These tensions can lead to beliefs across institutions that community college students are not prepared for study at a four-year institution or that four-year institutions are reluctant to accept community college credit, weakening inter-institutional partnerships (Handel & Williams, 2012). Co-admissions agreements could be seen as a commitment to accepting and supporting transfer students on the part of the four-year institutions, strengthening their partnerships with community colleges.

Solutions to Structural Barriers

Statewide articulation agreements, which govern the transfer of credit across all public (and sometimes private) institutions in a state, inter-institutional partnerships between community colleges and four-year institutions, and developing a transfer-receptive culture at the four-year institutions are some of the existing solutions to the structural issues in the transfer process. Because the efficacy of such solutions informs the design and could moderate the effect of co-admissions agreements, as demonstrated in the theory of change, a brief discussion of the effectiveness of each solution follows.

Statewide Transfer and Articulation Policies. Statewide transfer and articulation policies are a common solution to the structural barriers in the transfer process. These statewide agreements articulate the curriculum across community colleges and public universities to facilitate the transfer of students between those institutions (Gross & Goldhaber, 2009). Forty-five states have implemented some form of statewide articulation policy, such as a transferable core of lower-division courses guaranteed to transfer across all institutions or a guarantee that transfer students with an associate's degree can transfer all their credits to a four-year institution with junior standing (ECS, 2020).

Despite their popularity, statewide articulation policies have an uncertain relationship with transfer student outcomes. Such policies have consistently proven ineffective in increasing the rates at which student transfer from community colleges to four-year institutions (Anderson et al., 2006; Baker, 2016; Gross & Goldhaber, 2009; LaSota & Zumeta, 2016; Roksa & Keith, 2008; Stern, 2016). However, this common finding may stem from the true design and intent of articulation policies; because they focus on improving the articulation of credits, such policies may be more beneficial to students who have already successfully transferred (Roksa & Keith, 2008). Indeed, articulation policies seem to reduce the number of credits students lose when transferring, as they contribute to a reduction in the number of excess credits transfer students have earned upon graduation (Boatman & Soliz, 2018; Worsham et al., 2021). Articulation policies may also have a positive effect on transfer students' bachelor's degree attainment rates (Stern, 2016; Worsham et al., 2022), although some studies have found that such policies have no impact (Boatman & Soliz, 2018; Roksa & Keith, 2008).

Although the benefits of statewide articulation policies are unclear, their presence in a state could increase the effectiveness of co-admissions agreements by reducing the burden on

university advisors in the program through establishing more clearly articulated credits between participating institutions. In addition, the mixed effectiveness of these policies reflects the need to identify other policy and practice solutions that remove structural barriers in the transfer process, particularly solutions that focus on inducing more students to transfer.

Inter-Institutional Partnerships. Strong partnerships between community colleges and four-year institutions may positively influence the success of students transferring between them, but the research on these partnerships is somewhat limited. Most studies examine individual partnerships between two institutions or partnerships between one university and multiple community colleges; only three studies have examined partnerships across multiple institutions (Bartek, 2020; Fink & Jenkins, 2017; Xu et al., 2018). These studies all used a value-added approach, where they controlled for student and institutional characteristics and identified which two-year and four-year pairs performed better than expected on transfer and bachelor's degree completion metrics using a regression model. The variation in performance across the two-year to four-year pathways, even with student and institutional controls included in the model, showed that the policies and practices at each institution must be contributing significantly to transfer student success. However, these studies examined which community college to university transfer pathways outperformed others in general. They did not quantitatively explore the effects of specific policies and practices on transfer and bachelor's completion outcomes. One study did qualitatively investigate the practices of high-performing transfer pathways and found that the institutions involved shared three practices in common: making transfer a priority at their institutions, developing the pathway for bachelor's degrees together, and offering advising tailored to transfer students (Bartek, 2020). Nevertheless, none of the studies examine the effects of a formal partnership between the two-year and four-year institutions, such as a co-

admissions agreement. This study expands on the studies examining the effects of partnerships across multiple institutions by focusing on the effects of a specific type of formal partnership.

In several studies of individual, formal partnerships between community colleges and 4-years institutions, students saw benefits including gains in their academic and social development, increased likelihood of transferring and completing a bachelor's degree, and a greater level of comfort with the transfer process (Carlsen & Gangeness, 2020; Kisker, 2007; Wilson & Lowry, 2017). These partnerships can also have benefits for the institutions; in Kisker's (2007) study of a partnership between a university and multiple community colleges with the goal of better aligning their curricula, the community college faculty were able to build university requirements directly into their coursework. The colleges also had the advantage of using the partnership as a recruiting tool for local high school students (Kisker, 2007).

While inter-institutional partnerships may play an important role in improving transfer, they are not common (Taylor & Jain, 2017). In addition, many partnerships are administrative partnerships rather than a deeper alignment of curriculum, policies, and practices (Shugart & Harrison, 2011; Taylor & Jain, 2017). The effect of formal partnerships between community colleges and 4-year institutions has not been extensively studied, but some organizational behaviors have been identified as promoting a successful transfer partnership, whether it is informal or formal. First, aligning systems and people across institutions, including integrating academic advising and financial aid and involving faculty, contributes to a strong partnership (Amey et al., 2010; Bartek, 2020; Kisker, 2007; Shugart & Harrison; 2011). Second, a partnership that is deeply embedded in both institutions, through a commitment of resources (e.g., funding, personnel, etc.) and enhanced communication across institutions will have greater sustainability (Amey et al., 2010; Bers & Younger, 2011; Kisker, 2007; Shugart & Harrison;

2011; Yeh & Wetzstein 2019). Finally, building trust across institutions by prioritizing the relationship can lead to a more productive partnership, particularly if it is clear that the 4-year institution values transfer students (Amey et al., 2010; Bartek, 2020; Furbeck, 2011; Wellington-Baker, & Hammer, 2020; Yeh & Wetzstein, 2020). Understanding how these elements of institutional transfer relationships contribute to their effectiveness can help explain the impact of co-admissions agreements. If co-admissions agreements have an impact on the overall strength of collaboration between institutions, it could have a positive impact all students transferring between the institutions, not just those participating in the program (as demonstrated in the theory of change).

Transfer-Receptive Culture. Previous research on the role of four-year institutions in promoting transfer student success, while limited, has identified how a transfer-receptive culture at the institution can lead to more students successfully transferring to that institution. Jain & Herrera (2013) define a transfer-receptive culture as a commitment by the four-year institution to help community college students navigate both institutions, take the appropriate coursework, apply to, and enroll at the four-year institution, and successfully complete a bachelor's degree. Four-year institutions that lack a transfer-receptive culture may have a more difficult time reaching and enrolling transfer students and retaining them after they transfer (Taylor & Jain, 2017). Of particular importance to establishing a transfer-receptive culture is providing support to students before transfer by creating outreach and resources tailored to transfer students (Jain & Herrera, 2013). Many community college students make their transfer decisions before four-year institutions start recruiting, leaving them to navigate the process alone, even though the support of institutional staff is essential to navigating the transfer process (Bensimon & Dowd, 2009; Furbeck, 2011). The design of co-admissions agreements incorporates this pre-transfer tenet of

transfer-receptive culture (as well as many of the post-transfer tenets), suggesting that these programs may be helpful in supporting more students to successfully transition.

Co-Admissions Agreements

Previous research on the impact of co-admissions agreements on transfer student outcomes is limited and typically only examines one community college and university partnership at a time. Quantitative investigations of co-admissions programs' influence on outcomes such as participants' likelihood to transfer, persist, and earn a bachelor's degree have mostly used descriptive statistics, and those that do use statistical tests do not use rigorous causal methods. While most of the research points to positive outcomes from these programs, some of the findings are decidedly mixed (e.g., Boyd, 2018; Parr, 2009; Smith, 2014).

Some of the information on the impacts of co-admissions agreements originates from internal evaluations. Results from these evaluations are typically positive, reflecting record numbers of transfer students between the partner institutions, more transfer credit accepted, and better bachelor's degree completion rates for program participants (Knepfle & McCaskill, 2022; Ullman, 2011; University of Connecticut, 2021). Despite these positive outcomes, the evaluations have also revealed relatively low participation rates in the co-admissions programs among the entire transfer student population (State Council of Higher Education for Virginia, 2010; University of Connecticut, 2021), although this may be due to the fact that these were early evaluations. Descriptive statistics included in qualitative studies show similar results, with program participants having higher rates of transfer and degree completion as well as other benefits including a greater likelihood of earning an associate's degree and a shorter time to degree completion (Nichols et al., 2020; Phillips, 2014).

Researchers that have used statistical tests to isolate the effects of co-admissions agreements have also found positive results, but the findings are generally more mixed. In a study of a joint admission agreement (JAA) between a community college and flagship university, Boyd (2018) found an improvement in degree completion and time to degree both when comparing transfer students before and after the program implementation and when comparing participants and non-participants. In contrast, Smith (2014) found that a statewide guaranteed admissions policy did not improve graduation and time-to-degree outcomes for transfer students when compared to native students. Smith also compared outcomes for transfer students before and after the policy implementation and found that their outcomes were better before the policy. Finally, Parr (2009) compared the time to degree and GPA of participants in a JAA program to non-participants after they graduated and found no difference between the two groups. Although these three studies paint a mixed picture for the effectiveness of co-admissions programs, they highlight the importance of controlling for secular trends that could be affecting transfer student success overall. They also reflect the absence of research on co-admissions agreements' impact on students' likelihood to transfer and the number of students transferring, as these outcomes were not included in any of the studies.

The lack of clarity on co-admissions programs' overall effectiveness in improving transfer student success is contrasted by the research focused on students' experiences in the programs. These experiences are generally positive, with students reporting benefits such as increased motivation and educational aspirations, more ease with the transition between institutions, and a sense of belonging at the four-year institution (Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020; Morton, 2013; Parr, 2009; Phillips, 2014). These outcomes may be particularly important for increasing the number of transfer students; intent to transfer is a

major driver of students' likelihood to transfer, and improved motivation and sense of belonging lead to a stronger intent (Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020). Similar to previous research on transfer students, students' relationships with advisors at both institutions were a key element in their satisfaction with the program (Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020; Morton, 2013; Parr, 2009; Phillips, 2014).

One study of student experiences did have conflicting findings. Jointly admitted students did not feel a stronger connection to the four-year institution than other transfer students. However, this was likely due to the four-year institution having a strong transfer-receptive culture overall, the effects of which were not exclusive to the program participants (Higdon, 2018). Co-admissions agreements can lead to stronger transfer collaborations between universities and community colleges overall (ECS, 2015; Nichols et al., 2020; Phillips, 2014; SCHEV, 2010). This stronger collaboration may explain why the partnership in this study did not have a distinct benefit for program participants and instead led to better support of all students who transferred from the partner community college. These studies on student experiences reflect both a need to better understand co-admissions agreements' impact on transfer as an outcome and to examine transfer pathways across multiple institutions. If co-admissions agreements are leading to stronger partnerships across participating institutions, it could mask the impact on individual students participating in the program. By examining the overall volume of transfer students, this study will also capture any impact on the strength of the partnership between institutions with co-admissions agreements.

Summary

In this chapter, I introduced a theory of change based on previous research on transfer students and co-admissions agreements and an analysis of documents pertaining to the co-

admissions agreements included in this study. The theory of change informed both the development of my research questions and the design of my model. Each of the following sections in my literature review focused on a different part of the research on transfer students that in turn informed the inclusion of each of the elements in my theory of change. Next in the literature review, I summarized the research on student and institutional factors and structural barriers that promote or impede transfer student success to create a broader context for understanding the operations and effects of co-admissions agreements. I also covered the common solutions to the barriers that transfer students face that could moderate the effects of co-admissions agreements. Although the evidence of the effectiveness of co-admissions agreements is limited and mixed, I provided an overview of their impacts on students' experiences, motivation, and likelihood of transferring and earning a bachelor's degree. In the next chapter, I cover the data, sample, variables, methodology, and limitations for this study.

CHAPTER 3: METHODOLOGY

Overview

The purpose of this study is to examine how co-admissions agreements between community colleges and universities in North Carolina impact the number of students that transfer between the partner institutions. I used a difference-in-differences (DID) estimation strategy to explore the following main research question and sub-questions:

1. To what extent do co-admissions agreements impact the number of students that transfer between the partnering community college and university?
 - a. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student race and ethnicity?
 - b. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student socioeconomic status?
 - c. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student age?
 - d. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by whether or not the student earned an associate's degree prior to transferring?

The results of this study reveal the impact of co-admissions agreements in supporting more students to transfer.

Data and Sample

I used data from multiple sources for this study. To determine which community colleges and universities had a co-admissions agreement, I used information from the College Foundation of North Carolina, which released a list of all partnerships (CFNC, 2021), and university web

pages for the programs, which include lists of current partners. I gathered each co-admissions agreement's signing date, to signify the start of the program, from publicly available documents including news articles, institutional press releases, board meeting minutes, and signed MOUs completed by the institutions' presidents. I also used these documents and the program web pages to identify the stated goals of the co-admissions programs and assist with the development of the research questions.

To measure the outcome, the number of students transferring between institutions, I used secondary data from the University of North Carolina (UNC) System Office, which gathers data from its constituent institutions on an ongoing basis. The data on transfer students covered all students who transferred into a UNC System university between academic years 2010-2011 and 2020-2021. To control for institutional characteristics and economic trends that may influence transfer student enrollment, I also collected data from the Integrated Postsecondary Education Data System (IPEDS) and the Bureau of Labor Statistics.

I first limited my sample to all students who transferred from a North Carolina Community College. Next, I limited the sample to students that transferred to a university whose co-admissions program was appropriate for inclusion in the study based on the data available and the program design. Three programs were established too long ago to have a sufficient number of years of pre-implementation data, given the years included in my dataset. One program did not have publicly available data on the date each partnership began. Finally, three programs were limited in the scope of students they serve, making them distinct from the other programs available to all potential transfer students. One of these programs is only available to students in particular degree programs (e.g., accounting, business administration, nursing), the second one is only available to invited students (students who applied to the university initially and fell just

short of the admissions criteria), and the third is only available to low- and middle-income students.

The co-admissions agreements included in the final sample have some small variations in their design, but they all share two characteristics that appear to have an impact on students' experiences in co-admissions programs, according to previous research: a guarantee of admission and advising offered by the university prior to transfer (Nichols et al., 2020; Morton, 2013; Parr, 2009; Phillips, 2014). The co-admissions programs in this study differ in the types of associate's degree that students can earn to be eligible for the program, whether they require a certain community college GPA to qualify and what GPA is required, whether they require full-time enrollment at the community college, the timeframe in which students must apply for the program, and the timeframe in which students are eligible to participate.

The limitations to the sample leave eight universities with 58 potential community college partners in the final sample. The units of analysis for this study are pairs of community colleges and universities between which students transfer, which I refer to as transfer pathways. The eight universities and 58 community colleges in the sample produce a total of 464 transfer pathways. Co-admissions agreements exist across 124 of these transfer pathways. All the agreements between these institutions were signed between 2017 and 2021. In order to have a sufficient number of years of post-implementation data, I only included transfer pathways with an agreement signed in Summer 2019 or earlier, leaving 60 transfer pathways in the final treatment group. The agreements that were signed after the end of the study period (i.e., agreements signed in Spring 2021 or later) were also included as potential controls, creating a total of 364 transfer pathways as potential controls. The final sample therefore included a total of 424 transfer pathways, including both treatment and controls. Table 2 specifies which

universities and co-admissions agreements are included in and excluded from the final sample, as well as the number of treatment and control transfer pathways associated with each co-admissions program. A matrix table specifying the community colleges and public universities that are a part of any co-admissions agreement in North Carolina is included in Appendix C.

Table 2.

Co-Admissions Agreements in Final Sample

University	Co-Admissions Agreement Name	Year First Agreement Signed	Treatment Pathways in Study	Control Pathways in Study
<i>Transfer Pathways Included in Study</i>				
Appalachian State University	Aspire Appalachian Co-Admission Program	2018	1	52
East Carolina University	Pirate Promise	2018	18	21
Elizabeth City State University	Co-Admissions Program	2019	3	54
University of North Carolina at Asheville	Direct Admission Programs	2019	1	56
University of North Carolina at Greensboro	Spartan Passage	2017	8	50
University of North Carolina at Pembroke	BraveStep	2018	4	52
University of North Carolina at Wilmington	Pathway to Excellence Program	2018	24	25
Western Carolina University	Guaranteed Admissions Partnership Programs	2019	1	54
Total Number of Transfer Pathways:			60	364

Table 2 (continued).

<i>Transfer Pathways Excluded from Study</i>			<i>Reason for Exclusion</i>
Fayetteville State University	\$10k Degree Pathway	2018	Only offered for certain degree programs
North Carolina A&T State University	Aggie Plus	Unknown	No publicly available data on implementation dates
North Carolina Central University	Eagle Connect	2014	Only offered to invited students
North Carolina State University	C3	2018	Only offered to low- and middle-income students
University of North Carolina at Chapel Hill	Carolina Student Transfer Excellence Program (C-STEP)	2006	Insufficient years of pre-treatment data
University of North Carolina at Charlotte	49erNext	2010	Insufficient years of pre-treatment data
Winston Salem State University	Dual Admissions Program	2009	Insufficient years of pre-treatment data

Variables

Program Implementation

To determine the timing of program implementation for each community college and university co-admissions agreement, I collected publicly available information on the date each co-admissions agreement was signed. Because the programs typically are not implemented in the same semester the agreement was signed, I identified a *semester of impact* for each partnership based on the agreement's signing date. I assigned the semester of impact as the first fall semester following the signing of the agreement because the data on my outcome, number of transfer students, were aggregated by academic year. All the co-admissions agreements included in the

study were signed in Spring 2017 through Summer 2019, making the semester of impact either Fall 2018 or Fall 2019.

Treatment and Control Groups

The initial treatment group consisted of the 60 community college to university transfer pathways that launched co-admissions agreement during the study period. For the controls, I chose to use the community college to university transfer pathways in North Carolina that did not have a co-admissions agreement (364 transfer pathways). One of the main threats to making a causal inference using DID is an external change during the study period that affects the outcome (Furquim et al., 2020). By only including community college and university transfer pathways in North Carolina, I can account for any changes to state transfer and articulation policies that could impact the number of students transferring. I am also controlling for changes to the state economy that could cause the volume of transfer students to vary across states by focusing on one state.

Another threat to the validity of DID estimates is selection bias, or factors that affect the likelihood that some groups receive treatment that also affect the outcome (Furquim et al., 2020). Community colleges and universities may be more likely to enter into an agreement with another institution with which they have a strong history of transfer or an institution with which they share students based on geography, as revealed by the document analysis detailed in Appendix B. Universities with decreasing enrollment of native students or low undergraduate retention rates may be more likely to enter into a co-admissions agreements as a strategy to recruit more transfer students to bolster their falling enrollment (Dowd et al., 2008; Furbeck, 2011; Jenkins et al., 2014). These differences in the treatment and control groups can be corrected, however, by including weights for the likelihood of receiving treatment in the DID model (Furquim et al.,

2020; Smith, 2011).

To generate the weights, I conducted a logistic regression to predict the likelihood of entering into a co-admissions agreement for each community college to university transfer pathway, using the volume of transfer students in the base year of the study and the distance between community colleges and universities as predictors, based on the evidence from the document analysis. I also included measures for falling enrollment of native students and native student retention rates for the universities in the model, to control for universities that may be entering into co-admissions agreement to compensate for declines in enrollment of native students. I calculated the change in enrollment of native students from three years prior to the start of the study to base year of the study. I included this measure for change in enrollment and the retention rate during the base year of the study as additional predictors in the model. I also originally planned to include dummy variables indicating whether or not the community college and university in each transfer pathway was located in a rural area. However, after observing that the balance on these two variables was consistent across treatment and control groups, I excluded them from the final logistic regression model. The full list of the variables I considered for inclusion in the logistic regression model, their definitions, and sources is included in Table 3.

Table 3.

Variables for Propensity Model, Definitions, and Sources

Variable	Definition	Source
<i>Treatment and Control Groups</i>		
Co-Admissions Agreement Transfer Pathways	Individual community college and university pairs that have an agreement to guarantee admission for transfer students who meet certain requirements.	CFNC and program websites

Table 3 (continued).

Volume of Transfer Students in Base Year	The number of students who transferred along the community college and university transfer pathways in the first year of the study (2010-2011).	UNC System Data
Institution Locale (Rural or Urban)	The urbanicity of the area where the community colleges and universities are located, based on population density.	IPEDS
Distance between Institutions	The direct distance in miles between the community college and university in each transfer pathway.	IPEDS
Change in Native Undergraduate Enrollment	The native undergraduate enrollment in the base year of the study divided by the native undergraduate enrollment three years prior to the study.	IPEDS and Author's Calculation
Native Undergraduate Retention Rate	The percentage of first-time bachelor's degree-seeking students beginning in a Fall that are still enrolled for credit the following Fall in the base year of the study.	IPEDS

After producing a propensity score for each transfer pathway, I dropped transfer pathways outside of the area of common support to ensure sufficient overlap between the treatment and control groups in the likelihood of receiving treatment. I excluded transfer pathways with a propensity above the lowest maximum value and below the highest minimum value. This reduced the sample by 140 transfer pathways, for a final sample of 284 pathways. The summary statistics for the propensity values used to generate the inverse probability weights in the final sample, broken out by treatment and control groups, can be found in Table 4. Appendix D includes graphs demonstrating the overlap in propensities between the two groups.

Table 4.*Propensities Used to Generate IPWs*

	N	Mean	Standard Deviation	Min	Max
Treatment Pathways	44	0.4	0.2	0.0	0.8
Control Pathways	240	0.1	0.2	0.0	0.8
All Pathways	284	0.2	0.2	0.0	0.8

I then used the propensities generated from the logistic regression to calculate an inverse probability weight for each transfer pathway. The equations below produced an estimate of the average treatment effect on the treated (ATT). When using ATT weights, treated pathways serve as a reference group, and the control pathways are weighted up or down based on how closely they resemble the treated pathways (Austin & Stuart, 2015).

$$\text{For treated pathways: } w_{\text{ATT}} = 1 \quad (1)$$

$$\text{For control pathways } w_{\text{ATT}} = 1/(1-p) \quad (2)$$

For two of the control transfer pathways, the weights were significantly higher than the rest of the sample, with values above 2. To improve the balance between the treatment and control groups and ensure that these two pathways did not excessively influence the results of the final model, I reset their values to 2. After creating the final ATT weights, I checked the final balance between the treatment and control groups on the variables included in the logistic regression and compared them to the balance before including the weights. The balance before and after weighting is reflected in Tables 5 and 6. A comparison of the balance before and after weighting confirms that the standardized difference and raw difference between groups was improved for all variables with the inclusion of ATT weights. I included these weights in all outcomes models, models conducted as sensitivity analyses, and models conducted as robustness checks.

Table 5.*Balance of Variables Before Weighting*

	Mean in Treated	Mean in Control	Standardized Difference	Raw Difference
Volume of Transfer Students in Base Year	39.53	5.15	0.82	34.38
Distance between Institutions	82.92	218.85	-1.61	-135.93
Change in Native Undergraduate Enrollment	0.01	0.02	-0.04	-0.01
Native Undergraduate Retention Rate	0.82	0.79	0.62	0.03

Table 6.*Balance of Variables After Weighting*

	Mean in Treated	Mean in Control	Standardized Difference	Raw Difference
Volume of Transfer Students in Base Year	17.07	17.31	-0.01	-0.24
Distance between Institutions	100.40	101.36	-0.01	-0.96
Change in Native Undergraduate Enrollment	0.02	0.02	-0.06	0.00
Native Undergraduate Retention Rate	0.82	0.82	-0.10	0.00

Outcomes

The main outcome I examined is the number of students transferring along each community college and university transfer pathway. If the DID model reflects an increase in the number of transfer students across co-admissions partners, this could indicate that the co-admissions programs are encouraging more students to transfer. To examine my research question on the impact of co-admissions agreements on transfer enrollment by race and ethnicity, I ran separate models with the number of American Indian, Black, and Hispanic/Latinx transfer students as the outcome. For my research questions on co-admissions agreements' influence on transfer enrollment by socioeconomic status and age, I ran separate models with the number of

transfer students who received a Pell grant and the number that are adult learners (25 years old or older). Finally, because most of the co-admissions programs require students to earn an associate's degree before transferring, I ran a separate model including only transfer students who earned an associate's degree before transfer.

Covariates

Another threat to validity in DID studies is the effect of external variables that impact treatment and control groups differently and could also impact the outcomes during the time period of the study (Furquim et al., 2020). To control for these variables, I included several covariates in my model that could change across community college to university transfer pathways over time and impact transfer student volume. The economic environment where the community colleges are located could impact students' interest in pursuing a bachelor's degree and therefore transferring, so I included unemployment rate each year by county. Because some community college's service areas include multiple counties, I averaged the unemployment rate across the service area. The demographic characteristics of the student population at the community college in each transfer pathway could also have an influence on the number of students transferring out, so I included the percentage of students by race and ethnicity, Pell grant status, age, and full-time enrollment at the community college. Finally, tuition rates can impact students' likelihood of enrolling, so I controlled for the cost of in-state tuition at the university in each transfer pathway.

As reflected in previous research, both the institutional characteristics of the community college and university and state-level articulation policies could affect the likelihood that students will successfully transfer. Transfer pathway fixed effects controlled for any characteristics of the community colleges and universities in each transfer pathway that do not

vary over time, such as size of the institutions, their geographic location, or distance between institutions. Year fixed effects controlled for changes that impact all transfer pathways at the same time, such as state-level transfer policies. Table 7 includes a full list of variables that I used for the study, including program implementation variables, treatment and control variables, outcome variables, and transfer pathway covariates.

Table 7.

Variables for Main Models, Definitions, and Sources

Variable	Definition	Source
<i>Program Implementation</i>		
Agreement Signing Date	The date the presidents of the community colleges and universities signed each co-admissions agreement.	CFNC
Semester of Impact	The first fall semester following the signing of the co-admissions agreement.	Author's Calculation
<i>Treatment and Control Groups</i>		
Co-Admissions Agreement Transfer Pathways	Individual community college and university pairs that have an agreement to guarantee admission for transfer students who meet certain requirements.	CFNC and program websites
Inverse Propensity Weights	Weights generated using a logistic regression predicting the likelihood of receiving treatment.	Author's Calculation
<i>Outcomes</i>		
Number of Transfer Students	The number of students that transferred from the community college to the university in each transfer pathway each year.	UNC System Data
Number of American Indian Transfer Students	The number of American Indian students that transferred from the community college to the university in each transfer pathway each year.	UNC System Data

Table 7 (continued).

Number of Black Transfer Students	The number of Black students that transferred from the community college to the university in each transfer pathway each year.	UNC System Data
Number of Hispanic/Latinx Transfer Students	The number of Hispanic/Latinx students that transferred from the community college to the university in each transfer pathway each year.	UNC System Data
Number of Transfer Students that are Pell Recipients	The number of students that are Pell recipients that transferred from the community college to the university in each transfer pathway each year.	UNC System Data
Number of Transfer Students that are Adult Learners	The number of students that are adult learners that transferred from the community college to the university in each transfer pathway each year.	UNC System Data
Number of Transfer Students with Associate's Degrees	The number of students that earned an associate's degree prior to transferring from the community college to the university in each transfer pathway each year.	UNC System Data

Covariates

Unemployment by County	The annual unemployment rate for the county where community colleges are located. For community colleges that have service areas that cover multiple counties, the unemployment rate is an average.	Bureau of Labor Statistics
Percentage of Students by Race/Ethnicity	The percentage of students that identify as American Indian, Black, and Hispanic/Latinx enrolled at each community college.	IPEDS
Percentage of Students by Pell Grant Status	The percentage of students that are Pell Grant recipients enrolled at each community college.	IPEDS
Percentage of Students by Age	The percentage of students that are adult learners enrolled at each community college.	IPEDS

Table 7 (continued).

Percentage of Student Enrolled Full-Time	The percentage of students that are enrolled full-time at each community college.	IPEDS
In-State Tuition at Universities	The in-state tuition rate charged by each university.	IPEDS

Multiple Imputation

The Integrated Postsecondary Education Data System only requires that one of my covariates, the percentage students enrolled at the community college that are adult learners, is reported by institutions every other year. As such, a significant number of observations are missing this variable in my sample. Across all transfer pathways and years, 960 observations are missing this variable, which represents 31% of my sample. In order to avoid leaving such a substantial proportion of my sample out of my models due to missing data, I opted to conduct a multiple imputation to estimate the values I am missing for the percent adult learners variable.

Multiple imputation estimates missing values using the other observed variables for each observation. In order to avoid the statistical uncertainty inherent with only estimating these values once, multiple imputation create several potential values of the missing variable for each observation and uses all of the “complete” datasets it generates to estimate a final model (Azur et al., 2011). In order to use multiple imputation, the data must be either missing completely at random (MCAR) or missing at random (MAR). MCAR data occur when the pattern of missing values is unrelated to both the observed and unobserved variables in the model. A MAR data pattern occurs when missing values are only related to observed variables and unrelated to unobserved variables (Enders, 2017). My data are likely MCAR because missingness is the result of a federal requirement and whether or not individual community college administrators decided to report the data in optional years. To test this assumption, I compared the means of

each of my variables for observations that were missing the percent adult learner variable to those that were not (see Table 8). I also tested the correlation between a dummy variable for missing data and each of my other variables. None of the resulting correlations had an absolute value greater than 0.06. Because the values of my observed variables do not appear to differ

Table 8.

Means and Differences of Observed Variables for Observations with and without Missing Data

	Mean for Observations with Missing Data	Mean for Observations without Missing Data	Standardized Difference	Raw Difference
All Transfers	9.2	11.3	-0.1	-2.1
American Indian Transfers	0.3	0.3	0.0	0.1
Black Transfers	1.4	1.5	0.0	-0.1
Hispanic/Latinx Transfers	0.7	0.8	-0.1	-0.1
Pell Transfers	4.2	5.2	-0.1	-1.0
Adult Transfers	3.5	4.3	-0.1	-0.9
Associate's Transfers	5.1	5.8	-0.1	-0.8
Treatment Indicator	0.0	0.0	0.1	0.0
CC Unemployment by County	0.1	0.1	0.0	0.0
CC % American Indian	3%	2%	0.1	0.0
CC % Black	24%	22%	0.1	0.0
CC % Hispanic/Latinx	8%	8%	0.0	0.0
CC % Pell Recipients	46%	45%	0.0	0.0
CC % Full-Time	39%	39%	0.0	0.0
Uni In-State Tuition	\$5,974	\$6,052	-0.1	-77.8

based on whether or not the percent adult learner variable is missing, my data likely satisfy to the MCAR assumption (Enders, 2017).

To complete the multiple imputation, I used the *mi impute monotone* command in Stata 17. I used this command because my data follow a monotone missing pattern; transfer pathways that are missing the percent adult learner variable in some years are likely to be missing data in same years as other pathways because of the shared reporting requirement (or lack thereof) in specific years. Using the *mi impute monotone* command with monotone missing data is important because it simplifies the imputation task (StataCorp, 2021). Using this command, I created 45 imputed datasets, which I used to estimate all my models, including sensitivity analyses and robustness checks (with the exception of the sensitivity analyses focused specifically on the potential impact of using imputed data).

Analytic Approach

I used difference-in-differences (DID) to estimate the impact of co-admissions agreements on the number of students transferring along the pathways between community colleges and universities in North Carolina. The gold standard for determining causal impact would be a randomized controlled trial, in which each community college to university transfer pathway would be randomly assigned to develop a co-admissions agreement (treatment) or abstain from entering into an agreement (control).

In the absence of true randomization, researchers can exploit natural experiments, where some groups under study receive an “external shock,” such as a policy change or a new program, and some groups do not (Furquim et al., 2020). DID capitalizes on these natural experiments where the likelihood of receiving the treatment is as-good-as random by using the groups that did not receive the external shock as a counterfactual for the treated groups. By examining the outcomes of the treatment and control groups over time, both before and after the treatment took place, researchers can replicate what would have happened to the treated group in the absence of

the treatment. If the two groups follow similar trends in their outcomes in the time period before the treatment occurred, any difference in the outcomes after the treatment can be attributed to the effect of the treatment itself (Furquim et al., 2020). DID operates by first taking the difference in the mean outcome for the treatment group from the pre- and post- time period ($\bar{Y}^T_1 - \bar{Y}^T_0$; with 1 representing the time period after treatment and 0 the time period before) and calculating the same difference for the control group. Then, the researcher can subtract these two differences to obtain an estimate of the treatment effect, as shown in equation (3):

$$\delta_{DID} = (\bar{Y}^T_1 - \bar{Y}^T_0) - (\bar{Y}^C_1 - \bar{Y}^C_0) \quad (3)$$

In this study, I used the community college and university transfer pathways that did not have co-admissions agreement during the study period to serve as a counterfactual to those with a co-admissions agreement. By examining the differences in the number of students transferring between institutions over time, I was able to isolate the treatment effect of the co-admissions agreements.

Empirical Strategy

I used a regression model to generate my DID estimates to adjust for covariates. In a traditional DID model, time is divided into the pre- and post- treatment period, and units of analysis are categorized as treatment or control (Furquim et al., 2020). However, because the timing of treatment varies by community college to university transfer pathway (agreements signed at different times), I used a two-way fixed effects model, a variation of the traditional DID approach (Furquim et al., 2020). By including both transfer pathway and year fixed effects, the two-way fixed effects model allows for the timing of treatment to vary, as seen in equation (4):

$$Y_{it} = \beta_0 + \beta_1 \text{Treat}_{it} + \beta_2 X_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad (4)$$

In the equation, Y_{it} represents the outcomes from the various models for transfer pathway i in time t and β_0 represents the intercept. The coefficient β_1 represents the effect of co-admissions agreement on transfer student volume for treated transfer pathways in the years after treatment. X_{it} is a vector of the time-varying transfer pathway covariates, γ_i represents the transfer pathway fixed effects, δ_t the year fixed effects, and ε_{it} is the error term. By structuring the model as a two-way fixed effects model, the coefficient on the treatment variable measures the impact of the co-admissions agreements in the years each transfer pathway was treated based on its treatment timing. In this model, some of the treated pathways will serve as controls in earlier time periods before they received treatment (Furquim et al., 2020).

Another concern for the validity of DID estimates is the serial correlation of standard errors within units that occurs because observations for each unit are repeated over time (Furquim et al., 2020). The problem of correlation across units is particularly salient for this study; because the unit of analysis is community college and university transfer pathway, each community college and university a part of multiple different units of analysis. One solution to correlated errors among similarly situated individuals is to use clustered standard errors, which acknowledge that the observations in the panel dataset are not independent (Furquim et al., 2020). Because the standard errors for each community college to university transfer pathway are likely to be correlated over time, I used standard errors that were clustered by transfer pathway in my model.

Descriptive Statistics

Tables 9 and 10 show the descriptive statistics for the covariates and outcome variables for the final sample without weighting. Table 9 displays the descriptive statistics for these variables broken out by treatment group, control group, and the full sample. To understand the

size of the differences between the treatment and control groups, Table 10 includes the means for the treatment and control groups on each variable and the difference between them. For the covariates based on the community colleges in each transfer pathway, there are not substantial differences between the treatment and control groups. This similarity indicates that the sample is well-balanced and there are not any major differences in the community colleges included in the treatment and control transfer pathways, although these variables should still be included in the model to account for any major differences at specific time points. The university tuition and fees variable is somewhat higher at the universities that are more frequently a part of the treatment pathways. This difference can be attributed to the fact that tuition and fees at the universities with more partnerships (and that therefore make up a larger share of the treated transfer pathways) was on average higher than that of the universities with fewer partnerships during the time period of the study.

Transfer pathways in the treated group had a substantially higher mean on the main outcome variable, the number of students transferring along that pathway (an average difference of 15 transfer students per year). The pattern of treated transfer pathways having a higher volume of transfer students also extends to outcomes for student subgroups. This difference is expected, as universities and community colleges with a higher volume of students transferring between them were more likely to sign a co-admissions agreement. The use of inverse propensity weights to correct for the likelihood of treatment and the existence of parallel trends (discussed below) in the number of transfer students for the treatment and control groups prior to treatment should account for the overall discrepancy in outcome variables.

Table 9.*Descriptive Statistics for Treatment Group, Control Group, and Full Sample*

Variable	Treatment				Control				Full Sample			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
<u>Covariates</u>												
CC Unemployment by County	8%	3%	3%	16%	7%	3%	3%	16%	7%	3%	3%	16%
CC % American Indian	4%	9%	0%	46%	2%	6%	0%	46%	2%	7%	0%	46%
CC % Black	28%	15%	3%	67%	22%	14%	0%	67%	23%	14%	0%	67%
CC % Hispanic/Latinx	8%	6%	0%	28%	8%	5%	0%	28%	8%	5%	0%	28%
CC % Pell Recipients	48%	14%	5%	88%	45%	13%	5%	88%	45%	13%	5%	88%
CC % Adult Learners	38%	11%	12%	61%	37%	10%	12%	61%	37%	11%	12%	61%
CC % Full-Time	40%	8%	15%	64%	39%	8%	15%	64%	39%	8%	15%	64%
Uni In-State Tuition	\$6,228	\$1,007	\$3,194	\$7,403	\$5,992	\$1,231	\$3,194	\$7,410	\$6,028	\$1,202	\$3,194	\$7,410
<u>Outcomes</u>												
# Transfer Students	23.6	30.9	0.0	208.0	8.2	15.5	0.0	158.0	10.6	19.5	0.0	208.0
# American Indian Transfers	1.0	4.8	0.0	41.0	0.1	0.9	0.0	16.0	0.3	2.1	0.0	41.0
# Black Transfers	2.7	3.5	0.0	20.0	1.3	3.9	0.0	49.0	1.5	3.9	0.0	49.0
# Hispanic/Latinx Transfer	1.7	2.8	0.0	23.0	0.6	1.7	0.0	21.0	0.7	1.9	0.0	23.0

Table 9 (continued).

# Pell Recipients Transfers	10.8	13.0	0.0	67.0	3.8	7.1	0.0	84.0	4.9	8.7	0.0	84.0
# Adult Learner Transfers	9.9	15.1	0.0	113.0	3.0	6.5	0.0	87.0	4.1	8.8	0.0	113.0
# Associate's Degree Transfers	13.5	16.5	0.0	133.0	4.1	7.4	0.0	76.0	5.6	10.0	0.0	133.0
N	484				2,640				3,124			

Table 10.

Differences between Treatment and Control Groups on Descriptive Statistics

Variable	Treatment	Control	Difference Between Treatment and Control
	Mean	Mean	
Covariates			
CC Unemployment by County	8%	7%	1%
CC % American Indian	4%	2%	2%
CC % Black	28%	22%	6%
CC % Hispanic/Latinx	8%	8%	0%
CC % Pell Recipients	48%	45%	3%
CC % Adult Learners	38%	37%	2%
CC % Full-Time	40%	39%	1%
Uni In-State Tuition	\$6,228	\$5,992	\$236

Table 10 (continued).

Outcomes			
# Transfer Students	23.6	8.2	15.4
# American Indian Transfers	1.0	0.1	0.9
# Black Transfers	2.7	1.3	1.4
# Hispanic/Latinx Transfer	1.7	0.6	1.1
# Pell Recipients Transfers	10.8	3.8	7.0
# Adult Learner Transfers	9.9	3.0	6.9
# Associate's Degree Transfers	13.5	4.1	9.3

Assumptions

When using a DID model, the researcher must satisfy several assumptions to have confidence in the estimate of the treatment effect. First, the treatment and control groups must have parallel trends of the outcome before the treatment occurs. The presence of parallel trends ensures that the control group reflects a good estimate of what would have happened to the treatment group in the absence of the treatment (Furquim et al., 2020). To satisfy this assumption, I visually examined the trends of transfer student enrollment and the treated and control transfer pathways before the treatment period. I also conducted a leads analysis to statistically test for the presence of parallel trends. Second, the outcome being measured cannot impact whether or not a group receives the treatment (Furquim et al., 2020). To satisfy this assumption, I examined press releases and news articles on the co-admissions agreements to determine the institution's motivations for forming them. While the treated community college and university transfer pathways have a higher volume of transfer students on average, there is no indication that institutions entered into co-admissions

agreements to correct for a dip in transfer enrollment or to capitalize on an increase in transfer student volume. Finally, the Stable Unit Treatment Value Assumption (SUTVA) requires that the outcomes of the control units are not affected by the treatment in any way (Furquim et al., 2020). While participating in a co-admissions agreement might give a university a more transfer-receptive culture overall, the pre-transfer services offered through such programs are only available to community college students participating in the program. Therefore, the presence of a co-admissions program is unlikely to affect the number of transfer students coming from community colleges in the control transfer pathways because they will not have access to the program benefits.

Limitations

This study has several important limitations. First, all the co-admissions agreements in the study were implemented recently (semester impacted Fall 2018 or Fall 2019). As such, there are only three years or two years of post-implementation for each community college to university transfer pathway, making this a study of the early effects of co-admissions agreements on transfer student volume. I was not able to explore the long-term effects on the number of students that transfer or other outcomes that take longer to emerge, such as bachelor's degree attainment or time to complete a bachelor's degree. Second, because I did not have data on all the community college students, just those that transferred, I could not directly test for the impact of participation in a co-admissions program on the likelihood that a student will transfer. This is not problematic on its own, as my research questions focus on the transfer productivity of the partnerships between the community colleges and universities. However, because the co-admissions agreements have the potential to strengthen the partnership and lead to a higher number of transfer students moving between the institutions, I have no way of separating out the

impact on individual participants in the co-admissions program and the overall transfer student population moving along treated pathways. Finally, because this study only includes partnerships between institutions in North Carolina, it may have limited generalizability to other state contexts. This may be especially true for states that have mandated that all institutions establish at least one co-admissions agreement, as all the North Carolina partnerships were voluntary.

Data Management and Security

Because this study uses secondary data aggregated at the institutional level, the proposed study did not need to be submitted to an Institutional Review Board before any data was accessed. Individual identities were protected by only collecting data that was completely de-identified (i.e., contains no identifiable information such as names, phone numbers, email addresses, or student IDs). The students whose data was used in this study also have no risk of being reidentified, because the data was aggregated at the institutional level (i.e., their community college to university transfer pathway) and only total numbers of transfer students in each relevant outcome category was used. All data was stored on a password-protected Google Drive, and no data was stored locally. Because data was collected from multiple sources, data was cleaned for consistent formatting before being merged using Stata 17. Stata 17 was used for all data analysis in this study.

Summary

This study used a quasi-experimental method, difference-in-differences, to identify the impact of co-admissions agreements on the number of students transferring between partner institutions in North Carolina. The units of analysis, the community college to university transfer pathways, were divided into the treatment and control groups by the independent variable, the presence of a co-admissions agreement. The dependent variable, the volume of transfer students

along each transfer pathway, was also be examined separately for American Indian, Black, or Hispanic/Latinx students, students who are recipients of a Pell grant, students who are adult learners, and students who earned an associate's degree prior to transferring. Each model included time-varying covariates and inverse probability weights for the likelihood of being in the treatment group. I specifically used a two-way fixed effects model variation of difference-in-differences to account for the variation in the timing of the treatment. The transfer pathway fixed effects controlled for any institutional characteristics that do not vary over time, and year fixed effects controlled for any external factors that affect all the transfer pathways at the same time.

CHAPTER 4: RESULTS

Overview

In this study, I examined the impact of co-admissions agreements on the number of students transferring along community college to university transfer pathways with an agreement. I used difference-in-differences to estimate the overall impact on the number of transfer students, as well as the impact on transfer students who are American Indian, Black, or Hispanic/Latinx, Pell grant recipients, adult learners (age 25 or older), and who earned an associate's degree before transferring. The first section in this chapter discusses the parallel trends assumption and for which outcomes this assumption was met. In the second section, I cover the overall results of my primary model for each outcome. My third section includes the results of my sensitivity analyses. The fourth section details the results of my robustness checks, and I conclude with a summary of my results.

Parallel Trends Assumption

DID relies on the control group to serve as a counterfactual for what would have happened to the treatment group in the absence of treatment. If the control and treatment groups follow a similar trend in their outcomes before the treatment, the difference in outcomes after the treatment can be attributed to the treatment itself. In order to effectively use this method, I had to first satisfy the assumption that my treatment and control groups followed parallel trends in their outcomes in the time period before treatment occurred (Furquim et al., 2020). To accomplish this goal, I graphed the mean of each of my outcomes over time for the treatment and control groups and performed a visual inspection to confirm that they followed a similar pattern before treatment. Because my treated transfer pathways received treatment at different times, I also created separate graphs for the treated pathways that had a semester of impact in Fall 2018 and

Fall 2019. The graphs for each outcome and subdivision of treatment groups can be found in Figure 5.

The visual inspection confirmed that parallel trends existed for most of my outcomes prior to treatment. The treatment and control groups did not always follow a similar trend when broken out by different timing of treatment (Fall 2018 and Fall 2019), but I was not concerned by this finding because the combined treatment groups did follow a similar pattern. For three outcomes, however, parallel trends did not exist prior to treatment even with both treatment timings grouped together: the number of transfer students who were American Indian, Black, or Hispanic/Latinx. The variability in the trends prior to treatment for these outcomes likely occurred because for the vast majority of transfer pathways, the mean value of these outcomes was zero (99% of pathways for American Indian transfers, 85% of pathways for Black transfers, and 79% of pathways for Hispanic/Latinx transfers). Histograms demonstrating the distribution of the mean for each of these outcomes across transfer pathways can be found in Appendix G. Because most transfer pathways had a value of zero in most years for these outcomes, the pathways with a large number of transfer students from one of these student groups in certain years dramatically impacted the overall average in those years. In order to still measure the impact of co-admissions agreements on these three outcomes, I combined the outcomes into one variable that is a sum of all transfer students from any of these groups. I then included the number of transfer students who are underrepresented minorities (URM) as an outcome in all my analyses. The visual inspection of parallel trends for the URM variable revealed a much closer match between the treatment and control groups prior to treatment. The results for the number of transfer students who are American Indian, Black, or Hispanic/Latinx are still included in my results tables, but these outcomes are noted as failing the parallel trends assumption.

Figure 5.
Parallel Trends

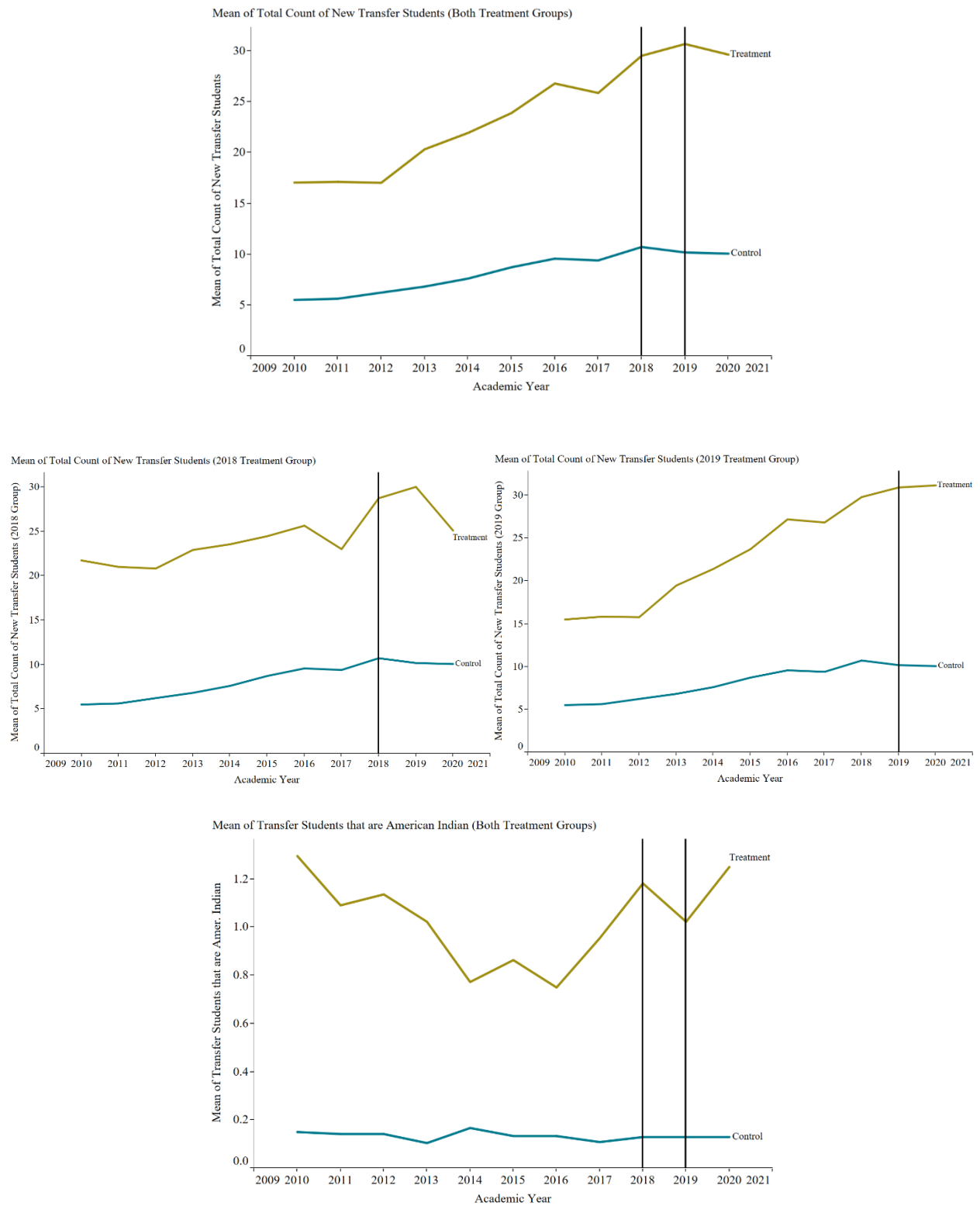


Figure 5 (continued).



Figure 5 (continued).

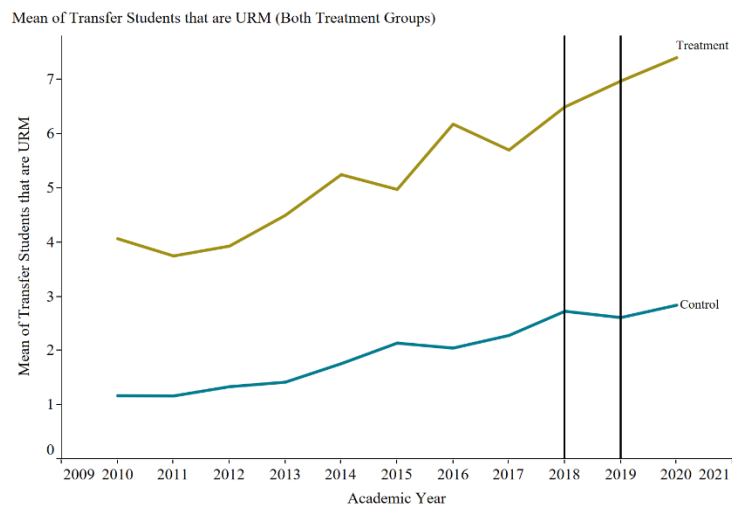
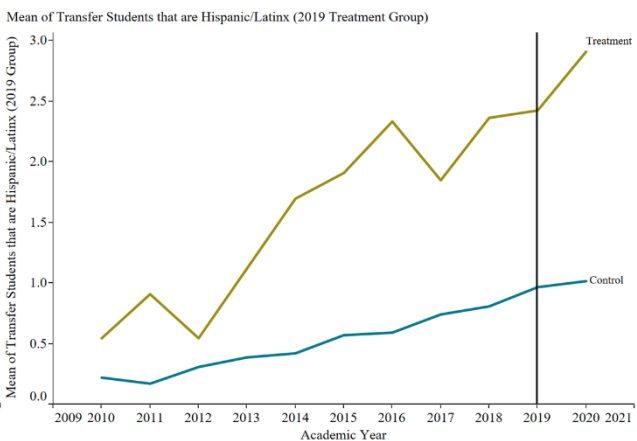
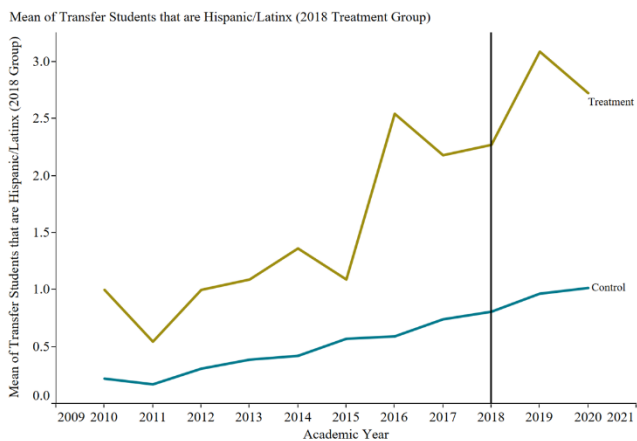
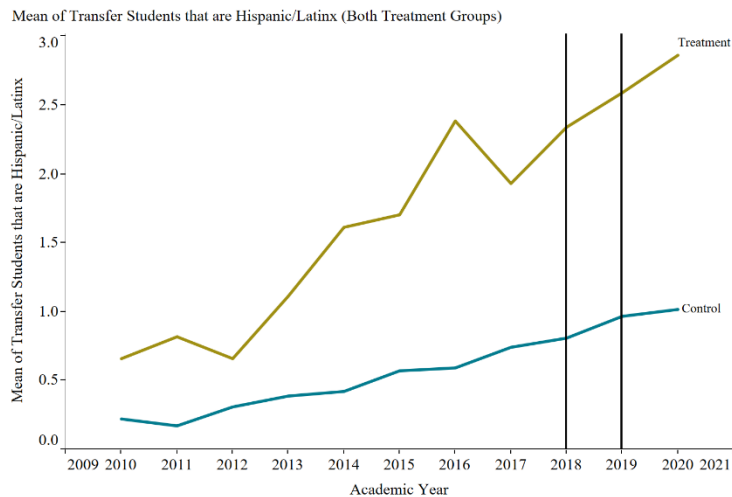


Figure 5 (continued).



Figure 5 (continued).

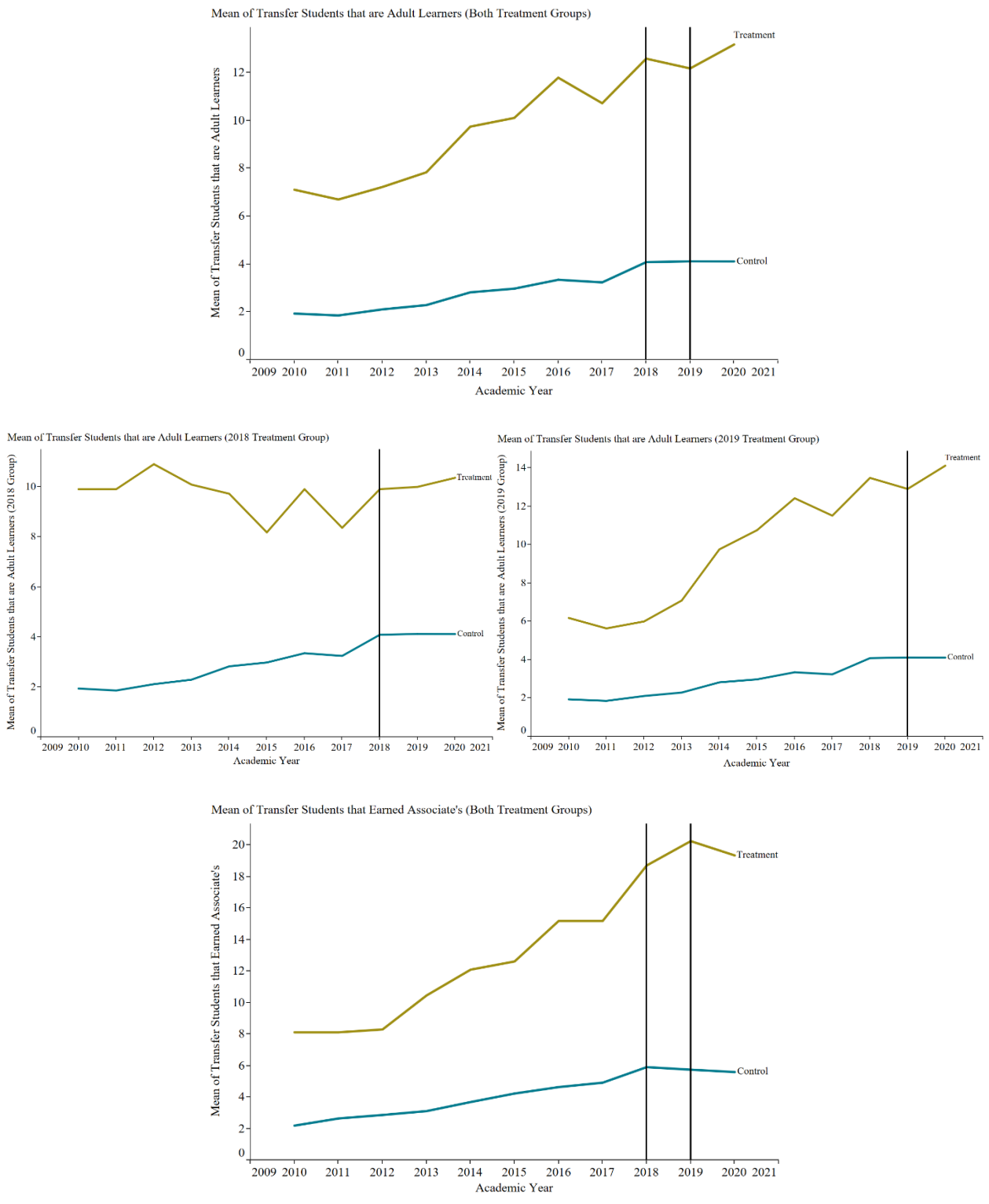


Figure 5 (continued).

In addition to the visual inspection of parallel trends, I also conducted a leads analysis to statistically test for the presence of parallel trends. I reran all of my main models with separate indicators for each year of the study, omitting the year immediately preceding the first year of treatment as the reference year (academic year 2017-2018 for the Fall 2018 semester of impact group and academic year 2018-2019 for the Fall 2019 semester of impact group). Although it is not a direct test of the parallel trends assumption, by examining the coefficients for each year prior to treatment, I conducted an informal test of parallel trends. Pretreatment coefficients that are statistically different from zero could be an indication of a violation of the parallel trends assumption (Furquim et al., 2020).

Results from the leads analysis are presented in Table 11. For most outcomes, the coefficients for the pretreatment years are not statistically significant from zero. For the outcomes where the visual inspection showed parallel trends, these coefficients are further evidence that the assumption was not violated. For the outcome of the number of transfer students who are adult learners, the coefficient was statistically significant in four of the eight pretreatment years (year -8 through year -5). As such, in all of my results tables, the outcome for adult learner transfer students is also noted as violating the parallel trends assumption.

For the outcome of transfer students with associate's degrees, only one pretreatment

coefficient was statistically significant (year -4). This finding could be evidence of a violation of the parallel trends assumption. In fact, revisiting the graph of pretreatment trends for this outcome, it appears that the mean number of associate's degree holding transfer students may have increased at a slightly higher rate among the treated transfer pathways versus the controls around this time (academic year 2014-2015 for the Fall 2018 group and academic year 2015-2016 for the Fall 2019 group). In my results tables, I do not note the models for this outcomes as violating the parallel trends assumption because the evidence is not as strong as with the violations for other outcomes. However, I do address the possible implications for a violation of the parallel trends assumption for this outcome in the discussion chapter.

Table 11.

Leads and Lags Analysis of Parallel Trends

	All Transfers	American Indian Transfers	Black Transfers	Hispanic/Latinx Transfers	URM Transfers	Pell Transfers	Adult Transfers	Associate's Transfers
Year -8	-4.17 (5.37)	-0.10 (0.17)	0.35 (0.92)	-0.12 (0.64)	0.33 (1.69)	0.13 (1.45)	-4.78* (2.27)	-4.88 (3.21)
Year -7	-3.84 (5.00)	-0.02 (0.27)	0.09 (0.73)	0.05 (0.58)	0.14 (1.59)	0.11 (1.24)	-4.62* (2.11)	-5.15 (3.05)
Year -6	-5.41 (5.00)	0.14 (0.27)	-0.14 (0.79)	-0.54 (0.62)	-0.14 (1.66)	-0.54 (1.35)	-4.52* (2.19)	-5.74 (3.14)
Year -5	-4.51 (3.57)	0.04 (0.20)	0.14 (0.56)	-0.19 (0.41)	0.44 (1.16)	-0.01 (0.94)	-3.72* (1.84)	-4.42 (2.43)
Year -4	-3.75 (2.53)	0.05 (0.18)	-0.17 (0.40)	0.00 (0.36)	-0.59 (0.81)	-0.12 (0.71)	-2.00 (1.02)	-3.77* (1.80)

Table 11 (continued).

Year -3	-2.35 (1.73)	-0.13 (0.20)	-0.37 (0.38)	0.21 (0.28)	-1.07 (0.68)	-0.29 (0.60)	-1.13 (0.89)	-2.70 (1.46)
Year -2	0.03 (1.49)	-0.15 (0.14)	0.12 (0.45)	0.08 (0.33)	-0.64 (0.62)	0.06 (0.67)	-0.30 (0.85)	-1.47 (1.00)
Year -1	-0.25 (1.32)	-0.19 (0.23)	-0.03 (0.36)	-0.18 (0.26)	-0.14 (0.64)	-0.39 (0.58)	-0.43 (0.70)	-0.23 (0.82)
Year 0 (omitted)								
Year 1	2.68 (1.39)	-0.01 (0.12)	0.25 (0.47)	-0.02 (0.38)	0.95 (0.67)	0.22 (0.61)	-0.12 (1.04)	3.45** (1.18)
Year 2	3.27 (2.22)	0.26 (0.19)	0.27 (0.43)	0.45 (0.37)	0.46 (1.00)	0.99 (0.58)	0.77 (1.30)	3.27* (1.51)
Year 3	-1.41 (2.66)	-0.22 (0.36)	-0.35 (0.95)	0.62 (0.53)	-1.16 (1.76)	0.05 (1.13)	-1.14 (1.79)	-0.71 (1.57)
N	3124	3124	3124	3124	3124	3124	3124	3124

Notes: + $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

Another advantage of conducting a leads analysis to test for parallel trends is the ability to include posttreatment indicators, or lags, and examine the effects of co-admissions over time (Furquim et al., 2020). In my main models, the reported coefficients represent the average effect of co-admissions agreements across all three posttreatment years. The coefficient for each posttreatment year reported in Table 11 shows the specific effect in that year, allowing me to determine if the effect of co-admissions agreements grows or fades over time. I discuss the results presented in Table 11 for the posttreatment indicators in the following section in the context of my results for my main models.

Main Models

This section covers the results from my model for my primary outcome, all transfer students, and the outcomes for student sub-groups (outcomes for students by race/ethnicity, including the URM transfer student variable, Pell recipient status, adult learner status, and associate's degree earners). I used the *xtreg* command in Stata to run all models with academic year and transfer pathway fixed effects and used standard errors clustered by transfer pathway. Table 12 shows the results for my primary outcome and the results for all student sub-groups. Upon initial examination, the results from the DID model for all transfer students indicate that co-admissions agreements may have an impact on the number of students that transfer along the pathways with the agreement. The results suggest that an average of 4.8 additional students transfer per year along transfer pathways with a co-admissions agreement. Considering the average number of students transferring along treated pathways in the time period prior to treatment was 22, this represents a 22% increase in transfer student volume. Although the results for overall transfer student outcome were statistically significant, they were only significant at the $p < 0.10$ level, and they were not consistent across the various sensitivity analyses I conducted (discussed further in later sections). Together, these findings suggest that co-admissions agreements did not have an impact on the overall number of students transferring along treated pathways.

Race/Ethnicity

The results of the DID models revealed that co-admissions agreements did not have a differential impact on the number of transfer students who belong to minoritized racial or ethnic groups. The model with the number of URM transfer students as an outcome had positive but statistically and practically insignificant results (an average increase of 0.4 transfer students in

Table 12.*Results from Main Model and Student Sub-Groups*

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years	4.78+ (2.81)	0.16 (0.10)	0.19 (0.58)	0.03 (0.41)	0.38 (0.84)	1.27 (0.79)	1.74 (1.60)	5.01* (2.02)
CC Unemployment by County	564.65*** (167.16)	2.31 (7.92)	112.77* (49.43)	73.90** (23.89)	188.98** (69.99)	189.52*** (56.71)	233.51** (71.03)	318.12** (102.42)
CC % American Indian	-70.97 (47.80)	0.64 (12.20)	14.79 (17.84)	-9.84 (12.16)	5.6 (25.82)	-40.37 (25.19)	-39.19 (29.30)	-70.49* (31.84)
CC % Black	19.02 (18.00)	1.61 (2.00)	5.82 (4.79)	-2.03 (2.25)	5.41 (6.72)	10.47 (7.88)	19.98* (9.59)	10.78 (12.10)
CC % Hispanic/Latinx	-11.11 (21.97)	-0.66 (1.65)	-3.41 (5.16)	4.41 (3.76)	0.34 (6.74)	0.16 (8.54)	2.84 (12.56)	-5.91 (15.08)
CC % Pell Recipients	4.97 (4.16)	-0.06 (0.27)	-0.88 (1.37)	0.85 (0.69)	-0.1 (1.76)	1.5 (2.19)	1.83 (2.31)	4.36 (2.66)
CC % Adult Learners	6.180 (7.25)	0.25 (0.86)	1.4 (2.53)	0.35 (1.29)	2.01 (3.51)	3.29 (3.67)	4.29 (3.69)	3.72 (5.09)
CC % Full-Time Uni In-State Tuition	20.31* (10.16)	-0.690 (1.10)	5.19+ (2.73)	2.020 (1.39)	6.52+ (3.91)	2.19 (3.85)	5.96 (5.45)	12.19+ (6.70)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

treated years). Although the models for transfer students who were American Indian, Black, or Hispanic/Latinx failed the parallel trends assumption, their results are consistent with those from the URM model and indicate no differential impact by student race/ethnicity.

Pell Recipients

Similar to the results of the models focused on student race/ethnicity, the effects in the model with Pell recipient transfer students as an outcome were positive but statistically insignificant and small (an average of 1.3 additional transfer students in treated years). These results suggest that co-admissions agreements do not have a specific impact on the number of students who transfer who are from low-income backgrounds.

Adult Learners

The results from the model examining the impacts of co-admissions agreements of adult learner (age 25 or older) transfer students also showed null effects. The results were statistically insignificant and practically small (an average of 1.8 additional transfer students in treated years). These findings imply that co-admissions agreements do not have an effect on the number of transfer students who are adult learners.

Associate's Degree Earners

The model focused on the number of transfer students who earned an associate's degree before transferring suggests that this outcome was positively impacted by the presence of a co-admissions agreement. This finding is consistent with the target audience for co-admissions agreements, as the majority of the agreements included in this study require students to earn an associate's degree to take advantage of the admissions guarantee. The results were statistically significant (at the $p < 0.05$ level) and practically large. An average of 5 additional students with associate's degrees transfer per year along transfer pathways with a co-admissions agreement.

The average number of associate's degree earners transferring along treated pathways in years prior to treatment was 11.9, so the growth in students attributable to co-admissions agreements represents a 42% increase.

In the leads and lags analysis I conducted to test for parallel trends (results presented in Table 11), the coefficients for one year posttreatment and two years posttreatment were both positive and statistically significant. This result is unsurprising considering the statistically significant result I found across all posttreatment years. However, the lags analysis also revealed that co-admissions agreements did not have a statistically significant effect on the number of associate's degree holding transfer students by the third-year posttreatment, indicating that the impact of co-admissions agreements may fade over time. Nevertheless, because I only have three years of posttreatment data, it is difficult to draw this conclusion with certainty. The lack of effect detected in year 3 might instead be a reflection of the relative effectiveness of specific co-admissions agreements, as I discuss further in the sections covering my sensitivity analyses.

Overall, the results from my main models indicate that co-admissions agreements may be effective in increasing the volume of students with associate's degrees who transfer along a community college to university pathway. However, the results suggest that co-admissions agreements do not have a specific impact on the volume of transfer students who are from minoritized racial/ethnic groups, Pell recipients, or adult learners. In addition, the results for all transfer students are not consistent across all my sensitivity analyses and imply that co-admissions agreements do not have an impact on this outcome either. I discuss the implications of this finding further in the following section.

Sensitivity Analyses

In this section, I discuss the findings of several sensitivity analyses I conducted to ensure my results were consistent under different model specifications. In order to determine whether my results were being affected by imputed data, I ran two variations of my models that excluded imputed data. Three of the universities included in the transfer pathways in my study are part of the NC Promise program, which reduces tuition to \$500 a semester for in-state students, so I re-ran my models with a variable indicating participation in the program to confirm that the NC Promise program was not driving my results. Next, I discuss the results of several analyses that present alternative definitions of my treatment variable, to determine if specific program design elements or programs at specific universities are behind my results. Finally, I discuss the results of my models with an alternative definition of my outcomes to determine if they are consistent.

Excluding Imputed Data

For one of my covariates, the percentage of students at the community college in each transfer pathway that are adult learners, about 30% of my sample was missing data. As such, I conducted a multiple imputation for that variable to retain my whole sample. To account for the possibility that use of imputed data impacted my results, I conducted two analyses which excluded the imputed data to determine if my results were consistent: one that only used my original data and excluded any observations with the missing variable and one that excluded the variable with missing data from the models. The results of these two analyses are fairly consistent with the results of my main models and can be found in Tables 13 and 14. The coefficients for each outcome were similar in size to those in the main models. In the models which excluded observations with missing data, the number of transfers with an associate's

Table 13.*Models without Imputed Data*

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years: No Adult Learners Variable	4.73+ (2.80)	0.160 (0.10)	0.180 (0.58)	0.030 (0.41)	0.370 (0.84)	1.25 (0.79)	1.71 (1.60)	4.98* (2.02)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

Table 14.*Models without Community College Percentage Adult Learner Variable*

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years: No Imputed Data	5.78 (4.80)	0.080 (0.10)	-0.080 (0.76)	-0.200 (0.63)	-0.200 (1.23)	0.95 (1.31)	2.02 (2.68)	6.30+ (3.34)
N	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

degree remained the only statistically significant outcome (at the $p < 0.10$ level), and the overall number of transfer students was no longer statistically significant. This change was likely due to the increase in standard errors resulting from the reduction in sample size. In the model which excluded the percentage of adult learners as a covariate and retained the whole sample, both the overall number of transfer students and the number of transfer students with associate's degrees remained statistically significant. These findings indicate that the use of imputed data did not impact my results.

NC Promise

Three of the universities included in the study are part of the NC Promise program: Western Carolina University, UNC Pembroke, and Elizabeth City State University (UNC System, 2022d). The program reduced tuition at these institutions to \$500 for in-state students and \$2,500 for out-of-state students, beginning in Fall 2018 (Western Carolina University, 2022). The reduced tuition rate applies to all undergraduates, including transfer students, not just incoming freshmen. Because the NC Promise program was implemented in the same year as my earliest treatment group, it has the potential to confound the effects of the co-admissions agreements implemented at those institutions. As such, I conducted a sensitivity analysis which included a dummy variable for NC Promise for the years the program was active for the transfer pathways that included a university that is part of the program. This analysis allowed me to determine if the effects of the NC Promise program were confounding any effect of the co-admission agreements. Consistent with my main models, I only found a statistically significant effect on the outcome transfer students with an associate's degree (see Table 15). The effects were also very similar in size to those in the main model (approximately 5 additional transfer

Table 15.*Models with NC Promise Variable*

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years	4.65+ (2.66)	0.17 (0.11)	0.31 (0.56)	0.04 (0.40)	0.52 (0.80)	1.45+ (0.77)	1.540 (1.52)	4.78* (1.91)
NC Promise	-7.520 (11.40)	0.690 (0.85)	6.92+ (3.68)	0.230 (1.44)	7.84+ (4.40)	10.65* (4.13)	-11.65+ (6.03)	-13.63+ (7.64)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

students per year). By controlling for the NC Promise program in these models, I was able to determine that it did not have an extraneous effect on my outcomes.

Alternative Treatment Definitions

The co-admissions agreements included in this study are similar in design and all share the key elements of guaranteeing participants admission to the university and granting them access to university advisors prior to transfer. However, several of the other design elements vary from program to program, including the required community college GPA and whether or not full-time enrollment is required at the community college. I completed two analyses to determine if specific program designs were more

effective than others. In addition, the two programs associated with East Carolina University and UNC Wilmington had a far greater number of partners than the other universities included in the study. To account for the possibility that the design of one of these programs was driving my results, I conducted an analysis that tested for the effects of each of these two program separately

GPA Requirement at Community College. Of the seven programs that required a specific community college GPA, 3 required a GPA of 2.5 and 4 required a GPA below 2.5. As such, I ran a separate analysis with dummy variables for each GPA requirement: one dummy variable for a requirement of 2.5 (accounting for 33 of 44 treated pathways) and one dummy variable for a GPA requirement below 2.5 (7 of 44 treated pathways). Table 16 shows the co-admissions agreements included in the study broken out by their required GPAs.

Table 16.

Co-Admissions Agreements by GPA Requirement

<u>University</u>	<u>Agreement Name</u>	<u>GPA Requirement</u>
<i>Greater than or equal to 2.5</i>		
East Carolina University	Pirate Promise	2.50
University of North Carolina at Wilmington	Pathway to Excellence Program	2.50
Western Carolina University	Guaranteed Admissions Partnership Programs	2.50
<i>Less than 2.5</i>		
Appalachian State University	Aspire Appalachian Co-Admission Program	2.25
Elizabeth City State University	Co-Admissions Program	2.00
University of North Carolina at Asheville	Direct Admission Programs	2.00
University of North Carolina at Greensboro	Spartan Passage	2.00

The effect of co-admissions agreements remained statistically significant only for the impact of the GPA requirement of 2.5 on the outcome of transfer students with an associate's degree (see Table 17). The coefficient for that outcome remained similar in size to that found in the main model (around 5 additional transfer students per year). For those co-admissions agreements with a GPA requirement below 2.5, only the coefficient for the transfer students who are Pell recipients was significant. These findings suggest that the specific GPA requirement may not be relevant to the overall number of students transferring, but programs with a higher GPA requirement may be necessary to have an effect on the number of associate's degree holders transferring. In addition, programs with a

Table 17.

Models with Treatment Defined by GPA Requirement

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
GPA Requirement ≥ 2.5 : Post Treatment Years	5.69+ (3.34)	0.04 (0.08)	0.52 (0.47)	-0.08 (0.44)	0.48 (0.80)	0.85 (0.84)	3.30+ (1.83)	5.28* (2.48)
GPA Requirement < 2.5 : Post Treatment Years	2.36 -(2.61)	0.02 -(0.17)	1.31 -(1.22)	-0.55 -(0.73)	0.78 -(1.29)	2.90* -(1.32)	-2.07+ -(1.16)	3.41 -(2.24)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

lower GPA requirement may induce more Pell recipients to transfer.

Full-Time Enrollment Requirement at Community College. My next analysis defined treatment based on whether or not each pathway was associated with a program with a requirement that participants enroll full-time at the community college. Pathways with this requirement account for 15 of the 44 total of treated pathways. I ran an analysis with separate dummy variables for those pathways with and without a full-time enrollment requirement (29 of 44 pathways). Table 18 shows the co-admissions agreements included in the study broken out whether or not they had a full-time enrollment requirement.

Table 18.

Co-Admissions Agreements by Full-Time Enrollment Requirement

University	Agreement Name
<i>Full-Time Enrollment Required at the Community College</i>	
Appalachian State University	Aspire Appalachian Co-Admission Program
East Carolina University	Pirate Promise
University of North Carolina at Greensboro	Spartan Passage
<i>No Full-Time Enrollment Requirement at the Community College</i>	
Elizabeth City State University	Co-Admissions Program
University of North Carolina at Asheville	Direct Admission Programs
University of North Carolina at Pembroke	BraveStep
University of North Carolina at Wilmington	Pathway to Excellence Program
Western Carolina University	Guaranteed Admissions Partnership Programs

The results of this analyses can be found in Table 19. The full-time requirement dummy revealed that co-admissions agreements had statistically significant effects on none of the outcomes. For the no full-time requirement dummy, the effect of co-admissions agreements remained statistically significant only for the outcome of transfer students with an associate's degree, with a slightly larger coefficient than that seen in the main model (approximately 1.5 more transfer students per year). These results suggest that the specific community college enrollment requirements of each program may not impact the number of transfer students overall, but programs without the full-time requirement may be more effective in supporting associate's degree holders to transfer.

Table 19.

Models with Treatment Defined by Full-Time Enrollment Requirement at Community College

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Full-Time Requirement: Post Treatment Years	2.5 (1.59)	0.01 (0.08)	0.08 (0.46)	0.32 (0.45)	0.41 (0.70)	1.82* (0.76)	-1.15 (0.78)	2.57+ (1.31)
No Full-Time Requirement: Post Treatment Years	6.35 -(4.20)	0.26 -(0.16)	0.27 -(0.81)	-0.17 -(0.51)	0.36 -(1.18)	0.90 -(1.13)	3.73 -(2.38)	6.69* -(2.99)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

Co-Admissions Programs with a Large Number of Partners. The majority of treated pathways (32 of 44) fall under the umbrella of two universities, East Carolina University and UNC Wilmington. My results could be driven mainly by the effects of one or both of these programs. To account for that possibility, I ran a model with a dummy variable for pathways associated with ECU and a dummy variable pathways associated with UNCW. The results for this model can be found in Table 20. For the ECU variable, co-admissions agreements did not have a statistically significant effect on any of my outcomes. For the UNCW variable, however, both the outcome of all transfer students and the outcome of transfers with an associate's degree still had a statistically significant effect from co-admissions agreements (both at the $p < 0.05$ level). In addition, the effect sizes for both these outcomes were larger than those

Table 20.

Models with Dummy Variables for the ECU Pirate Promise Program and UNCW Pathways to Excellence Program

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latin x Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years: ECU	2.53 -(1.74)	-0.11 -(0.09)	0.39 -(0.47)	0.51 -(0.43)	0.78 -(0.66)	1.10 -(0.76)	0.50 -(0.77)	0.93 -(1.36)
Post Treatment Years: UNCW	9.20* (4.57)	0.16+ (0.09)	0.750 (0.50)	-0.050 (0.51)	0.860 (0.88)	1.24 (0.87)	6.66** (2.43)	7.20* (3.56)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

in the main model: approximately 4 more transfer students per year and 2 more transfers with associate's degrees compared to the main model.

For the outcome of adult learner transfer students, there was a statistically significant effect that did not appear in the main model ($p < 0.01$). The results suggest that an average of 6.7 students who were adult learners transferred along pathways with co-admissions agreements. The findings from the UNCW model indicate that the effect of that university's co-admissions agreements may be driving the effects I detected in my main models. UNCW's co-admissions program is associated with half of my treated pathways. If that program in particular is more effective than the others included in this study, it could produce a significant effect by itself in the main models. To further test for this possibility, I ran a separate set of models where I defined treatment as only including

Table 21.

Models with Treatment Defined as excluding UNCW Pathways to Excellence Program

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years: Excluding UNCW	0.86 (2.22)	0.100 (0.16)	-0.070 (0.79)	0.110 (0.46)	0.140 (1.09)	1.18 (1.15)	-1.87 (1.31)	2.48* (1.24)
N	2,882	2,882	2,882	2,882	2,882	2,882	2,882	2,882

Notes: + $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

treated pathways that were not associated with UNCW. The results of this analysis can be found in Table 21. In these models, only the outcome of transfers with an associate's degree sustained a statistically significant effect from co-admissions agreements ($p < 0.05$). However, with this treatment definition, the coefficient was much smaller. When compared to non-treated pathways, all treated pathways other than those associated with UNCW saw an average increase of 2.5 transfer students with associate's degrees in years that their agreements were active. The findings from this set of models add further evidence to the conclusion that the impact of UNCW's co-admissions agreements is driving some of the effects seen in the main models.

In addition, the results from my leads and lags analysis conducted to test for parallel trends provide further evidence of UNCW's influence. The lagging indicators revealed that the effect of co-admissions agreements on the number of transfer students with associate's degrees faded by three years posttreatment. However, the treated pathways associated with UNCW, which represent half my sample, almost all have a semester of impact in Fall 2019 (21 of the 22 pathways associated with UNCW). Because the transfer pathways with a semester of impact in Fall 2019 only have two years of posttreatment data, their effects do not influence the coefficient for the third posttreatment year generated from the lags analysis. If UNCW's agreements are driving my results, I would expect to see the impact of co-admissions agreements to fade in year three when most of UNCW's pathways are no longer included in the model. UNCW's agreements may be the only ones that induce more students to transfer overall, and their agreements are also responsible for a large portion of the increase in transfer students with associate's degrees. However, co-admissions agreements associated with other universities are likely effective in encouraging students to earn an associate's degree before transferring as well.

Alternative Outcome Definition

For my final sensitivity analysis, I changed the definition of my outcomes to be expressed as a percentage of total undergraduate enrollment at the university in each pathway (see Table 22). If co-admissions agreements are successful at boosting transfer student enrollment at the universities, I would expect the results to follow a similar pattern to those found in my main models. In these models, the coefficient for the transfer students with an associate's degree outcome remained statistically significant, but the coefficient for all transfer students did not. These results provide more support to the conclusion that co-admissions agreements did impact the number of transfers with associate's degrees, but they also suggest that the finding for all transfers is not robust to alternative model specifications.

Table 22.

Models with Outcome Defined as New Transfer Students as a Percent of Undergraduates

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
% of Undergrads: Post Treatment Years	0.03 (0.03)	0.00 (0.00)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.01 (0.01)	0.01 (0.01)	0.04** (0.02)
N	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

My findings from these models could also be caused by simultaneous increase in overall undergraduate enrollment and enrollment of transfer students. This pattern would emerge because as overall enrollment increased, even though the number of new transfer students was also increasing, the share that those new transfer students represented of total undergraduate enrollment would remain the same. If the new transfer students produced by the co-admissions agreements were more likely than previous transfer students to earn an associate's degree before transferring, the share of new transfer students with an associate's among the full undergraduate population would increase. This explanation accounts for the statistically significant coefficient in my transfer with associate's degrees model under this outcome definition. This interpretation of the results is also consistent with results of my main models; the coefficient for co-admissions agreements in both the overall transfer student model and the transfer with associate's degree model are both around 5 students per transfer pathway. This finding suggests that all or most of the new transfer students resulting from co-admissions agreements earn an associate's degree before transferring.

The results of my sensitivity analyses suggest that the results of my main model are not being influenced by the use of imputed data or the impact of the NC Promise program. The findings from the models with an alternative definition of treatment indicate that some program design elements (i.e., requiring a GPA of 2.5 at the community college or declining to impose a full-time enrollment requirement) may be associated with program success. However, the analysis focused on the universities with a large number of community college partners revealed that UNCW's co-admissions program revealed that that program may be driving my overall results. UNCW's program requires a community college GPA of 2.5 and does not require students to enroll full-time at the community college, indicating that it was likely driving the

results of those sensitivity analyses as well. As such, my results suggest that UNCW's program is inducing more students with associate's degrees to transfer but does not provide as much evidence about the effectiveness of smaller co-admissions programs. Finally, the results from my models with alternative outcome definitions indicate that while co-admissions agreements may not influence more students to transfer overall, they do have an impact on transfer students with associate's degrees.

Robustness Checks

To test for the possibility of some external factor affecting my estimate of the treatment effect, I conducted two placebo tests. The first test placed the timing of the treatment two academic years before treatment for each community college to university transfer pathway (either 2016-2017 or 2017-2018) and only used data from pre-treatment years, with the idea that if the results for this model still show an impact of co-admissions agreements, this indicates that some external cause may be confounding the estimate of the treatment effect (Furquim et al., 2020). The second test used a non-equivalent outcome; by testing for the impact of treatment on an outcome that should not be affected by co-admissions agreements, I can ensure that the existence of an agreement is truly what is driving my results (Furquim et al., 2020). I used first-time student enrollment at the universities as my non-equivalent outcome, as this outcome should be unaffected by a program for transfer students.

Change in Treatment Timing

The results of the models with treatment timing placed in the previous year can be found in Table 23. In these models, none of the outcomes maintained a statistically significant effect from co-admissions agreements. This finding suggests that the results from my main models are robust and that there is not a factor external to my models driving my results.

Table 23.*Models with Treatment Timing Assigned to Previous Year*

	All Transfers	American Indian Transfers [^]	Black Transfers [^]	Hispanic/Latinx Transfers [^]	URM Transfers	Pell Transfers	Adult Transfers [^]	Associate's Transfers
Post Treatment Years: Lagged Treatment	0.14 (1.95)	-0.18 (0.40)	-0.52 (0.68)	0.35 (0.37)	-0.46 (0.92)	-0.35 (0.95)	0.16 (1.00)	1.10 (1.31)
N	2,272	2,272	2,272	2,272	2,272	2,272	2,272	2,272

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output.

[^] Fails the parallel trends assumption

Non-Equivalent Outcome

The results of my second robustness check can be found in Table 24. For this test, I ran a model with the same specifications as my main model but changed my outcome to the number of first-time undergraduate students enrolled at the university in each pathway. This outcome should not be impacted by the presence of a co-admissions agreement. The statistically significant results for this outcome indicate that approximately 173 fewer first-time undergraduates enrolled at the universities associated with treated transfer pathways after the introduction of a co-admissions agreement. This finding suggests that there is an external factor that took place around the timing of treatment that affected both the number of students transferring along each pathway and the number of first-time students enrolling at the universities.

Table 24.*Model with Non-Equivalent Outcome*

	First-Time Undergraduates
Post Treatment Years	-172.96*** (40.71)
N	3,124

Notes: + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Standard errors are clustered at the transfer pathway level. Academic year and pathway fixed effects are omitted from the output

An alternative explanation for the significant results in my non-equivalent outcome model is that my outcome observations are serially correlated. First-time undergraduate enrollment is correlated within each university over time; observations for enrollment are fairly similar year to year. Because my unit of analysis is transfer pathways, my observations for first-time undergraduate enrollment are also correlated across units of analysis. My study includes 284 unique transfer pathways, but only 8 different universities are associated with each pathway. As such, for each academic year, the outcome of first-time undergraduate students only takes on 8 different values across the 284 pathways. The significant results in this model could be caused by the correlation across observations.

Even with this alternative explanation, taken together, the results of my placebo tests suggest that an external factor may be driving the results found in my main models. I will cover other potential causes of the increase in transfer students and transfer students with associate's degrees seen in the post-treatment years in the following chapter.

Summary

In this section, I covered the results from my DID analyses for my primary outcome, the total number of students transferring along each pathway, and my outcomes for specific student

sub-groups. I also discussed the results of several sensitivity analyses I conducted to ensure that the results of my models were consistent across different specifications and were not being driven by factors such as the use of imputed data, the NC Promise program, or the definition of my treatment or outcomes. Finally, I described the results of my robustness checks conducted to check if an external factor was confounding the results of my analysis. In the next chapter, I will discuss these findings and their implications for policymakers, practitioners, and researchers.

CHAPTER 5: DISCUSSION

Overview and Summary of Results

This study sought to examine the impact of co-admissions agreements on the number of students transferring along the pathway between the partner institutions. I analyzed the trends of transfer student volume along transfer pathways with a co-admissions agreement, using transfer pathways without an agreement as a comparison group. Utilizing a difference-in-differences estimation strategy, I aimed to answer the following main research question and sub-questions:

1. To what extent do co-admissions agreements impact the number of students that transfer between the partnering community college and university?
 - a. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student race and ethnicity?
 - b. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student socioeconomic status?
 - c. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by student age?
 - d. To what extent do the effects of co-admissions agreements on the number of students that transfer vary by whether or not the student earned an associate's degree prior to transferring?

The results of my main models revealed that co-admissions agreements produced a sizable increase in the number of transfer students moving along each pathway. However, this finding was not consistent across my sensitivity analyses. I also found that co-admissions agreements had a large impact on the number of students transferring who had already earned an associate's degree, which in contrast was consistent across the sensitivity analyses. Together,

these findings suggest that co-admissions agreement may not encourage more students to transfer along a certain transfer pathway, but they could induce more students already transferring along that pathway to earn an associate's degree first. The results of my main models also revealed that co-admissions agreements did not have a tailored effect on the number of transfer students who were underrepresented minorities, Pell recipients, or adult learners.

I conducted several sensitivity analyses to determine if my results were consistent when excluding imputed data and different definitions of my treatment and outcomes. The findings from these analyses suggest that one university's program, UNC Wilmington, could be driving the results in my main models due to its disproportionate representation among the treated pathways. I also completed two robustness checks to ensure that my results were not influenced by external factors. The placebo test which placed my treatment timing in the previous year revealed that the effects I detected of co-admissions agreements on the number of students transferring with an associate's degree could be the result of underlying trends in transfer student enrollment along treated pathways.

In the remainder of this chapter, I further discuss the results of my main models as they pertain to all transfer students, historically underrepresented transfer students, and transfer students with associate's degrees. I also address the possibility that policy diffusion led to the proliferation of agreements in North Carolina, competition over transfer students, and consequently, my null results. I next include an examination of the results of my robustness checks and their implications for my overall findings. Finally, I cover the implications of my study for policymakers and practitioners and for future research.

Discussion of Results

All Transfer Students

As illustrated in the theory of change created for this study, co-admissions agreements should induce more students to transfer by increasing their motivation to transfer, helping them navigate the transfer process, and increasing their engagement with and sense of belonging at the university. These goals for changing student attitudes and behaviors are addressed by program elements such as the admissions guarantee, tailored advising, and access to university facilities and events. However, program design elements that do not fully meet students' needs or are implemented differently than intended, as well as unintended consequences of design elements, could be leading to the overall lack of effects observed in this study.

One of the key elements shared by all of the co-admissions programs in this study is the guarantee of admissions if students fulfill the program requirements. Pre-transfer students typically view the transfer path as unclear, risky, and competitive, but qualitative studies of other co-admissions programs have demonstrated that participants felt less stress and had more confidence about the transfer process due to the admissions guarantee (Lukszo et al., 2022; Nichols et al., 2020; Zahner, 2022). Participation in a co-admissions program can increase a student's motivation to transfer and should then lead to an increased likelihood of transferring (Nichols et al., 2020; Parr, 2009). Nevertheless, this guarantee has limitations that may prevent it from encouraging all participants to transfer. First, for the agreements included in this study, students must still apply to the university. Their admissions may be guaranteed, but students must still complete the process of applying, transferring their coursework, and enrolling. Even with tailored advising, it is possible that some participants still had difficulties with the application process or with transferring some of their credits, dampening their motivation to

transfer (Grote et al., 2022). Second, co-admissions agreements do not guarantee admission to a particular major. Participants may still have concerns about gaining acceptance to a competitive major (Zahner, 2022) or institutions could implement caps on popular majors (Furbeck, 2011). Students intending to transfer to a university in pursuit of a particular program might be able to take advantage of the guarantee of admission to the university overall, but still decide not to transfer after being unable to access to a particular program.

The second key element shared across all programs included in this study is the availability of tailored, pre-transfer advising provided by the university and in collaboration with the student's community college. In other studies of co-admissions programs, access to personalized, transfer-specific advising was often mentioned by participants as being extremely helpful in navigating the transfer process, boosting their confidence about transferring, and increasing the likelihood that participants would successfully transfer (Fay et al., 2022; Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020; Parr, 2009; Philips, 2014; Zahner, 2022). Quality transfer advising, and specifically a personal relationship with an institutional agent at the intended transfer institution, is frequently cited as an important missing piece from the typical way students manage their transfer journey (Bensimon & Dowd, 2009; Jabbar et al. 2022; Lukszo & Hayes, 2020; Wang, 2020). As such, the tailored advising provided to co-admissions participants should contribute to their transfer success.

Several aspects of the actual implementation of transfer advising among the programs in this study could be contributing to the lack of overall effects. For some co-admissions programs, including programs in this study, students have access to transfer advising but are not required to meet with an advisor on a regular basis (B. Humphrey, personal communication, November 2, 2022; Lukszo et al., 2022). Research on transfer students in general has revealed that frequently,

students manage the transfer process largely on their own if they do not receive proactive outreach from an advisor or do not have to meet an advising requirement (Bensimon & Dowd, 2009; Fay et al., 2022; Grote et al., 2022; Wang, 2020). Students tend to forge their own path if they receive inconsistent or incorrect information from advisors, which reduces their trust in the advising process overall, or if lack of institutional resources reduces their access to quality advising (Fay et al., 2022; Grote et al., 2022; Wang, 2020). Advisors from the co-admissions programs in this study may have difficulty providing consistent information across the differing course articulation and transfer admissions requirements for each of their partners, especially at institutions with a large number of partners. Advisors could also be overwhelmed with the demand from program participants if new staff positions are not created and existing admissions or advising staff take on the additional responsibility of managing the program instead.

By providing students with access to university facilities, resources, and events, co-admissions programs are designed with the intent of increasing participants' sense of belonging and engagement with the university, motivating them to transfer (Nichols et al., 2020). Studies of other co-admissions programs showed that participants often see themselves as university students who are following a different degree pathway when they first enroll at the community college (Lukszo et al., 2022; Nichols et al., 2020). However, access to university life may have a limited impact on students' likelihood of transferring if students are not taking advantage of this program benefit. Personal conversations with administrators for some of the programs in study revealed that they do not track student participation in campus events, so it is difficult to determine if this non-participation is leading to the lack of program effects (B. Humphrey, personal communication, November 2, 2022; H. Hill, personal communication, October 28, 2022). A study of a similar co-admissions program showed that students rarely took part in

university events (Nichols et al., 2020). In addition, programs included in this study were limited in their ability to offer in-person campus events due to the COVID-19 pandemic (B. Humphrey, personal communication, November 2, 2022). Some community colleges are located at a great physical distance from the universities who are their partners (see maps in Appendix A), which could also limit the practicality of students accessing campus resources and events. Participants' withdrawal from or inability to access these program benefits could be contributing to the overall lack of effects found in this study.

Requirements for program participation are likely intended to motivate participants to succeed at their community college and increase their likelihood of transferring, but these conditions for participation could have unintended consequences. Seven of the eight programs in this study required a minimum GPA, and three programs required a GPA of 2.5 or higher. Universities likely include these requirements because a higher community college GPA is associated with a greater likelihood of transferring and success once enrolled at a university (D'Amico et al., 2014; LaSota & Zumeta, 2016). For two of the programs included in this study, the GPA requirement for the co-admissions program is higher than the GPA requirement for transfer students in general at that institution. These programs may be selecting for high-performing students already likely to transfer, leading to the observed lack of effect.

Three of the programs included in this study required students to enroll full-time at their community college to participate. Full-time enrollment at a community college is associated with an increased likelihood of transferring (Crosta, 2014; LaSota & Zumeta, 2016; Park, 2015), which most likely contributed to universities' decision to include it as a program requirement. In spite of this advantage of enrolling full-time, community college students have multiple demands on their time (e.g., work, family obligations), and the majority of them enroll part-time (Mullin,

2017). The full-time enrollment requirement could therefore exclude the majority of possible program participants, decreasing the program's effectiveness in inducing more students to transfer. In addition, community college students may face greater challenges with full-time enrollment that could inhibit their success. Enrolling in more courses increases students' tuition costs, contributes to a lack of balance between students' academic and personal responsibilities, and makes it difficult for students to perform well in multiple courses (Bourdeau et al., 2022). Full-time enrollment requirements could have the unintended consequence of excluding potential participants and preventing students from succeeding at their community college, contributing to the lack of program effect.

Students participating in co-admissions programs may also face financial barriers to completing a degree at their community college and successfully transferring that are unaddressed by the program designs. Financial burdens are one of the most common limitations to community college students graduating and/or transferring (Wang, 2020), and three-quarters of community college students have unmet financial need after receiving federal student aid (Beer, n.d.). While six of the programs included in this study offer coordinated financial aid counseling across the community college and university, only two programs offer any additional opportunities for scholarship support to program participants. If co-admissions program participants are not receiving any additional financial support to reduce their unmet need, it could hamper their likelihood of transferring.

Several institutions involved in the agreements included in this study cited an ability to leverage the improved efficiency of credit transfer provided by the Comprehensive Articulation Agreement (CAA) as an advantage of implementing a co-admissions agreement (Southeastern Community College, 2020; UNC Asheville, 2019; Western Carolina University, 2019). In

theory, the CAA should help students participating in co-admissions programs navigating the transfer process by giving them a clear understanding of which courses to take at the community college and which of their credits will transfer. In reality, articulation agreements do not induce students to transfer because of their design is focused on supporting students after they transfer and students do not understand how the agreements operate (Anderson et al., 2006; Baker, 2016; Gross & Goldhaber, 2009; Grote et al., 2022; LaSota & Zumeta, 2016; Roksa & Keith, 2008; Stern, 2016). In addition, the CAA only applies to students who earn an associate of arts or associate of science degree prior to transferring, and four of the co-admissions programs included in this study either did not require an associate's degree or included other associate's degrees under their eligibility requirements. The CAA's inability to increase the number of transfer students, co-admissions participants' lack of understanding about how the policy operates, and the fact that the CAA does not protect some program participants could be limiting its capacity to support the success of co-admissions agreements.

The final factor potentially impacting the effectiveness of co-admissions agreements is the requirement of seven of the eight programs that students earn an associate's degree prior to transferring. This requirement is likely included because earning an associate's degree has a positive impact on the likelihood that a transfer student will also complete a bachelor's degree (Kopko & Crosta, 2016), and program designers are attempting to enhance participant's success after transfer. Earning an associate of arts or sciences also allows program participants to take advantage of the benefits of the CAA (CAA, 2020). However, many community college to public university transfer students in North Carolina do not earn an associate's degree before transferring; 46% of students transfer without a degree (Worsham, 2022). In addition, five of the co-admissions programs in this study do not include an associate of applied science (AAS)

among the eligible degrees, an increasingly popular degree for transfer students in North Carolina, with about a fifth of transfer students earning the degree (Nichols & Sublett, 2022). By excluding students with certain associate's degrees or without an associate's degree, co-admissions agreements may be unintentionally reducing their potential participant pool and their impact on overall transfer numbers. In contrast, the agreements in this study did have an observed effect on the number of students with an associate's degree transferring along treated pathways, implying that the programs encouraged students who would have transferred anyway to earn an associate's degree first. This effect could have an impact on student success after transferring, discussed further in the section on transfer students with associate's degrees below.

Students Historically Underserved by the Transfer System

Co-admissions agreements in North Carolina are typically not designed with the specific goal of supporting transfer students who are historically underrepresented among bachelor's recipients; however, I wanted to test for the possibility that the supports provided by the programs benefit students from these backgrounds in particular. The results of my main models revealed that co-admissions agreements did not have a distinct effect on the number of transfer students who were underrepresented minorities, Pell recipients, or adult learners. These results were consistent across almost all of my sensitivity analyses (except for adult learners in the analyses with an alternative treatment definition; I will discuss this further below). The lack of effect I observed for underrepresented students may have resulted directly from co-admissions agreements' lack of focus on these students. Community college and university partnerships designed with shared values around equity are more successful in achieving their equity goals (Yeh & Wetzstein, 2022). In addition, both program design and differences between intended and actual implementation could be contributing to the lack of effect seen for these groups.

As discussed in the previous section, transfer students with an AAS degree or without an associate's degree are excluded from participating in most programs in this study. This omission may be felt more acutely by students who are racial or ethnic minorities, low-income, or adult learners. Transfer students who are Black or low-income are less likely to earn a CAA or UAA-qualifying degree (Worsham, 2022), which are among the degrees most commonly required by co-admissions programs. AAS-earners, in particular, are more likely to be Black, older, and come from economically distressed counties (D'Amico et al., 2022; Nichols & Sublett, 2022).

In addition to the limits to qualifying associate's degrees, other co-admissions program requirements may be limiting access for students who are racial or ethnic minorities. Three of the programs included in this study require students to enroll full-time at their community college and seven require a specific community college GPA. In a study of several transfer incentive programs (including co-admissions programs), researchers found that these requirements disproportionately excluded potential transfer students who were American Indian, Black, or Latinx (Mwangi et al., 2023). One of the programs also requires students to complete their associate's degree within 3 years of entering the co-admissions program, a stipulation which the same study found was more likely to prevent students who were American Indian and Black from participating (Mwangi et al., 2023). While these program requirements are likely implemented with the aim of improving participant success with a race-neutral intent, they could still be leading to the exclusion of students from these groups and the null effects for these groups seen in my results.

As detailed in the section above discussing the overall effects on all transfer students, pre-transfer advising is a key factor in transfer student success and an important element in the design of co-admissions programs (Fay et al., 2022; Grote et al., 2022; Lukszo et al., 2022;

Nichols et al., 2020; Parr, 2009; Philips, 2014; Zahner, 2022). Quality advising is particularly important for students historically underserved by the transfer system, and access to advising can serve as an equalizer among transfer students across different backgrounds (Fay et al., 2022; Harper & Thiry, 2022; Jabbar et al., 2022). As such, negative experiences with advising can disproportionately impact underrepresented transfer students, making them likely to withdraw from the advising process and rely on family and friends for guidance or give up on seeking support altogether (Harper & Thiry, 2022; Wang, 2020). As proposed above, advisors for co-admissions programs could face capacity constraints to serve all students in the program or have difficulty giving guidance across multiple community colleges at universities with a large number of partners. The effects of these limitations to advising could more acutely impact underrepresented students. Minoritized students must also contend with the implicit biases of their advisors that can change the advice they receive (Wang, 2020; Worsham et al., 2021). Adult learners must confront the additional limitation of advising that is only offered during traditional business hours, which poses scheduling difficulties to students who work (Wang, 2020).

The null effects observed for underrepresented minority students, Pell recipients, and adult learners were consistent across almost all sensitivity analyses. In the analyses where I used an alternative definition of treatment (GPA requirement, full-time enrollment requirement, and only pathways associated with ECU or UNCW), I observed statistically significant effect on the number of transfer students who were adult learners. This finding could indicate that specific program design elements are more or less successful in supporting adult learners. The most likely explanation, however, is that the effects I observed in my results are being driven by UNCW's program, the program with the largest number of community college partners.

UNCW's program design could be resulting in an increased number of transfer students who are adult learners because it does not have a full-time enrollment requirement. Adult learners are much more likely to enroll in postsecondary education part-time (64% of adult learners enroll part-time vs. 55% of students ages 20-24) (Complete College America, 2022). The lack of a full-time enrollment requirement could provide greater access to the program for adult learners. However, two other programs included in the study did not have a full-time enrollment requirement, so this program design feature is likely not the only reason UNCW saw an increase in adult learner transfers.

A second possibility is that UNCW overall implemented some changes during the time period of my study to make the university more welcoming to adult learners. These changes would be an external factor not controlled for in my model. Adult learner focused innovations could include targeted outreach to recruit and enroll adult learners, updating university communications and resources with language inclusive of adult learners, and offering alternative course schedules and advising hours to accommodate working adults' schedules (Nichols & Barger, 2021). These changes could increase UNCW's enrollment of adult learners overall and encourage more adult learners to transfer through the co-admissions program. There is some evidence that UNCW has targeted adult learners based on their enrollment trends over time. The percentage of undergraduates enrolled at UNCW that were 25 or older increased from 12.5% to 18.8% from Fall 2013 to Fall 2020, representing an increase of 1,176 students. While the number of adult learners enrolled at all the universities included in this study increased by 19.9% during the same time period, UNCW increased its adult learner enrollment by 77.4% (UNC System, 2022b and author's calculations). This overall trend towards focusing on adult learner enrollment could have impacted my results for the UNCW-specific model.

Transfer Students with Associate's Degrees

In contrast to my findings for co-admissions agreements on the number of transfer students overall, the results for transfer students with associate's degrees were consistent across my various sensitivity analyses. This finding implies that co-admissions agreements may not induce more students to transfer, but they do encourage more transfer students to earn an associate's degree. The ability to support more students in earning an associate's degree has implications for co-admissions agreements' long-term success in achieving the goal of increasing bachelor's degree attainment, as transfer students with an associate's degree are more likely to also earn a bachelor's, particularly in North Carolina (Kopko & Crosta, 2016; Umbach et al., 2019). Earning an AA or AS also gives students the protection of CAA, which can enhance their likelihood of earning a bachelor's degree and improve their degree efficiency by reducing excess credits (Worsham et al., 2021; Worsham et al., 2023). While my findings suggest that co-admissions agreements may not meet one of their goals, increasing transfer, they could be supporting transfer student success in other ways, such as associate's and bachelor's degree attainment and degree efficiency.

Policy Diffusion and Competition

As discussed in the introduction, the majority of community colleges and universities that began co-admissions agreements did so between 2017 and the present. I proposed several possible explanations for the recent proliferation of agreements, including policy diffusion across the institutions. Policy diffusion occurs when governmental entities, such as postsecondary institutions, adopt a policy that emulates policies adopted by other, similar governmental entities in their system (Berry & Berry, 2007). Policy diffusion can occur for several reasons (e.g., learning from other governments, coercion from a more powerful government body), there are

likely several drivers of diffusion in the case of North Carolina co-admissions agreements. However, if the diffusion of co-admissions agreements was caused in part by competition between universities, it could help explain my null findings and have significant implications for co-admissions agreements' effectiveness in increasing transfer. As such, I will discuss these implications for my findings and present some preliminary evidence that policy diffusion occurred in part due to competition.

First, policy diffusion is not always beneficial. At times, government entities learn the wrong lessons from each other and adopt policies that do not work in their specific context (Shipan & Volden, 2012). If community colleges and universities were prompted to sign co-admissions agreements to stay competitive with other institutions that already had agreements, they might be likely to model their agreements after existing ones. Personal conversations with administrators of some of the co-admissions programs included in this study revealed that universities were inspired to start their own program by programs at other universities and borrowed design elements from other programs (B. Humphrey, personal communication, November 2, 2022; H. Hill, personal communication, October 28, 2022). The failure of these borrowed program elements to function as well in the specific context of another university (e.g., their culture, program offerings, and students) could have contributed to my null results.

Second, if co-admissions agreements overall are ineffective at encouraging more students to transfer, as suggested by my results, evaluations of individual programs could overestimate their impact on increasing transfer student enrollment by failing to account for the diversion students from other universities. Researchers examining policy diffusion via competition have found that when governmental entities operate in the same geographical area and constituents can make choice of where to obtain a governmental good or service, governments will

strategically adopt the same policy to avoid losing revenue from their own constituents (Baybeck et al., 2011). Transfer students weigh multiple factors in the decision of where to enroll, including prioritizing the institutions that are closest to them (Jabbar & Edwards, 2020). Universities may be adopting co-admissions agreements as an enrollment management strategy to avoid losing tuition revenue from transfer students to other universities (Furbeck, 2011). If this is the case, it calls into question my finding the UNCW's co-admission program in particular increased the overall number of students transferring along its treated pathways. Taken with the findings from my main model which encompasses more of the NC transfer ecosystem, these results suggest that UNCW may only be diverting transfer students from other universities rather than increasing the number NCCCS students who successfully transfer in the state overall.

Next, I will present some descriptive statistics that suggest policy diffusion may have influenced NC postsecondary institutions to adopt co-admissions agreements. Universities and community colleges in North Carolina were more likely enter into co-admissions agreements with other institutions where they had a strong history of transfer. The average number of students transferring along treated pathways in the years prior to treatment was 49 compared to 10 along control pathways. Institutions also chose partners among those closest to them, with an average distance of 84 miles between institutions in treatment pathways and 210 miles between institutions in control pathways. In my document analysis, I also found that institutions frequently cited the shared geography of their student populations and a history of transfer between the institutions as reasons for entering into co-admissions agreements (see Appendix B). Taken together, this evidence supports the notion that institutions sign co-admissions agreements in part to preserve their enrollment pipeline because they are focused on the transfer pathways that are most vital to their enrollment management.

The universities included in this study, which implemented broad access co-admissions programs, were more likely to be smaller institutions in terms of overall and first-time student enrollment. They were also more likely to enroll a greater number of transfer students in general (UNC System, 2022b). These enrollment patterns mean that the institutions with broad access co-admissions programs had more to lose from a potential decline in transfer student enrollments. The two universities with the highest first-time student enrollment (based on Fall 2017 data) offer their co-admissions programs only to low and middle-income students (UNC System, 2022b). Without needing to use the co-admissions agreements to bolster their undergraduate enrollment, these institutions may have decided to target the reach of their programs to achieve other goals, such as providing greater access to their institution for transfer students from diverse SES backgrounds. In a similar vein, the university with the highest enrollment of transfer students (by a significant margin - that institution enrolled 61% more transfer students than the institution with the next highest transfer enrollment) was the last to adopt a broad-based program, possibly because it took longer for competition from other co-admissions programs to affect their transfer enrollments (UNC System, 2022b).

Universities were also likely to enter into a co-admissions agreement with community colleges that were top feeder colleges for their institution and another university. For example, Central Carolina Community College (CCCC) is associated with three treated pathways in this study. For all the universities in those pathways CCCC is in the top 20 of transfer feeder colleges for that university. Pitt Community College is associated with two treated pathways in this study and is the 1st and 2nd most common feeder school for the two universities associated with those pathways. Pitt is also the 6th most common origin for transfer students for one of the universities that signed an agreement after the time period of this study. Asheville-Buncombe Technical

Community College is the top feeder school for two universities in this study and has co-admissions agreements with both of them. In these instances of significant overlap between transfer student populations across universities, universities may be more motivated to sign a co-admissions agreement if another university in the area has already signed one (for a visual representation of the geographic competition for transfer students among universities as it relates to co-admissions agreements, see Appendix H).

The evidence of policy diffusion spurred by competition that I have presented here is only preliminary and not causal proof that policy diffusion was at play when it came to the spread of co-admissions agreements. However, it is suggestive of a competitive transfer enrollment strategy across the public institutions and warrants further research into the motivations behind adopting co-admissions agreements, as this competition could be impacting the effectiveness of co-admissions agreements in producing new transfer students rather than diverting students from other institutions.

Parallel Trends Assumption

As revealed in my tests for the parallel trends assumption, my models testing for the impact of co-admissions agreement on the number of students transferring with an associate's degree may violate this assumption. The leads analysis showed a statistically significant result in one of the years prior to treatment. This significant result coincides with a slightly higher increase in the number of associate's degree holding transfer students among treated pathways in the corresponding academic years (2014-2015 for the Fall 2018 semester of impact group and 2015-2016 for the Fall 2019 group). A violation of the parallel trends assumption could have resulted from an ongoing trend, external to the influence of co-admissions agreements, in the

number of transfer students with associate's degrees in North Carolina. As such, I will discuss the potential source of this trend and the implications for the interpretation of my results.

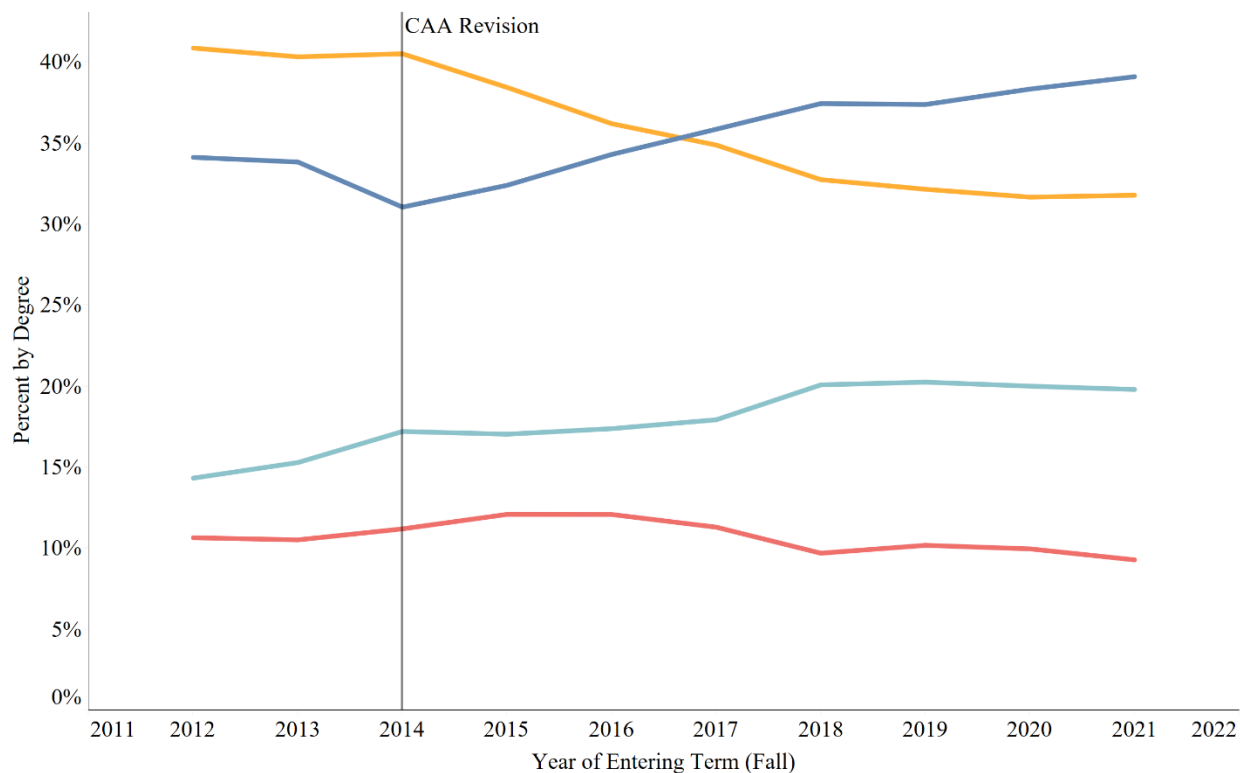
A likely contributor to the increase in transfer students with associate's degrees is the Comprehensive Articulation Agreement, which was revised in 2014 and requires students to earn an AA or AS degree to take advantage of its benefits (CAA, 2020). This policy protection could encourage more transfer students to earn an associate's degree prior transfer without encouraging more students to transfer overall, consistent with my observed results. As demonstrated in Figure 6, beginning around the time of the CAA revision, the percentage of NCCCS to UNC transfer students with an AA or AS degree began to increase while the percentage of students who earned no degree, but had 30 or more credit hours began to decline. From Fall 2012 to Fall 2021, the percentages for transfer students with an AA or AS compared to those with no degree and 30+ credit hours had almost exactly switched their values.

The CAA could have encouraged more students transferring along treated pathways to earn an associate's degree first because treated pathways are more likely to include community colleges that are feeder colleges for that university. While the CAA offers equal protections to all NCCCS to UNC transfer students, it could provide a greater advantage to students who transfer along common pathways. The CAA requires universities to create baccalaureate degree plans (BDPs) that map courses offered at the community colleges to each bachelor's degree program they offer (Worsham, 2022). The degree programs across all 16 UNC institutions result in approximately 1,280 BDPs for which community college advisors must provide guidance to students (Hodara et al., 2017). As a result of this vast amount of information advisors must process, advisors may choose to familiarize themselves more with and provide better guidance on the BDPs from their college's top transfer destinations.

Despite the fact that some of my observed effects may have been caused by the CAA revision, it is possible that co-admissions agreements still had some effect of their own. Students

Figure 6.

Percent of NCCCS to UNC Transfer Students by Degree Earned Prior to Transfer



Community College Degree Type

- AA/AS Degree
- Other Associate Degree
- No Degree: 30+ hours
- No Degree: Under 30 hours

Data Source: UNC System, 2022b

often have difficulty understanding articulation agreements on their own, and the CAA's design relies on students having adequate information about the policy in order to take advantage of it (Taylor, 2019; Worsham et al., 2021). In order to transfer successfully under the protection of an

articulation agreement, students still need knowledgeable advising and mentoring (Smith et al., 2022). The pre-transfer advising provided by co-admissions agreements may help participants be more informed about the transfer process and the requirements (including earning an AA or AS degree) and benefits of the CAA. In addition, several institutions noted in press releases and news articles the opportunity presented by signing a co-admissions agreement shortly after the revision of the CAA (Southeastern Community College, 2020; UNC Asheville, 2019; Western Carolina University, 2019). Co-admissions programs can capitalize on the ease of transferring credit provided by the CAA and the CAA can be made more effective by the targeted advising offered through co-admissions programs. While both the CAA and co-admissions possibly contributed to my observed effects on transfer students with associate's degrees, from the findings of this study, I cannot tease out the relative effects that can be attributed to each transfer innovation.

Robustness Checks

The first robustness check I conducted placed the timing of treatment for each transfer pathway in the previous year to determine if an external factor outside of my model was driving my results. For this test, I did not observe a statistically significant effect of co-admissions agreements on any of my outcomes, suggesting that the effects I found in main models and sensitivity analyses can be attributed to co-admissions agreements.

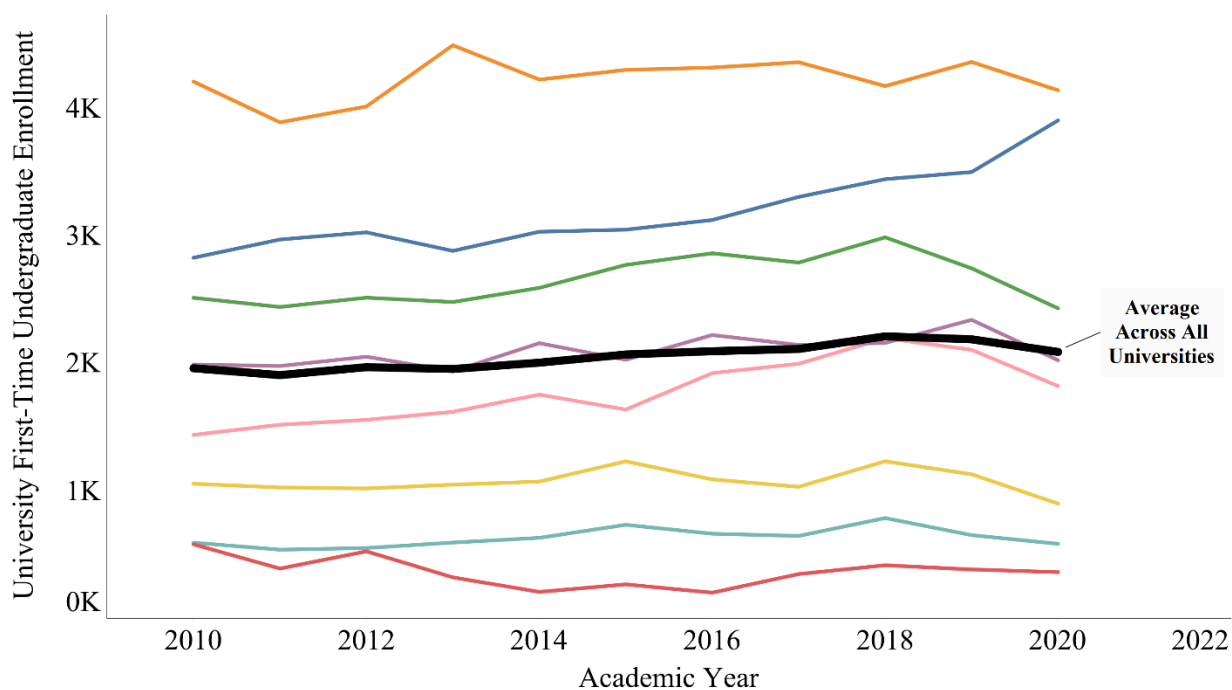
My second robustness check was a test of a non-equivalent outcome: enrollment of first-time in college students at the university associated with each transfer pathway. The statistically significant effect that I saw here, that in post-treatment years treated pathways saw an average decline of 173 first-time students, indicates that a factor external to my model might be driving both the effect I observed on transfer students with associate's degrees and first-time students.

One possible explanation for this shared effect is that universities overrepresented among the treated transfer pathways were more likely to experience a decline in first-time student enrollment (for a visual representation of this pattern, see Figure 15 in Appendix I) due to some external factor, for example, declining numbers of high school graduates in their physical vicinity. In response to this decline, universities might more actively recruit transfer students with associate's degrees because these students more likely to persist and earn bachelor's degree (Kopko & Crosta, 2016), making recruiting them a safe investment for supporting enrollment numbers. Universities might also focus on transfer students from their top feeder colleges, leading to the effect specific to my treated transfer pathways. However, this explanation does not account for the stable enrollment of transfer students overall. An increase in overall transfer enrollment would also be expected if universities are attempting to make up for falling first-time enrollment (Jenkins et al., 2014).

Another possible explanation for the statistically significant effect is that collinearity across my observations for first-time enrollment is producing a falsely statistically significant result. There are only eight distinct universities associated with the 284 transfer pathways included in my final sample, meaning that each observation for enrollment in each year is repeated an average of 35.5 times. In addition, some universities are overrepresented among the treatment and control pathways (see Appendix I). First-time enrollment is also fairly consistent over time, as seen in Figure 7, meaning that my observations are also collinear over time. This substantial collinearity is likely causing the statistically significant result I observed.

Implications for Practitioners and Policymakers

The results of this study can provide valuable insights to both practitioners at universities and community colleges considering entering into a co-admissions agreement and policymakers

Figure 7.*University First-Time Undergraduate Enrollment*

University Name

- Appalachian State University
- East Carolina University
- Elizabeth City State University
- University of North Carolina at Asheville
- University of North Carolina at Greensboro
- University of North Carolina at Pembroke
- University of North Carolina Wilmington
- Western Carolina University

interested in improving outcomes for transfer students in their state. I first discuss the implications and recommendations for practitioners, including institutional leadership, co-admission program administrators, and advisors, and then discuss the implications and my recommendations for policymakers.

Practitioners at community colleges and universities interested in implementing a co-admissions agreement in order to promote transfer students success should first consider their

goals for the agreement. In the document analysis I conducted for this study, institutional leaders mentioned many, often intersecting goals for their agreements, including increasing the number of students that successfully transfer, easing their transition to the university, and improving bachelor's degree attainment rates for transfer students. While this study revealed that co-admissions agreements did not increase the number of students who transferred, that does not mean institutional leaders should disregard co-admissions agreements as a possible intervention or fail to invest resources into their existing programs. Other research suggests that these agreements do meet some of their other goals, such as improving students' motivation, increasing their sense of belonging at the university, easing their transition to the university, and improving their likelihood of earning a bachelor's degree (Boyd, 2018; Nichols et al., 2020). This study also suggests that co-admissions agreements may encourage participants to earn an associate's degree before transferring, which could improve their success post-transfer and allow them to take advantage of the benefits of articulation agreements (Kopko & Crosta, 2016; Worsham, 2022). However, I recommend that community college and university leaders use this study to set their expectations for which goals for transfer student success co-admissions agreements would help them accomplish and still consider exploring other interventions targeted at improving transfer rates.

Institutional leaders interested in pursuing a co-admissions agreement should also reflect on common program design elements, such as full-time enrollment requirements, community college GPA minimums, and requirements to earn a specific associate's degree. Eliminating or altering these program requirements (e.g., removing the full-time enrollment requirement, reducing the minimum GPA, expanding the types of eligible associate's degrees) would expand access to co-admissions programs, particularly for students who are racial or ethnic minorities,

low-income, or adult learners. While altering these requirements could have an impact on participants' success in the program, this effect could be offset by providing additional program supports, particularly advising. In addition, to ameliorate students' concerns about gaining admission to a specific major, institutional leaders could consider implementing program specific co-admissions agreements in high-demand majors, which could have the added benefit of cohort-building among program participants (Grote et al., 2022). Finally, institutional leaders should evaluate which student needs are not being met with current program designs and determine if additional financial support would improve student outcomes.

Access to quality, pre-transfer advising is frequently cited as one of the most or the most important element of success in other studies of co-admissions agreements (Fay et al., 2022; Grote et al., 2022; Lukszo et al., 2022; Nichols et al., 2020; Parr, 2009; Philips, 2014; Zahner, 2022). Ensuring that participants take advantage of this benefit may enhance the impact of co-admissions agreements if program administrators and advisors are relying on students to initiate contact with their advisors, similar to a traditional pre-transfer advising relationship (Bensimon & Dowd, 2009; Fay et al., 2022; Grote et al., 2022; Wang, 2020). Other studies of co-admissions agreements or similar pre-transfer advising programs stress the importance of proactive outreach on the part of the advisor (Fay et al., 2022; Grote et al., 2022). Strategies such as using e-advising tools to provide students with basic information about the transfer process and relying more heavily on virtual advising could reduce the administrative burden on advisors and make them accessible to more students (Fay et al., 2022).

State policymakers may be interested in encouraging institutions to begin co-admissions agreements to achieve their goals for transfer student outcomes. State-level directives to collaborate across institutions can be catalyst for more and stronger transfer partnerships (Yeh &

Wetzstein, 2019). Some states have already taken this approach to co-admissions agreements. The Virginia General Assembly passed a bill in 2006 requiring all four-year public institutions to develop what they call dual admission programs, which guarantee admission to the university for transfer students upon completion of an eligible associate's degree (S. B. 538, 2006). In Florida, each community college is required to establish at least one targeted pathway agreement with a university where transfer students are guaranteed admission to the university, and universities are required to do the same with at least one community college (Statewide Articulation Agreement, 2021).

The results of this study have several important implications for states following suit and implementing policies requiring co-admissions agreements, or higher education governance bodies wishing to encourage institutions to adopt agreements. First, similar to institutional leaders, policymakers should set their goals for co-admissions agreements based on what current research indicates they are most likely to accomplish. If policymakers aim to increase the number of students that transfer within their state, they should explore alternative policies and interventions. If policymakers are interested in supporting co-admissions partnerships, they should focus on their ability to encourage students to earn an associate's degree before transferring. Earning an associate's degree prior to transfer could lead to several benefits for students, the first being that they would be likely to earn a bachelor's degree as well (Kopko & Crosta, 2016). Associate's degree earners can also take advantage of the protections of the CAA and transfer with junior status (CAA, 2020). The associate's degree could also confer benefits to the student and the state outside of academics. Adults with an associate's degree earn, on average, \$1,200 more per year than those with some college credit but no degree (Ma & Pender, 2023). They are also more likely to be employed, less likely to receive support from public

assistance programs, and more likely to be civically engaged (Ma & Pender, 2023), all of which are outcomes desirable to state policymakers. In North Carolina in particular, the additional associate's degree produced by co-admissions agreements could bring the state closer to its statewide goal of 2 million North Carolinians with a high-quality credential or postsecondary degree by 2030 (myFutureNC, 2023).

Second, policymakers should consider how a policy focused on co-admissions agreements would interact with other institutional enrollment policies and goals (Grote et al., 2020). Recruitment of transfer students at universities sometimes comes in conflict with other enrollment goals focused on crafting a freshmen class (Dowd et al., 2008; Grote et al., 2020). Policymakers interested in investing in transfer students may want to ensure that universities have adequate resources for transfer student admissions processing, financial aid processing, and marketing and recruitment to support the operations of co-admissions agreements (Jenkins et al., 2014). Accountability measures for enrolling and graduating transfer students may also be helpful in encouraging institutions to reach state-level goals for transfer and ensuring the success of co-admissions agreements (Jenkins et al., 2014).

Encouraging co-admissions agreements at the state level may also require an additional investment of resources in both community colleges and universities. Strong transfer partnerships are built on a deep level of coordination across the community college and university (Boche, 2022; Shugart & Harrison, 2011). This type of coordination in support of co-admissions agreements might involve investment in data sharing, staff positions earmarked for the programs, and technical resources to support communication across departments such as advising, financial aid, registrars, and admissions. Finally, policymakers should consider revisiting their existing state articulation policies in ways that reduce the burden on advisors as

they guide students through the agreements. Decreasing the time advisors spend helping students navigate articulation agreements could bolster the success of co-admissions programs by giving advisors more time to support students in other ways, such as orienting to them the university, helping them engage with the campus community, and supporting the development of their long-term education and career goals. In North Carolina, for example, revising the baccalaureate degree plans so they are uniform across majors and universities would drastically reduce the amount of information advisors must keep up with (Hodara et al., 2017; Loss, 2021). Developing more Uniform Articulation Agreements or adding AAS degrees to those protected under the CAA would also extend advisors' ability to support students by offering more defined pathways to a larger portion of transfer students (Atwell & D'Amico, 2021). With all these recommendations, it is important to consider the external validity of my results and the extent to which they apply to other institutional and state contexts outside of North Carolina.

Implications for Future Research

This study contributes significantly to the knowledge about the impact of co-admissions agreements by examining agreements across multiple institutions and using robust causal methods. However, much work remains to be done to better understand co-admissions agreements' long-term outcomes, how the programs operate, and their impact on students' transfer experience. One limitation of this study is that I only had access to data on transfer student enrollment 2-3 years after the implementation of each co-admissions agreement. The results of this study only reflect the early impacts of co-admissions agreements on the number of students transferring between partner institutions; it is possible that over time, programs could become more successful in encouraging more students to transfer. In addition, the amount of post-implementation data did not allow for any analysis of the long-term goals of co-admissions

programs, including increasing the number of credits students are able to transfer, improving their experience of transitioning to the university, and increasing the likelihood that participants complete a bachelor's degree. I suggest that future researchers utilize more years of post-treatment data to examine some of these remaining questions.

Previous research on individual co-admissions agreements between one community college and one university has shown that they have the potential to increase the number of students who transfer between the two institutions (Nichols et al., 2020; University of Connecticut, 2021). In contrast, this study revealed that across multiple co-admissions agreements, more students were not induced to transfer between partnering institutions. This distinction between the results of research examining one partnership vs. those examining multiple partnerships should be considered in future studies of co-admissions agreements. Future researchers should also address the possibility that students are being diverted from transferring to other institutions, rather than the program inducing new students to transfer, as a part of their research design. This null finding in a multi-institution study could also have implications for research on other innovations targeted at supporting transfer students. Interventions implemented at one university or community college could have significant impacts for that institution, but an individual evaluation does not consider the influence of the entire transfer ecosystem within a state. Future researchers examining any policy or program intended to increase the number of students transferring should take consider the potential difference in between their findings when examining one institution or partnership and multiple partnerships.

The null results I found in my study also highlight the importance of continuing research on interventions specifically targeted at inducing more students to transfer. As I stated in my literature review, much of the research on transfer interventions focuses on outcomes after the

student transfers, such as bachelor's degree completion and time to degree. However, the disparity between the number of community college students that express a desire to transfer and those who do successfully transfer calls for more research on interventions that support students through process of transitioning to a university.

Finally, my results present an opportunity to better understand the experiences of students participating in co-admissions programs through qualitative research. Tailored pre-transfer advising is a key program element in students' success, but it also has the potential to hinder students on their transfer journey. Surveys, interviews, or focus groups with program participants examining their advising experience could reveal why some students are still struggling to transfer, even with additional support, and uncover what students found the most helpful about their advising experience. The same qualitative instruments could also be used to determine if participants or potential participants confront any challenges with the design of co-admission programs, such as being excluded from participation or struggling to maintain eligibility due to enrollment requirements or GPA cut-offs. The lack of knowledge on how often students avail themselves of the access to university resources and events and the impact this benefit has on their success also presents the opportunity to delve further into students' experiences in co-admissions programs. Finally, understanding the needs of potential transfer students that are not being fully met by co-admissions programs, particularly financial needs, could help inform strategies to improve program success.

Conclusion

Many postsecondary students enroll at a community college with the ultimate goal of transferring to a 4-year institution, but due to difficulties navigating the transfer system on their own, they are unable to succeed in this endeavor. Co-admissions agreements are an increasingly

popular solution adopted in partnership between community colleges and universities to support transfer students before and after their transition to the university and promote their success in earning a bachelor's degree. Co-admissions agreements are collaborations between a community college and a university that guarantee admission to the university for transfer students who meet certain requirements, such as earning an associate's degree while maintaining a certain GPA. Co-admissions programs also typically offer transferring students additional support such as tailored advising and access to campus resources and facilities. Despite their popularity, very little research has explored the impact of co-admissions agreements on transfer student outcomes, particularly their influence on students likelihood of successfully transferring.

In this study, I sought to examine the impact of co-admissions agreements between North Carolina community colleges and public universities on the number of students that transfer between the institutional partners. Using a difference-in-differences model with two-way fixed effects, I estimated the effect of co-admissions agreements on the overall number of transfer students, the number of transfer students that were racial or ethnic minorities, Pell recipients, or adult learners, and the number of transfer students that earned an associate's degree prior to transferring. The results of my analysis suggest that co-admissions agreements do not have an effect on the overall number of transfer students or the number of transfer students that are underrepresented minorities, Pell recipients, or adult learners. However, my results do indicate that co-admissions agreements increase the number of students that earn an associate's degree prior to transferring. I proposed that the lack of overall impact on transfer student volume that I observed resulted from the design of co-admissions agreements and differences between their intended and actual implementation. I provided several recommendations for community colleges and universities interested in implementing a co-admissions agreement that could

increase their likelihood of impacting transfer student success. I also provided recommendations for policymakers wishing to encourage institutions in their state to pursue a co-admissions partnership.

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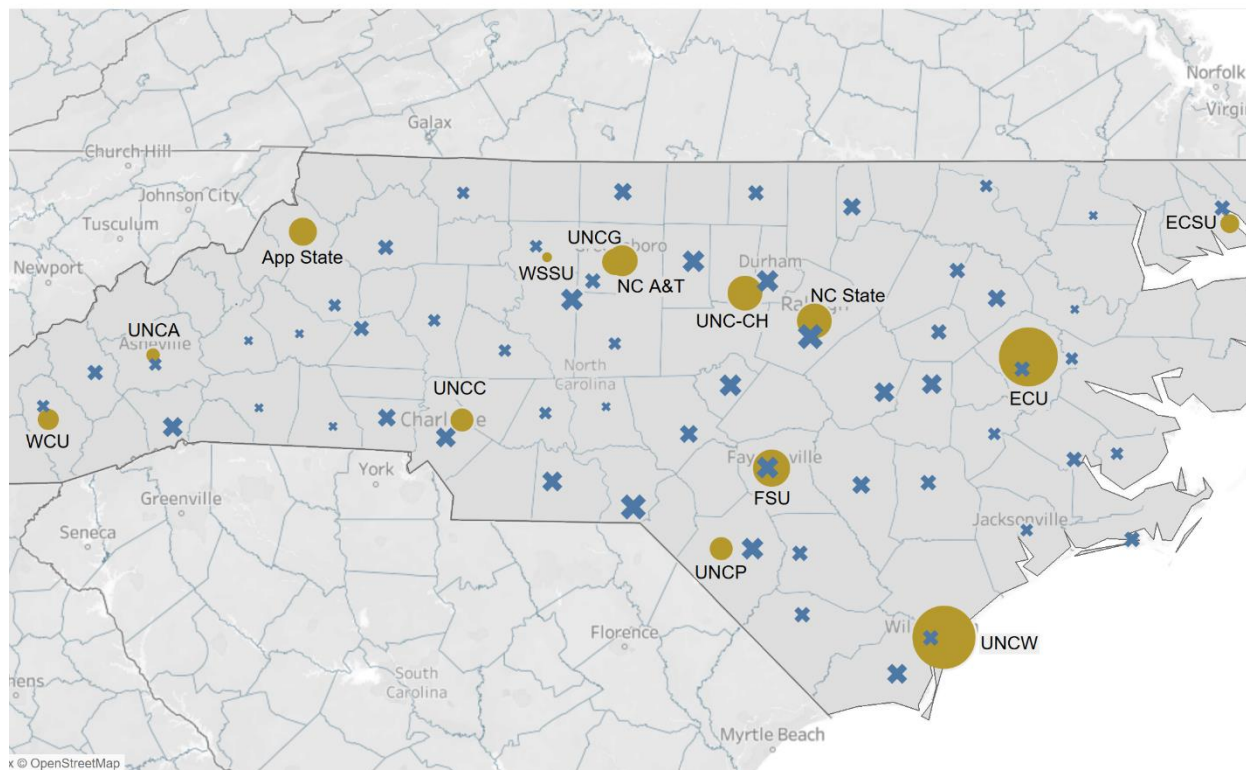
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APPENDICES

Appendix A

Figure 8.

Locations of Institutions with Co-Admission Agreements and Number of Agreements

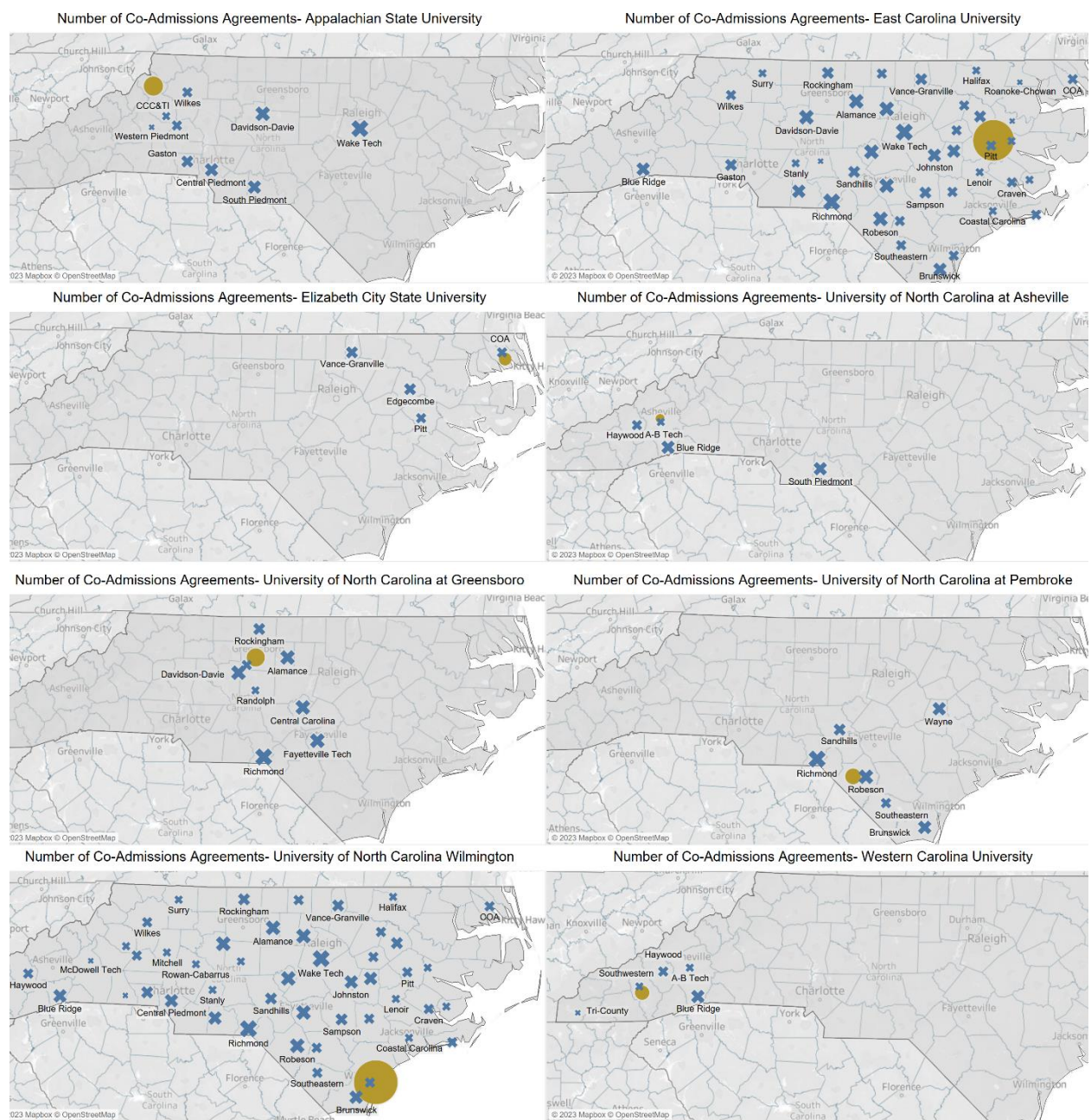


Type of Institution
 ✕ Community College
 ● University

Notes: Marks for community colleges and universities appear larger based on the number of co-admissions agreement partners associated with that institution (more partners, larger mark). The scale for the number of partnerships ranges from 0 to 47.

Figure 9.

Locations of Institutions with Co-Admission Agreements in Study and Number of Agreements

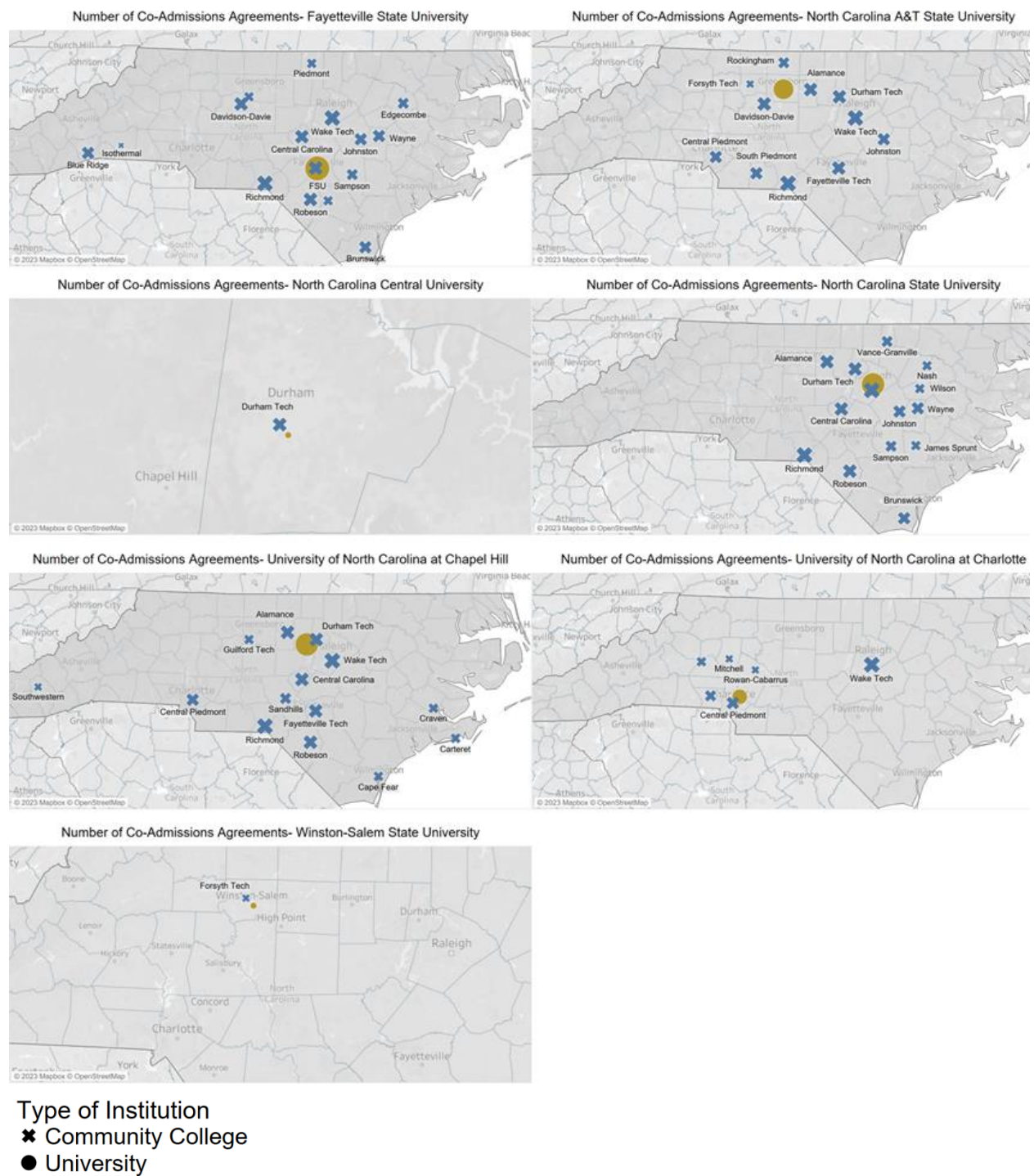


Type of Institution
 ✕ Community College
 ● University

Notes: Marks for community colleges and universities appear larger based on the number of co-admissions agreement partners associated with that institution (more partners, larger mark). The scale for the number of partnerships ranges from 0 to 47.

Figure 10.

Locations of Institutions with Co-Admission Agreements Not in Study and Number of Agreements



Notes: Marks for community colleges and universities appear larger based on the number of co-admissions agreement partners associated with that institution (more partners, larger mark). The scale for the number of partnerships ranges from 0 to 47.

Appendix B

Document Analysis of Co-Admissions Agreements

I conducted a document analysis of co-admissions program documents for programs included in my study. I completed this document analysis before beginning my study for four reasons: 1) to inform the design of my theory of change, 2) to identify the goals of co-admissions agreements and inform the formulation of my research questions, 3) to determine the factors that influence community colleges and universities to enter into a co-admission agreement to determine which variables to include in my model predicting likelihood of treatment, and 4) to determine if I was satisfying the assumptions of a difference-in-differences model.

For the document analysis, I collected 66 documents related to the eight co-admissions programs in my study. These documents included press releases from the community colleges, universities, and UNC system on institutional websites and news articles in local papers announcing the signing of a new co-admissions agreement and describing the program and its goals. I also included MOUs signed by the presidents of the community colleges and universities, resources on co-admissions program webpages, and institutional board of trustee minutes that described co-admission program design and goals. Each of the eight co-admissions programs included in the study had at least two documents represented in the sample. Table 25 includes the sources of these documents, broken down by document type and university co-admissions program and the number of documents in each category. Most of the documents were produced by the institutions, either as press releases or MOUs, and most of the documents came from the two universities with the most community college partners, University of North Carolina at Wilmington, and East Carolina University.

Table 25.*Co-Admissions Agreement Documents included in Analysis*

Document Type	Number of Documents
Institutional Press Release	36
MOU	15
Local News Article	10
Co-admissions Program Webpage	3
BOT Minutes	2

University Source	Number of Documents
University of North Carolina at Wilmington	20
East Carolina University	12
Appalachian State University	10
University of North Carolina at Greensboro	9
Elizabeth City State University	5
University of North Carolina at Pembroke	5
Western Carolina University	3
University of North Carolina at Asheville	2

To complete the analysis, I coded the documents for instances of the rationales or motivations behind signing a co-admissions agreement and the goals of the agreements using inductive coding. The codes used and the frequency of each code are included in Table 26. Some codes are also organized into sub-codes within a larger theme. The most common reason institutions cited for entering a co-admissions agreement was to strengthen the collaboration between the community college and university. Most institutions mentioned a desired to promote collaboration in general, but some institutions added that a strong history of students transferring between the institutions and a shared geography were reasons they entered into agreements with

specific institutions. I included the number of students transferring the base year of the study, the institutions' locale, and the distance between institutions in the logistic model predicting likelihood of receiving treatment based on these themes found in the rationales. Universities also cited an improvement in access and affordability among their motivations for entering co-admissions agreements. They claimed that co-admission agreements would increase access to their institutions, especially for transfer students, and to improve affordability through completing the first two years of a bachelor's degree at a community college. The motivation to improve access for transfer students informed the main outcome of my study, the number of students transferring between institutions. Finally, although one source claimed that low bachelor's completion rates among transfer students at the university was a reason for entering a co-admissions agreement, none of the documents mentioned a decrease in transfer student enrollment as a factor in signing a co-admissions agreement. Therefore, I can be assured of satisfying the assumption that my outcome, changes in transfer student volume, is not impacting the likelihood of receiving treatment.

The most cited goals for forming a co-admissions agreement are all related to student success. The most common goal, easing the transition between the community college and university when transferring, is incorporated into the theory of change, along with providing students with a clearer bachelor's degree path and increased motivation to transfer and creating a sense of belonging at the university. The goal of increasing the number of students that transfer was the focus of this study. Although many documents included increasing bachelor's degree attainment as a goal, the timeframe of this study was not long enough to measure degree completion as an outcome.

A final notable finding from the document analysis is that of the 46 press releases and news articles, 36 prominently featured information about a signing ceremony or joint press conference where leadership from the community college and university, typically the presidents, signed the actual co-admissions agreements. These news articles and press releases also often included comments in support of the agreement from the leaders of one or both of the institutions. The visibility of institutional leadership's support for the co-admissions agreements is both a strong endorsement of the program and a way to emphasize supporting transfer students as an institutional goal. In addition, publicizing the signing of co-admissions agreements with leadership support may have led to other community colleges and universities pursuing agreements with each other.

Table 26.

Rationales and Goals of Co-Admissions Agreements

Rationales for Entering Agreements	Frequency of Code
Collaboration	45
General	23
Strong Transfer History	12
Shared Geography	7
Shared Mission	2
Shared Student Base	1
Access & Affordability	25
Low Transfer Student Bachelor's Completion	1
Goals of Agreements	
Community Impact	8
Workforce Development	6
Learning	2
Student Success	86
Ease Transition	26
Degree Attainment/Transfer Student Grad Rates	20
Clear Pathway/Promise of Transfer	16
Increase Transfer	9

Table 26 (continued).

Shorter Time to Bachelor's Degree	6
Student Success at Both Institutions	4
Sense of Belonging	4
Social Integration	1

Appendix C

Table 27.

Matrix of Co-Admissions Agreements Across All North Carolina Community Colleges and UNC System Universities

	Total Number of Agreements	University of North Carolina at Wilmington	East Carolina University	Fayetteville State University	North Carolina State University	University of North Carolina at Chapel Hill	North Carolina A&T University	Appalachian State University	University of North Carolina at Greensboro	University of North Carolina at Charlotte	University of North Carolina at Pembroke	Western Carolina University	Elizabeth City State University	University of North Carolina at Asheville	North Carolina Central University	Winston Salem State University
Total Number of Agreements		47	41	16	14	14	11	9	8	6	6	5	4	4	1	1
Richmond Community College	8	X	X	X	X	X	X		X		X					
Wake Technical Community College	8	X	X	X	X	X	X	X		X						
Davidson-Davie Community College	7	X	X	X			X	X	X						X	
Alamance Community College	6	X	X		X	X	X		X							
Central Carolina Community College	6	X	X	X	X	X			X							
Robeson Community College	6	X	X	X	X	X					X					
Blue Ridge Community College	5	X	X	X								X		X		
Brunswick Community College	5	X	X	X	X						X					
Central Piedmont Community College	5	X				X	X	X		X						
Durham Technical Community College	5	X	X		X	X	X									
Fayetteville Technical Community College	5	X	X	X		X	X									
Johnston Community College	5	X	X	X	X		X									
South Piedmont Community College	5	X	X				X	X						X		

Table 27 (continued).

	Total Number of Agreements	University of North Carolina at Wilmington	East Carolina University	Fayetteville State University	North Carolina State University	University of North Carolina at Chapel Hill	North Carolina A&T University	Appalachian State University	University of North Carolina at Greensboro	University of North Carolina at Charlotte	University of North Carolina at Pembroke	Western Carolina University	Elizabeth City State University	University of North Carolina at Asheville	North Carolina Central University	Winston Salem State University
Total Number of Agreements	47	41	16	14	14	11	9	8	6	6	5	4	4	1	1	
Nash Community College	3	X	X		X											
Piedmont Community College	3	X	X	X												
Pitt Community College	3	X	X										X			
Southeastern Community College	3	X	X							X						
Wilkes Community College	3	X	X					X								
Wilson Community College	3	X	X		X											
Asheville - Buncombe Technical Community	2											X		X		
Beaufort County Community College	2	X	X													
Caldwell Community College and Technical Institute	2	X						X								
Coastal Carolina Community College	2	X	X													
Halifax Community College	2	X	X													
Lenoir Community College	2	X	X													
Mitchell Community College	2	X								X						
Pamlico Community College	2	X	X													
Randolph Community College	2	X							X							
Rowan-Cabarrus Community College	2	X								X						
Southwestern Community College	2					X						X				

Appendix D

Figure 11.

Propensity Score Overlap before Dropping Transfer Pathways

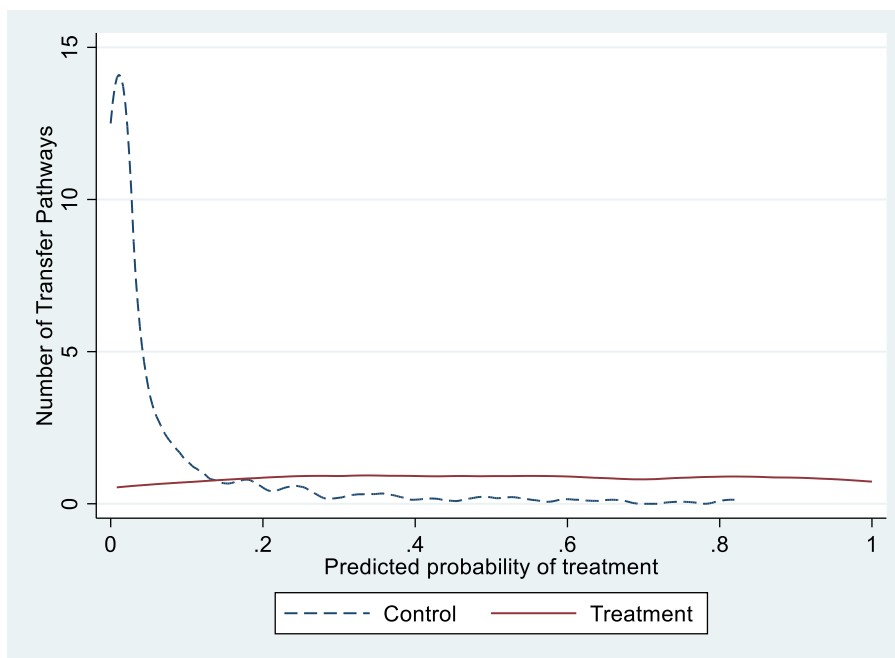
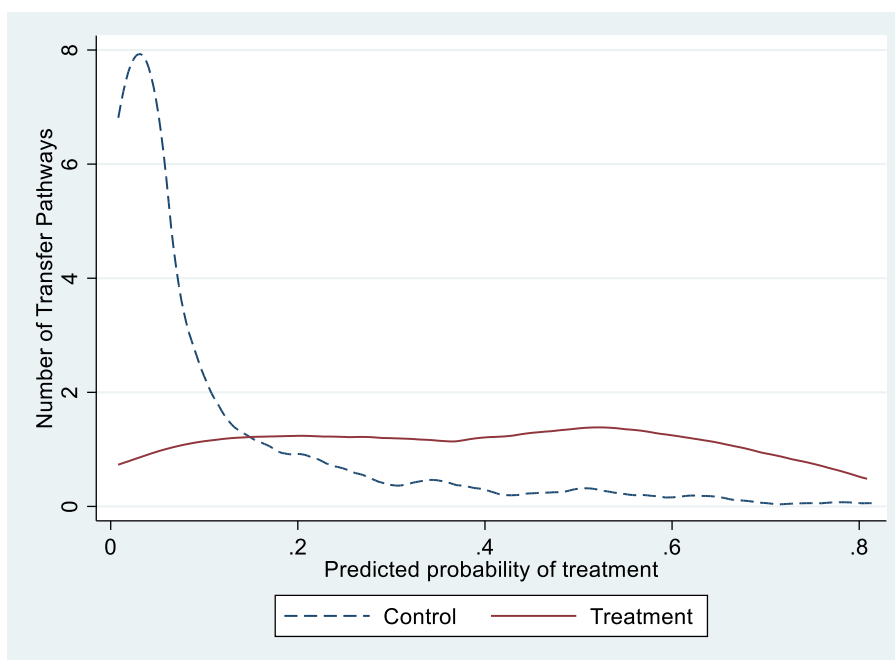


Figure 12.

Propensity Score Overlap after Dropping Transfer Pathways

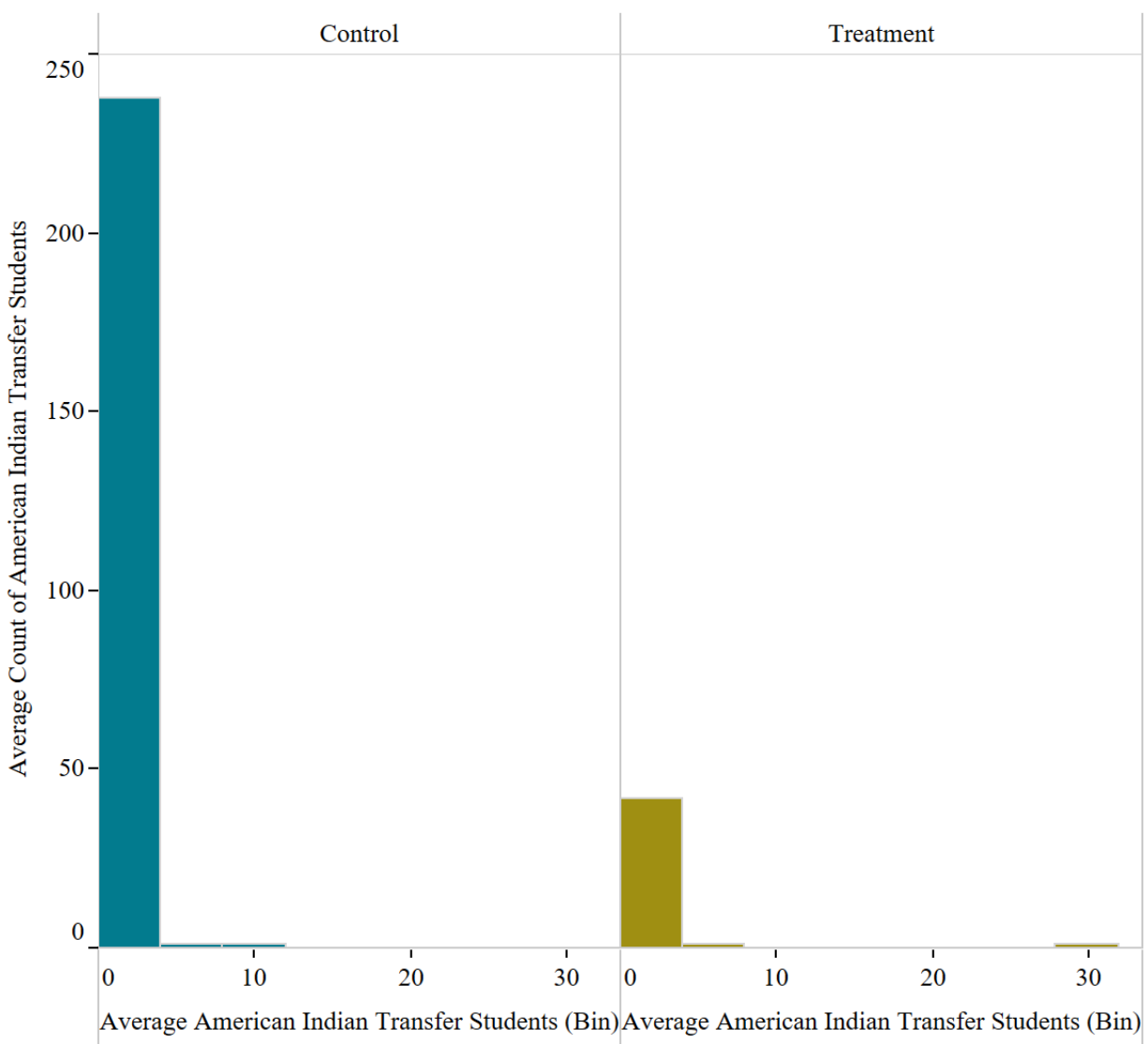


Appendix E

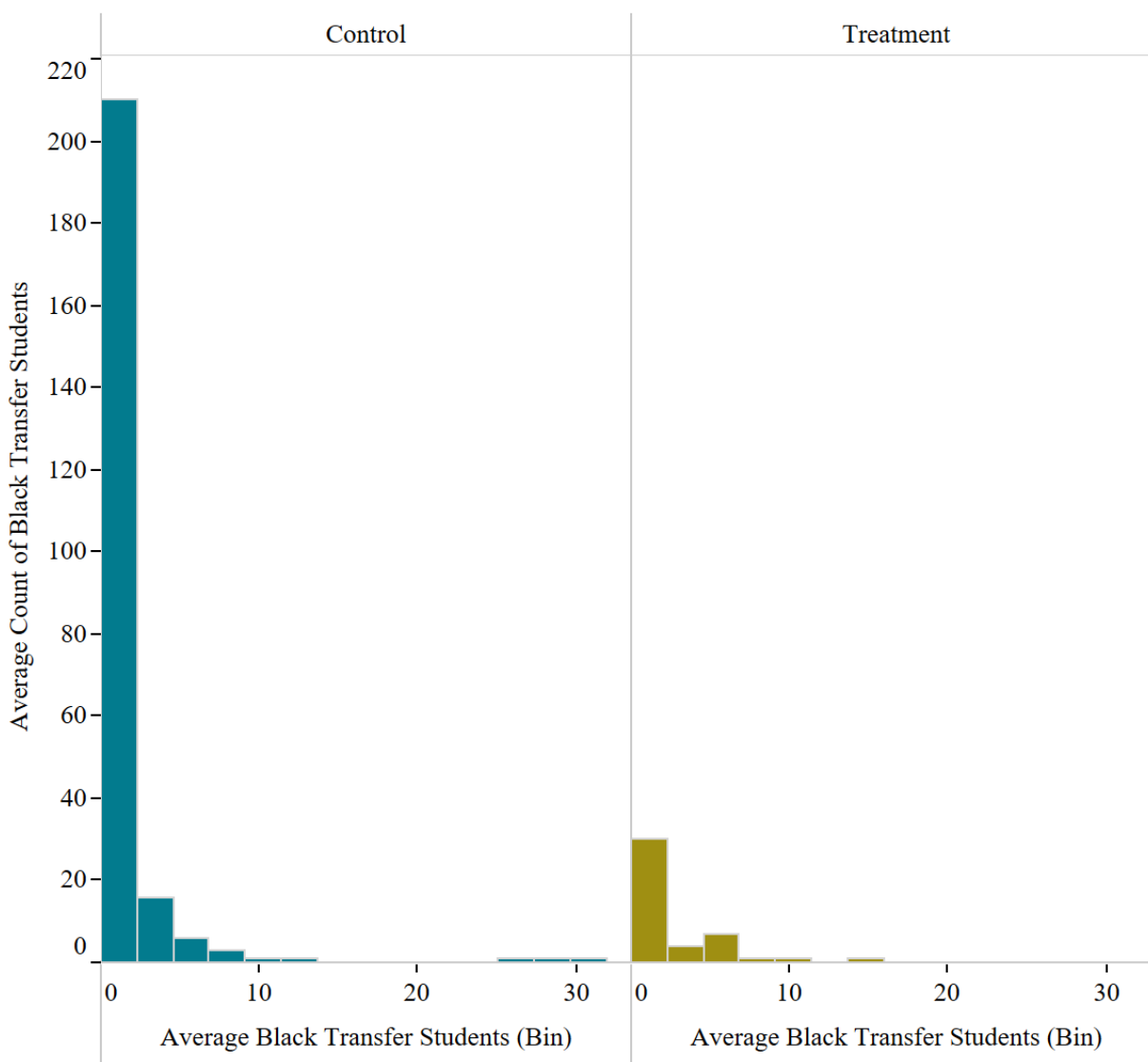
Figure 13.

Histograms of American Indian, Black, and Hispanic/Latinx Transfer Students

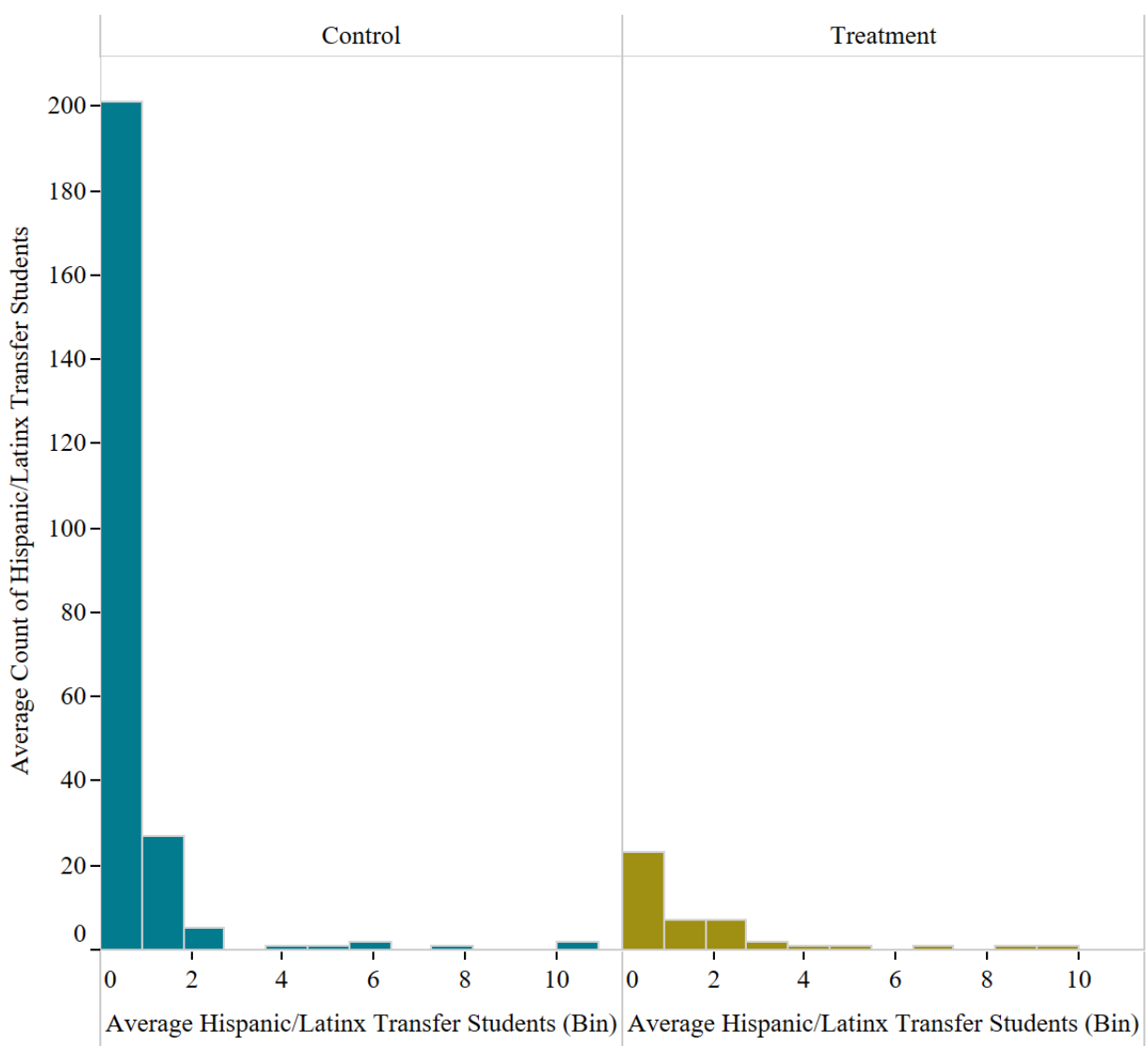
Average Count of Transfer Students that are American Indian



Average Count of Transfer Students that are Black



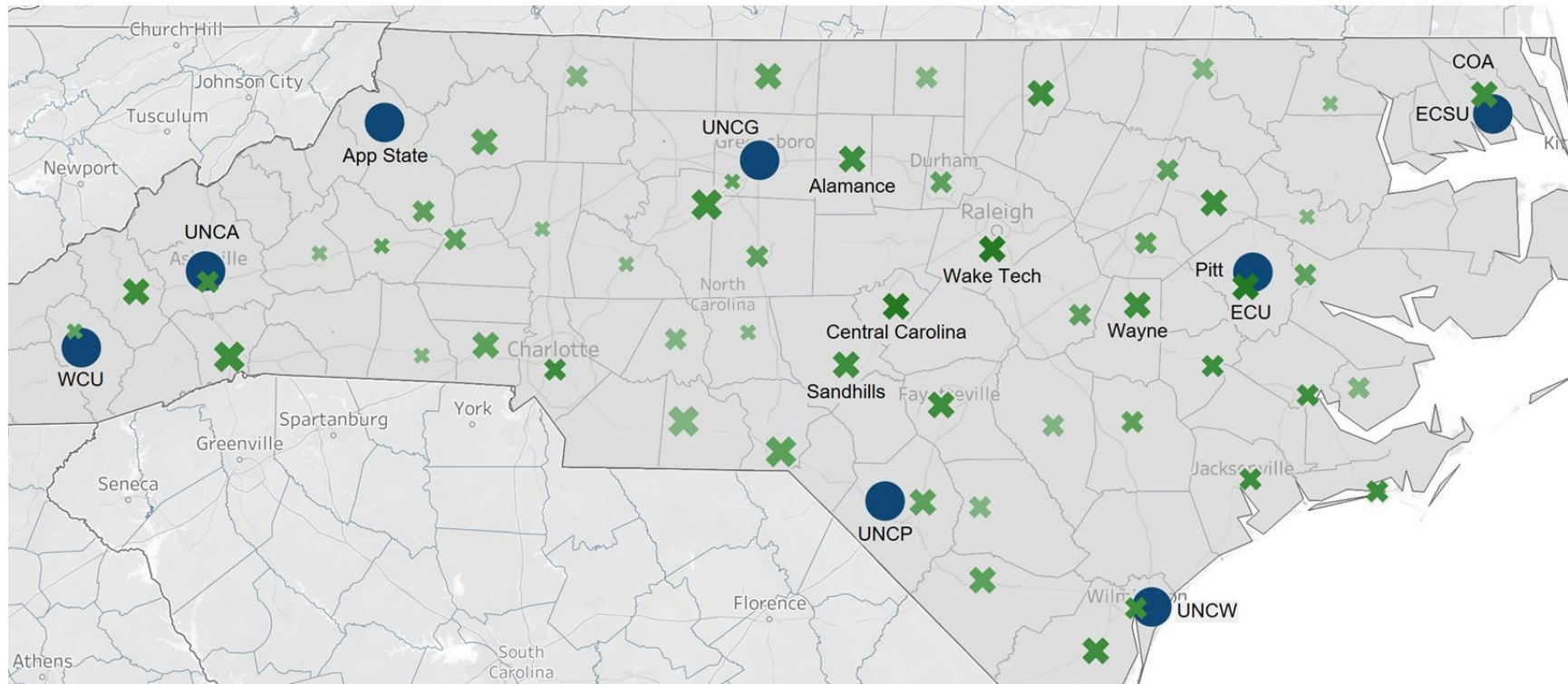
Average Count of Transfer Students that are Hispanic/Latinx



Appendix F

Figure 14.

Number Co-admissions Agreements and Top Feeder Colleges for Treated Pathways



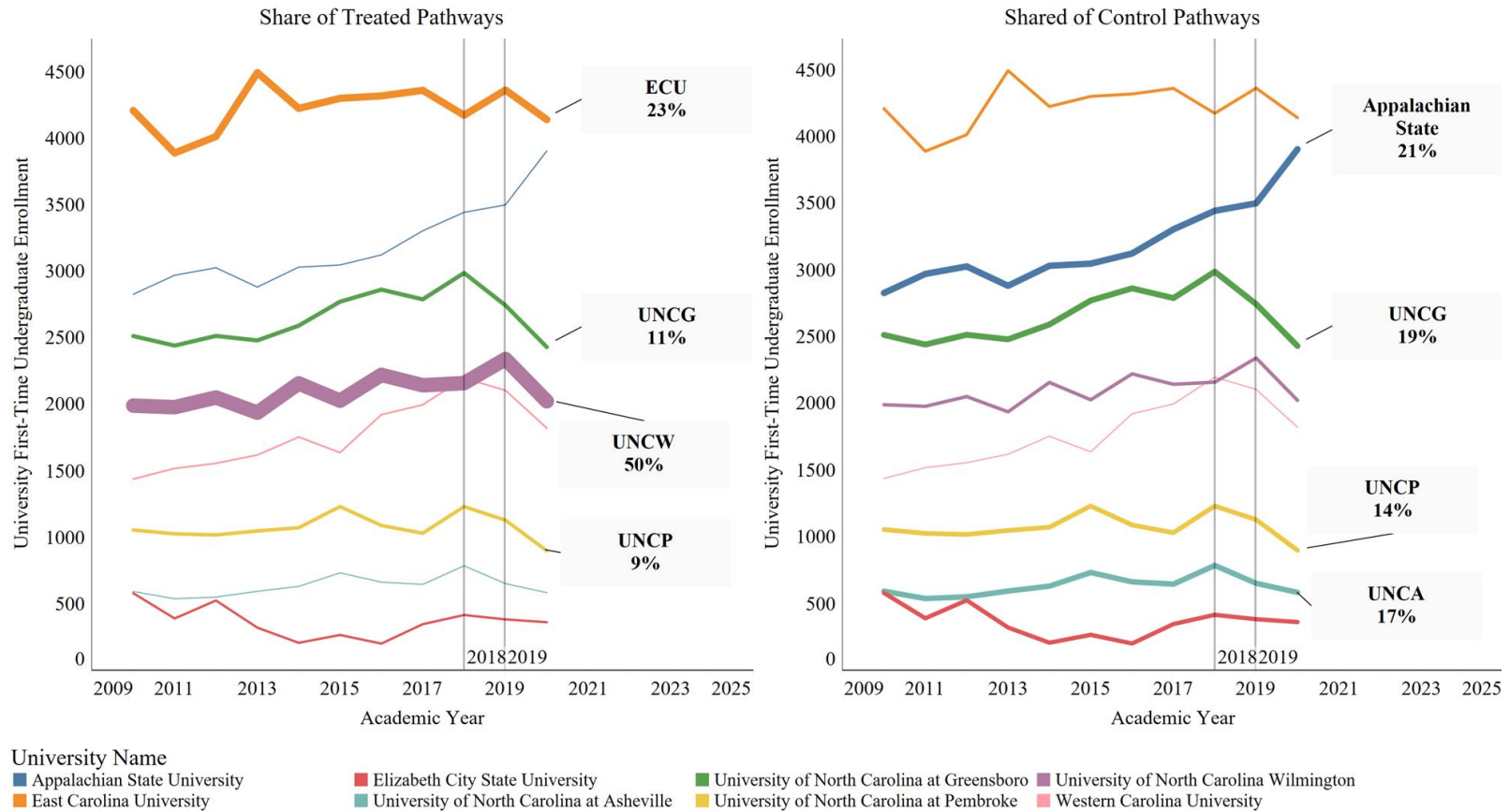
Type of Institution
x Community College
● University

Notes: Marks for community colleges appear larger based on the number of treated pathways associated with that college (more pathways, larger mark). Marks are darker based on the number of universities for which the college is a top feeder college (defined as in the top 20 for feeder colleges; more universities, darker mark).

Appendix G

Figure 15.

Trends in First-Time Undergraduate Enrollment at Universities and Share of Treatment/Control Pathways



Notes: Bolder lines indicate a larger share as a percentage of treated and control transfer pathways. Universities among the top four for share of treated/control pathways are annotated with the institution name and percentage of pathways.