

**NC STATE**  
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# The Role of North Carolina's Comprehensive Articulation Agreement in Transfer Efficiency



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College of Education  
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### **About this Report**

Inspired by the 2019 Dallas Herring Lecture delivered by Dr. Sanford C. “Sandy” Sugart on Tuesday, December 3, 2019, this report is a part of a series that will address critical issues of transfer in North Carolina. The Belk Center’s research team, graduate faculty, and doctoral students jointly explore and propose solutions to problems of practice relating to transfer pathways.

### **About the Belk Center for Community College Leadership and Research**

With a \$10.86 million grant from the John M. Belk Endowment, the NC State College of Education established the Belk Center for Community College Leadership and Research to enhance and strengthen its support of community colleges in North Carolina. The Belk Center seeks to develop and sustain exceptional community college leaders who are committed to advancing college access, the social and economic mobility of their colleges’ students, and the economic competitiveness of their regions. The Center conducts and disseminates research to address current and emerging student success challenges facing community college leaders and policymakers in North Carolina and beyond.

### **About The John M. Belk Endowment**

Based in Charlotte, North Carolina, the John M. Belk Endowment is a private family foundation committed to transforming postsecondary educational opportunities to meet North Carolina’s evolving workforce needs. Its mission is aligned with the vision of its founder, the late John M. Belk who served four terms as mayor of Charlotte and was CEO of the department store company Belk, Inc. He created the John M. Belk Endowment in 1995 to fund a national merit scholarship program for his beloved alma mater, Davidson College. Now led by Mr. Belk’s daughter, MC Belk Pilon, the John M. Belk Endowment staff and board continue to partner with innovative, results-oriented programs in North Carolina to further Mr. Belk’s values, legacy, and focus on the value of education as a means to personal fulfillment and community vitality.

For more information, please visit <http://jmbendowment.org>.

### **Acknowledgements**

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### **Abstract**

In 2014, the North Carolina Board of Governors approved revisions to the state's Comprehensive Articulation Agreement (CAA). The research summarized in this report explores the impact of these revisions on three key outcomes among community college transfer students: bachelor's degree completion, time to degree, and accumulation of excess credits at graduation. Our results suggest an overall positive impact of the CAA on both bachelor's degree completion and the reduction of excess credits. These results serve as a reminder that it is possible to advance transfer student success through reforms to policy and practice. At the same time, while the CAA is an important component of statewide transfer policy conversations, it should not be seen as the sole solution to the many barriers to bachelor's degree completion that transfer students face.

# Table of Contents

Executive Summary .....	5
Background.....	7
Section 1   Assessing the Impact of the Revised CAA .....	8
Section 2   The Impact of the Revised CAA.....	10
Section 3   Thinking Ahead.....	14
References .....	17
Appendix A .....	18
Appendix B .....	21

## Executive Summary

*Transfer is vital to North Carolina's economy as it improves individual economic mobility for students and supports the preparation of a trained workforce to fill positions in North Carolina's quickly expanding knowledge-focused job market. In recent years the combined call to increase the number of North Carolinians with high quality credentials (myFutureNC, 2019) and an emphasis on promoting equity through transfer (Shugart, 2019) underscore the importance for understanding the efficiency of transfer policies and practices across the state of North Carolina. This report is the first in a series of reports exploring the state of transfer.*

In 2014, the North Carolina Board of Governors approved revisions to the already-established Comprehensive Articulation Agreement (CAA), which is designed to ease transfer from community colleges to four-year institutions. The North Carolina Community College System (NCCCS) and University of North Carolina System (UNC System) are required by North Carolina General Statute to conduct biannual joint reviews of the CAA to ensure the agreement is "fair, current, and relevant for all students and institutions" (Annual Report, 2019). The research summarized in this report explores the impact of the 2014 revised Comprehensive Articulation Agreement (CAA) on three key outcomes among transfer students: bachelor's degree completion, time to degree, and accumulation of excess credits at graduation. These outcomes have important implications for both individual students and the state as a whole. When transfer pathways are well articulated, students save money, as completing two years at a community college is much cheaper than completing the same amount of time at a four-year college (Belfield, Fink, & Jenkins, 2017). Slowed or lack of degree production is not in alignment with students' needs or the needs of the labor market in North Carolina.

To investigate the impact of the CAA revisions on students' outcomes, we explored data from students who transferred from NCCCS institutions to UNC institutions. We focused specifically on changes over time in the outcomes of students who earned AA or AS degrees prior to transferring, as the CAA revisions included certain protections for this specific student group. That is, these students were guaranteed 60 credit hours at the four-year institution upon transfer under the policy revisions. Our results suggest that the revised CAA was successful in both increasing the likelihood of bachelor's degree completion and reducing the number of excess credits among students who completed CAA qualifying degree programs.

- We found that the CAA increased the likelihood of bachelor's degree completion between 5-13% among transfer students after the CAA revisions.
- Regarding excess credits, our results indicated that after the CAA revisions, students transferring with an AA or AS degree experienced a 11-27% decrease in excess credit accumulation.
- The CAA revisions were not associated with a reduction in time to degree among qualifying transfer students. Instead, our results suggested that AA/AS-earning transfer students took between half a semester to a whole semester longer to graduate after the CAA revisions were implemented. One potential explanation for this finding is the changing demographics of students who were incentivized to transfer after the 2014 CAA revisions.

Overall, our results suggest a positive impact of the CAA on the likelihood of success among North Carolina community college transfer students. The positive effects of the CAA, summarized in this report, serve as a reminder that it is possible to advance student success through reforms to policy and practice. At the same time, while the CAA is an important component of statewide transfer policy conversations, it should not be seen as the sole solution to the many barriers to bachelor's degree completion that transfer students face.



Students' outcomes, especially bachelor's degree completion, time to degree, and excess credit earning, have important implications for students and the state as a whole.



Implementation of the CAA revisions led to a 5-13% increase in the likelihood of bachelor's degree completion.

## Statewide Goal

**2 million**  
North Carolinians



with a high-quality  
postsecondary degree  
or credential by

**2030**

# The Role of North Carolina's Comprehensive Articulation Agreement in Transfer Efficiency

*In 2014, the North Carolina Board of Governors approved revisions to the previously-established Comprehensive Articulation Agreement (CAA), which is designed to ease transfer from community colleges to four-year institutions.*

This policy represents one step in supporting the transfer pathway for students. The North Carolina Community College System (NCCCS) and University of North Carolina System (UNC System) are required by North Carolina General Statute to conduct biannual joint reviews of the CAA to ensure the agreement is "fair, current, and relevant for all students and institutions" (Annual Report, 2019). This report builds on these joint reviews and examines the effect of the revised CAA on three key student outcomes:



**The CAA revisions represent one step in supporting the transfer pathway for students.**

- (1) bachelor's degree completion** among community college students who transfer to public four-year institutions in the state
- (2) time to degree** among transfer students who subsequently completed a bachelor's degree
- (3) excess credit earning** among transfer students who subsequently completed a bachelor's degree.

Our results suggest that the revised CAA was successful in both increasing the likelihood of bachelor's degree completion among transfer students and reducing the number of excess credits for graduates enrolled in CAA qualifying degree programs (Associate in Arts [AA] and Associate in Science [AS]). The policy was not associated with a reduction in time to degree among these students, which may be due to the policy increasing college access for part-time students who inherently take longer to graduate.

# Background

## **Transfer in the state of North Carolina has increased by almost 250 percent in the past 20 years**

(D'Amico & Chapman, 2019). Although this pathway to a four-year degree is a popular choice among North Carolina students, researchers and practitioners alike wonder the extent to which students save money by starting at a community college (Belfield, Fink, & Jenkins, 2017). For example, community college students who successfully transfer and complete a four-year degree may face increases in credit accumulation and time to degree compared to their peers who started their studies at a four-year institution, which can lead to increased educational expenses (Cullinane, 2014; Xu, Jaggars, Fletcher, & Fink, 2018).

When transfer pathways are well articulated, students save money, as completing two years at a community college is much cheaper than completing the same amount of time at a four-year college (Belfield, Fink, & Jenkins, 2017). The goal of North Carolina's CAA revision was to ease transfer between public two-year and four-year institutions in the state by creating efficiencies which would reduce excess credits earned and time to bachelor's degree completion.

**The revised CAA includes four key components intended to improve the transfer process** from North Carolina Community College System (NCCCS) institutions to University of North Carolina (UNC) System institutions:

- (1) agreed-upon guaranteed transfer of certain general education courses from any NCCCS institution to any UNC System institution;
- (2) a requirement of all UNC System institutions to publish four-year degree plans with courses mapped to course offerings at NCCCS institutions;
- (3) a suggestion that all NCCCS students intending to transfer declare their planned transfer major prior to completing 30 hours of coursework; and
- (4) guaranteed 60 transferable credit hours to a UNC System institution for all NCCCS students who complete a transfer associate's degree, Associate in Arts or Associate in Sciences (AA or AS) (North Carolina Community Colleges System, 2014).

The updated policy changes were implemented across all institutions in the fall 2014 semester. Only students who earn a transfer associate's degree, defined as an AA or AS, are eligible for the full benefits under the CAA. (See Annual Report on the CAA to The Joint Legislative Education Oversight Committee for additional background information.)

Students who are able to complete degrees within the traditional four-year time frame and without additional credits beyond what they would need to complete a bachelor's degree save money when they do not have to make tuition payments for additional semesters of coursework. Additionally, students who are able to graduate within four years are able to enter the workforce earlier, which is in alignment with the needs of North Carolina's labor market. North Carolina legislators, educators, business leaders, and community members recognize the urgency of having a well-trained workforce to fill anticipated jobs in high demand fields and have embarked on a statewide attainment goal to increase the number of North Carolinians with a high quality postsecondary credential to 2 million by 2030 (myFutureNC, 2019). It is in the state's best interest to ensure that transfer students complete their bachelor's degrees and do so in a timely fashion so that they can fill positions in North Carolina's quickly expanding knowledge-focused job market.

# 1 Assessing the Impact of the Revised CAA

To assess the impact of the revised CAA on students' outcomes – **bachelor's degree completion, time to degree, and excess credit accumulation** - we used a difference-in-differences analytic approach, explained in-depth in Appendix A. In our analyses, we compared the outcomes of transfer students who earned one of the CAA-qualifying degrees (AA/AS) before and after the CAA revisions to estimates of what their outcomes would have been if the revisions to the CAA were never made. We estimated these potential outcomes using data from AA/AS students prior to the CAA revisions as well as data from transfer students who did not earn an AA or AS degree. (Note that these students may have completed 30 or more credit hours at the community college, but they did not earn an AA or AS degree.)" Because this kind of analysis takes advantage of data collected over time, it is able to account for additional policy changes, such as the introduction of fixed tuition, the NC Promise program, and the reintroduction of summer Pell. These policies were introduced during the observation period of the study, but they would not have impacted our CAA or non-CAA groups differently.

Our general dataset for this research was provided by the UNC System Office and included information from students who transferred from a NCCCS institution to a UNC System institution between Fall 2010 and Spring 2019. We used a different subset of this dataset to examine each of our outcomes of interest, given the nature of the outcome. To examine bachelor's degree completion, our dataset was limited to students who transferred between Fall 2010 and Summer 2017 (N=58,055) because, under the revised CAA, students should be able to enter the four-year institution and graduate in two years. Limiting our dataset in this way allowed students at least two years to graduate. While the students who entered the university in the later years of this analysis had less time to graduate, our statistical method was able to account for the effect of differing entry points on the completion outcome.

To examine bachelor's degree completion, our dataset was limited to students who transferred between Fall 2010 and Summer 2017 (N=58,055) because, under the revised CAA, students should be able to enter the four-year institution and graduate in two years. Limiting our dataset in this way allowed students at least two years to graduate. Our statistical method accounts for the differing entry points of the students in our dataset, some of whom had less time to complete a degree.



The policy was associated with a reduction in the percentage of excess credits earned.



Because time to degree inherently only applies to bachelor’s degree completers, we limited the dataset to students who both transferred between Fall 2010 and Spring 2019 and graduated with a bachelor’s degree (N=33,709) to examine this outcome<sup>1,2</sup>.

Finally, the dataset examining excess credit accumulation included students who transferred between Fall 2010 and Summer 2018 and who subsequently graduated within three years of transferring (N=25,781). This final subset allowed us to explore excess credit accumulation among students who completed bachelor’s degrees but may have taken longer than two years to graduate.

Outcome	Definition
Bachelor’s degree completion	Either a student completed a bachelor’s degree or did not
Time to degree	Number of semesters (fall, spring, and summer) between transfer and graduation
Excess credit accumulation	Number of credits earned beyond those required to earn a typical bachelor’s degree (120 credits) <sup>3</sup>

Table 1  
Outcome Definitions

Table 1 above provides specific definitions of our three outcomes. Demographic characteristics of students in each sample, along with information about average completion, time to degree, and excess credit accumulation, can be found in Appendix B.

We analyzed the impact of the revised CAA on these outcomes using two time points for policy implementation: 2014 and 2016. These time points refer to the year that a student transferred, and the post-policy time period refers to all years after this one. For example, for our 2014 analyses, we considered students who transferred in 2014 or later as transferring under the revised CAA. We chose these two years to account for policy uptake during the year the CAA revisions were implemented (2014) and to observe differences in outcomes two years after the policy had been implemented (2016) with the idea in mind that students might need time to take advantage of the CAA.

<sup>1</sup> For our purposes, we considered each academic year to consist of three semesters: Fall, Spring, and Summer. In our dataset we have entry and graduation term data that distinguish between summer 1 and 2; however we collapsed these into one semester because it is possible a course spans both semesters and it is rare for a student to take a full semester (12+ hours) of coursework during one summer session. Our time to degree analysis, then, represents the impact of the CAA on the number of terms a student was potentially enrolled. This detail is important because even if a student does not enroll in classes, these terms represent time without a bachelor’s degree.

<sup>2</sup> We recognize that limiting the dataset in these ways has the potential to impact our estimates. For example, for the cohort of transfer students entering a UNC institution in Fall 2017, the only way to be included in our time to degree analysis would be to graduate in two years. That is, these students on average would have shorter completion times compared to graduates who entered in earlier years because they were given less time to complete in our dataset. With additional time incorporated into the dataset, we would expect average time to degree to increase. Therefore, this analysis provides a conservative estimate of the impact of the CAA.

<sup>3</sup> 120 credits was chosen as the cutoff point for this measure of excess credit accumulation since it is the standard minimum number of credits required for a Bachelor’s degree; however, there are some degree programs that require more than 120 credits for students to complete their degrees. While we did control for major in our analyses, we also ran analyses with the cutoff point at 126 and 128 to ensure that our analyses were not affected by longer degree programs. We found that the estimates only changed slightly using these different cutoff points, and all cutoff points reflected reduced excess credits.

# 2 | The Impact of the Revised CAA

*The results of our analyses for each outcome variable are summarized in the following sections. All of the results presented here were statistically significant at a standard level ( $p < .05$  or less) in our difference-in-differences models.*

## **Bachelor's Degree Completion**

The results of our analyses indicated that the revised CAA had a positive impact on the likelihood of bachelor's degree completion among students who transferred with CAA-qualifying associate's degrees, as summarized in Figure 1. Specifically, when we considered policy implementation in 2014 (the green arrow), the likelihood of bachelor's degree completion among students who earned an AA or AS prior to transfer increased by approximately 5%. A larger increase, approximately 13%, was observed when we considered policy implementation in 2016 (the orange arrow). These results suggest that the CAA revisions had an overall positive impact on the likelihood that an AA/AS-earning transfer student would complete a bachelor's degree. However, these results do not speak to the relationship between the policy and the amount of time it takes students to complete this degree.



Degree completion rates were consistently higher over time for transfer students who earned an AA or an AS degree prior to transfer.





## Percent Increase in Likelihood of Bachelor's Degree Completion

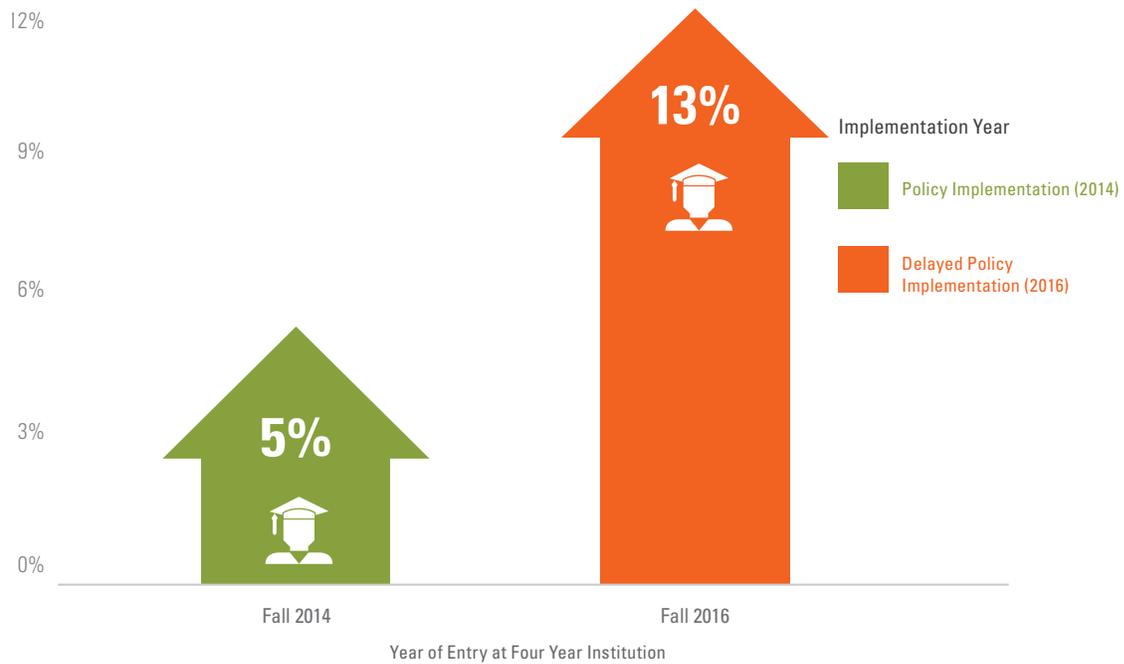
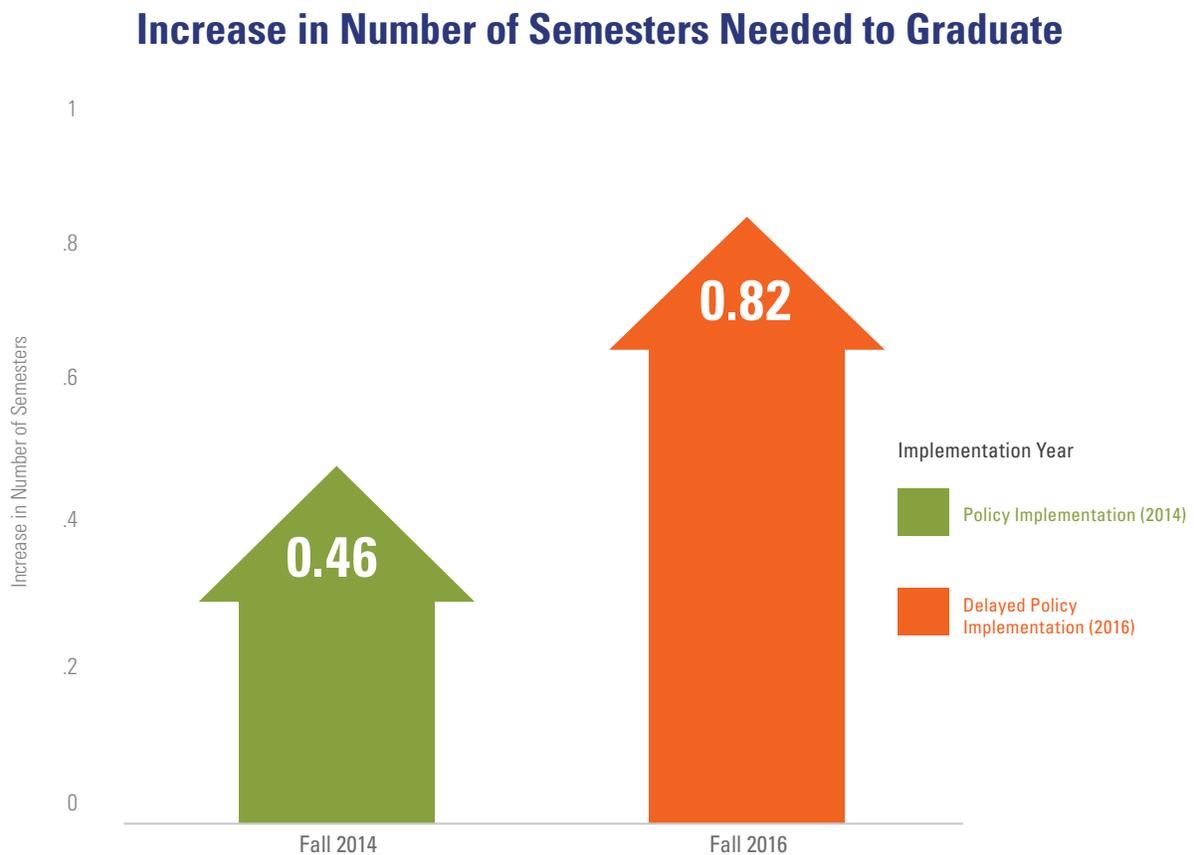


Figure 1.  
Percent Increase in Likelihood of Bachelor's Degree Completion among AA/AS-earning Transfer Students who Graduated from UNC System Institutions After the Revised CAA

## Time to Degree

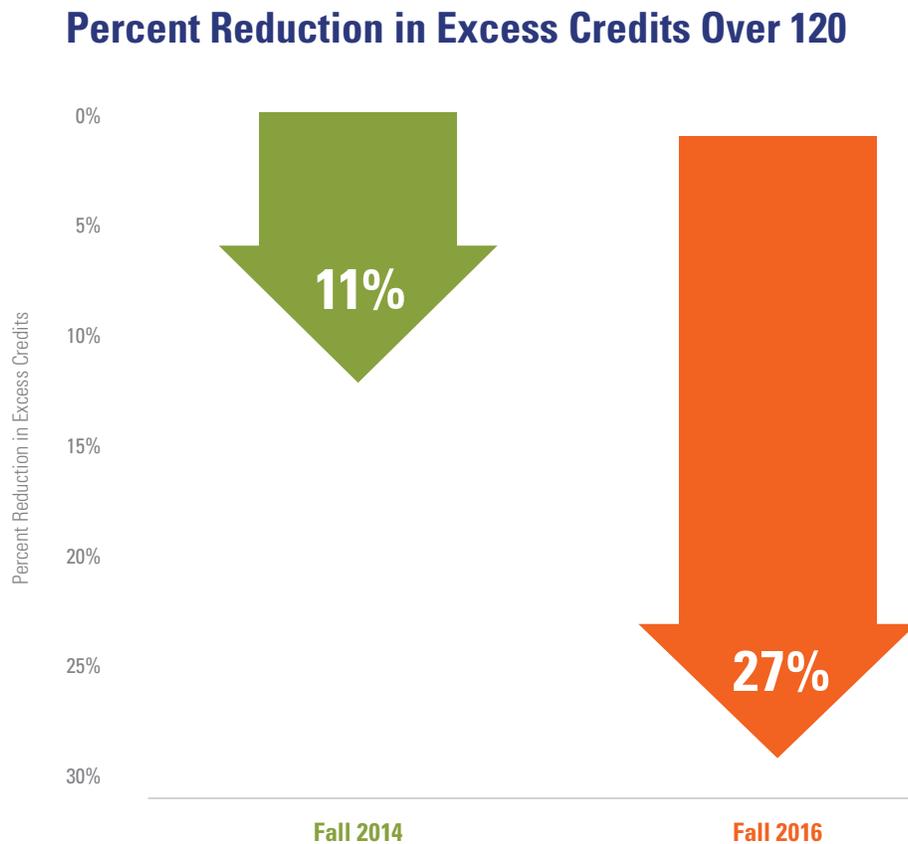
Results of our statistical models regarding time to degree are summarized in Figure 2. Our results indicated that after the 2014 revision to the CAA, students who qualified for the full benefits of the CAA took around half a semester longer on average to graduate. This increased average time to degree is even larger when we considered a delayed effect for the policy. In 2016, CAA-qualifying students took, on average, almost a semester longer to graduate. We believe this is due to a shift in demographic characteristics of students transferring with AA/AS degrees. Specifically, we noted an increase in the percentage of students who were enrolled part-time entering the four-year institution with an AA or AS degree. This change could be the result of better advising for these students at the community college and may also indicate that the revised CAA increases college access for these students. Because of their part-time enrollment status, these students would take longer to graduate, explaining this increase in average time to degree.



**Figure 2.** Increases in Time to degree among AA/AS-earning Transfer Students who Graduated from UNC System Institutions After the Revised CAA

## Excess Credit Accumulation

Our statistical analyses indicated that students experienced significant benefits from the 2014 CAA revision regarding excess credit accumulation. As shown in Figure 3, after 2014, CAA-qualifying students graduated with 11 percent fewer credits past 120 compared to a scenario where the CAA revisions did not happen. Students who earned CAA-qualifying associate's degrees and transferred to a four-year institution after 2016 graduated with 27 percent fewer credits past 120 as a result of the policy.



**Figure 3.** Reductions in Excess Credit Accumulation among AA/AS-earning Transfer Students who Graduated from UNC System Institutions After the Revised CAA

# 3

## Thinking Ahead



Part of ensuring seamless transfer **requires courses to be offered in a schedule that accommodates/supports transfer**

Given the recentness of the CAA in 2014, our significant findings are encouraging. In all cases, our results show a stronger impact of the revised CAA for students who transferred in or after 2016 compared to 2014, suggesting an expected delayed impact of the policy. Specifically, we found that the revised CAA both increases students' likelihood of bachelor's degree completion and reduces the number of excess credits that they accumulate at graduation while simultaneously increasing students' time to degree.

These results at first glance appear to be contradictory. However, it is possible that they indicate a shift in demographics among students who transfer to four-year institutions in North Carolina. As noted earlier, the percentage of students enrolling part-time at the four-year institution who transferred with a CAA-qualifying degree increased from 44 percent to 60 percent after the 2014 revision. An increase in part-time students would contribute to an increase in average time to bachelor's degree completion because these students take fewer courses at a time. These students would benefit from the revised CAA in terms of excess credit accumulation and increased likelihood of degree completion while simultaneously increasing average time to degree.

It is also possible that increased time to degree is related to availability and scheduling of courses. Part of ensuring seamless transfer requires needed courses to be offered in a schedule that accommodates and supports transfer (according to the Baccalaureate Degree Plan (BDP)) and transfer students have to be able to register early enough to ensure, in the case of limited enrollment options, reasonable opportunity to enroll in needed courses. The Transfer Advisory Committee (TAC), composed of representatives from the UNC System and NCCCS, engage with institutional representatives regarding such issues. We would expect to see time to degree improve as UNC institutions improve course availability and scheduling for transfer students. More effective communication between community colleges and four-year institutions about the CAA and continued improvements in CAA-related advising might also contribute to a decrease in time to degree for transfer students. Future research is needed to further explore these and other possible explanations for why the revised CAA resulted in an increase in average time to degree. Our findings otherwise indicate that the revised CAA has a positive impact on both bachelor's degree completion and reduction of excess credits.

This impact of the revised CAA has important economic implications for both students and the state. Recent estimates from the U.S. Census Bureau indicate that median earnings for individuals with a bachelor's degree in North Carolina are around \$47,000 annually – over \$10,000 more than individuals with some college or an associate's degree (U.S. Census Bureau, 2017). Economic benefits also derive from a reduction in the number of excess credits that students accumulate at graduation. Students in our dataset who transferred to the four-year college with CAA-qualifying degrees before 2014 earned, on average, 140 credits at graduation - that is, 20 excess credits past the Bachelor's degree requirement. Those who graduated after the policy was implemented earned an average of 135 credits - that is, 15 excess credits past the Bachelor's degree requirement, which is a reduction of 5 excess credits.

We saw a similar reduction in excess credits when we considered policy implementation in 2016. Students who transferred to the four-year college before 2016 graduated with an average of 139 credits, 19 past the Bachelor's degree requirement excess credits, and those who transferred after 2016 graduated with an average of 132, 12 excess credits, which is a reduction of 7 excess credits.

While these decreases in the average number of credits earned at graduation may seem small, a reduction of five to seven excess credits has surprisingly large financial implications for students. For example, taking seven additional credits at the most expensive UNC system institution, the University of North Carolina at Chapel Hill, in 2019 would cost a student upwards of \$2,700 (The University of North Carolina at Chapel Hill, 2019).

The state of North Carolina also benefits from the impacts of the revised CAA. With projected job growth at 23.8% in fields that require a bachelor's degree or higher, compared to 11.6% and 10.2% in fields that require an associate's degree or non-degree credential, respectively (Tippet & Stanford, 2019), increased bachelor's degree production helps the state of North Carolina to fulfill the needs of an economy that relies increasingly on a more educated workforce.

In sum, our analyses of the early impact of the revised CAA suggest that the revised policy increases the likelihood of bachelor's degree completion and reduces excess credits among students who earn either an AA or an AS at a North Carolina Community College and who then subsequently transfer to a public four-year institution. The data also suggest that the CAA revisions have become more effective over time, which necessitates continued analysis of the policy over the next few years. Future research will be able to provide additional nuance and insight into these broad findings. For example, this work might include a deeper examination of credit accumulation or explore the impact of the CAA on the outcomes of students from different racial/ethnic or socioeconomic status groups. The CAA is one component among many necessary to strengthen transfer in our state among all students. For example, the CAA does not focus support on students who earn



Students who transferred after 2016 graduate with an average of 6 fewer excess credits.



**This impact of the revised CAA has important economic implications for both students and the state.**

Associate in Applied Science (AAS) degrees. This point is especially crucial, because, over the past 30 years, transfer rates for students with degrees other than an AA or AS (such as the AAS) have increased at a higher rate than AA or AS transfer. AA and AS transfer has increased by 118 percent, while the transfer rate for students with other associate's degrees has increased by 134 percent (D'Amico & Chapman, 2019).

In addition, transfer agreements support only those students who actually transfer rather than the large percentages of students who intend to transfer but never do. While it is estimated that around 80% of community college students have plans to transfer to a four-year institution (Horn & Weko, 2009; Provasnik & Planty, 2008), only around 24% of first-time North Carolinian community college students transfer out to a four-year institution within six years, and of these students, only around 40% complete a Bachelor's degree (Shapiro, Dundar, Huie, Wakhungu, Yuan, Nathan, & Hwang, 2017). The positive effects of the CAA, summarized in this report, serve as a reminder that it is possible to advance transfer student success through reforms to policy and practice. The NCCCS and UNC System have developed multiple systems to support transfer in North Carolina while the TAC supports individual institutions with information and strategies to continue to improve the transfer process. At the same time, the CAA is one of many policies and practices that address barriers to Bachelor's degree completion among transfer students. Additional attention is needed to explore other initiatives that can also help transfer students achieve success.



The positive effects of the CAA serve as a reminder that it is possible to advance transfer student success through reforms to policy and practice.



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# Appendix A

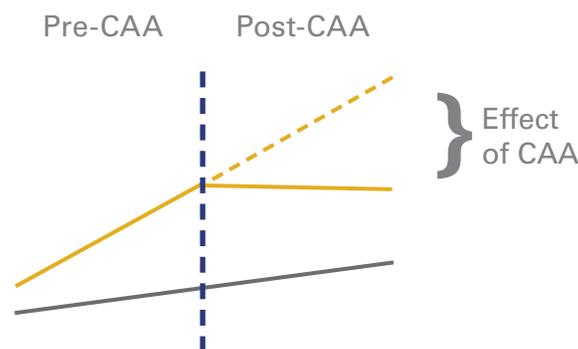
## Difference-in-Differences Method

In quantitative evaluations of policies or programs, researchers seek to understand the effects of an intervention (in our case, the CAA revision) on an outcome or series of outcomes (in our case, bachelor's degree completion, time to degree, and excess credit accumulation). To understand the true effects of the intervention, researchers are tasked with separating out the influence of other factors from the effect of interest (in our case, the CAA revision) on the outcomes of interest. One way to separate out the effects of other factors from the true effects of the intervention is through random assignment of individuals (students, in our case) to treatment and control groups (that is, some students would, at random, be covered by the protections of the CAA while others would not). This would ensure that the makeup of the treatment and control groups are similar, which allows the researcher to isolate the effect of the intervention without concern that the composition of the groups will mask the treatment effect.

Random assignment to treatment and control groups in this study was not possible or, for that matter, ethical; therefore, we utilized a difference-in-differences (DID) analytic approach, which offers us a way to estimate what would have happened to our treatment group (students who benefitted from the CAA) had the CAA not been implemented (Khandker, Koolwal, & Samad, 2010). DID compares the treated and control groups before and after policy implementation by subtracting the difference in the treatment group outcome variable (denoted by  $t$ ) from the control group outcome variable (denoted by  $c$ ), before (denoted by 0) and after the intervention (denoted by 1), as in the following equation:

$$DID = (Y_{t1} - Y_{c1}) - (Y_{t0} - Y_{c0})$$

Assuming that differences between the groups are stable over time, this calculation isolates the effect of the intervention on the treated (Murnane & Willett, 2011). In other words, this analytic approach uses the control group to estimate what would have happened to the treatment group in the absence of treatment. It relies on control group data to create a counterfactual scenario wherein policy implementation did not happen. Below is a graphical representation of DID, using excess credit accumulation as an example. The dotted vertical line denotes the CAA policy implementation, the yellow line represents credits at graduation for those with CAA qualifying degrees and the grey line is credits for those without CAA qualifying degrees. The dotted yellow line represents the treatment groups' credits at graduation had the CAA not been passed and the solid yellow line shows their actual credits. The difference between the dotted and solid yellow lines are the effect of the CAA on excess credit accumulation.



A primary assumption of DID is that both treatment and control groups follow parallel trends on outcomes over time (in our case, degree completion, time to degree, and excess credit accumulation) prior to policy implementation. Researchers usually check this assumption by plotting outcomes for treatment and control groups over time both before and after policy

implementation. The following three figures show these parallel trends. In these figures the blue line represents transfer students who qualified for full protection of the CAA, those who earned AA and AS degrees prior to transfer. The yellow line refers to all other students, such as those who earned another kind of associate's degree prior to transfer (e.g., an Associate in Applied Science [AAS] degree) or those who did not earn a credential at all prior to transfer.

### Outcome: Bachelor's Degree Completion

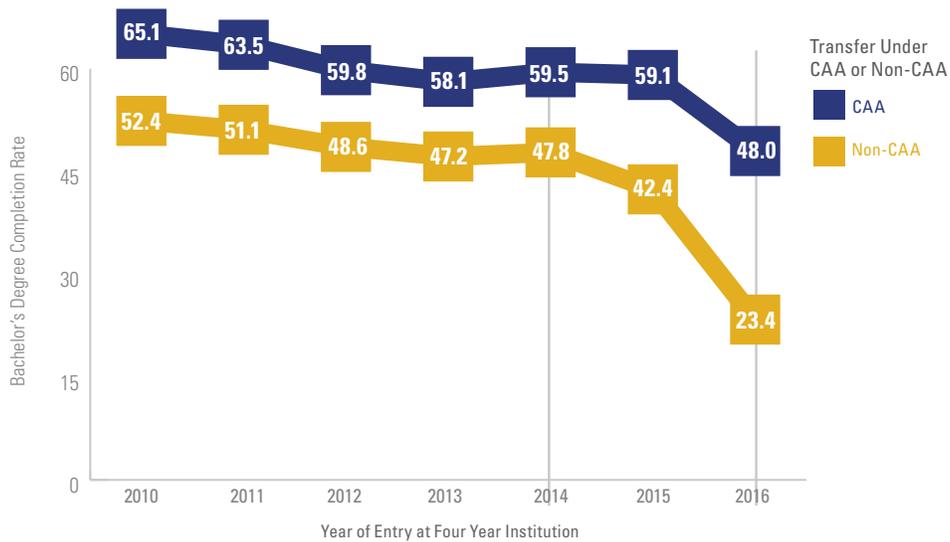


Figure A1. Percentage of Transfer Students who Had Completed a Bachelor's Degree at the Time of this Study Before and After the Revised CAA (N=58,055)

### Outcome: Semester Count to Graduation

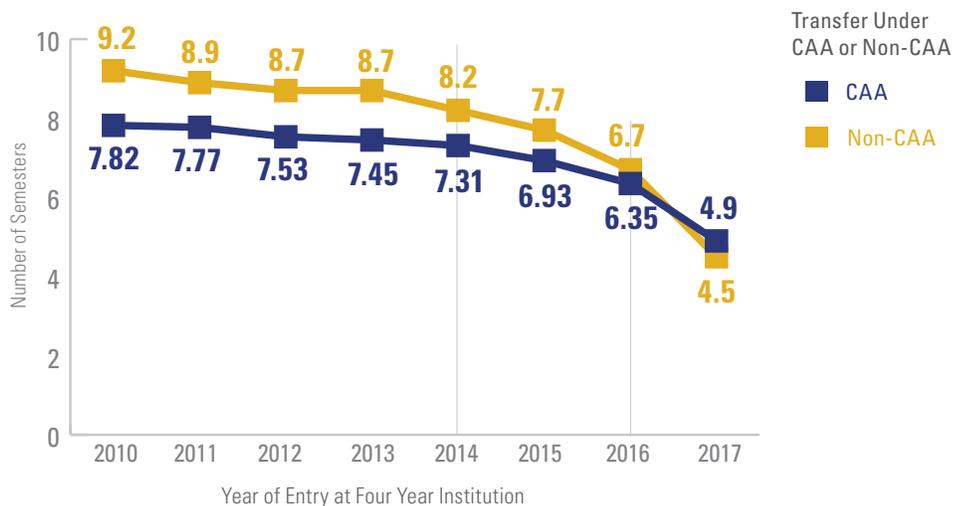


Figure A2. Time to degree among Transfer Students at UNC System Institutions Before and After the Revised CAA (N=33,709)

## Outcome: Excess Credits

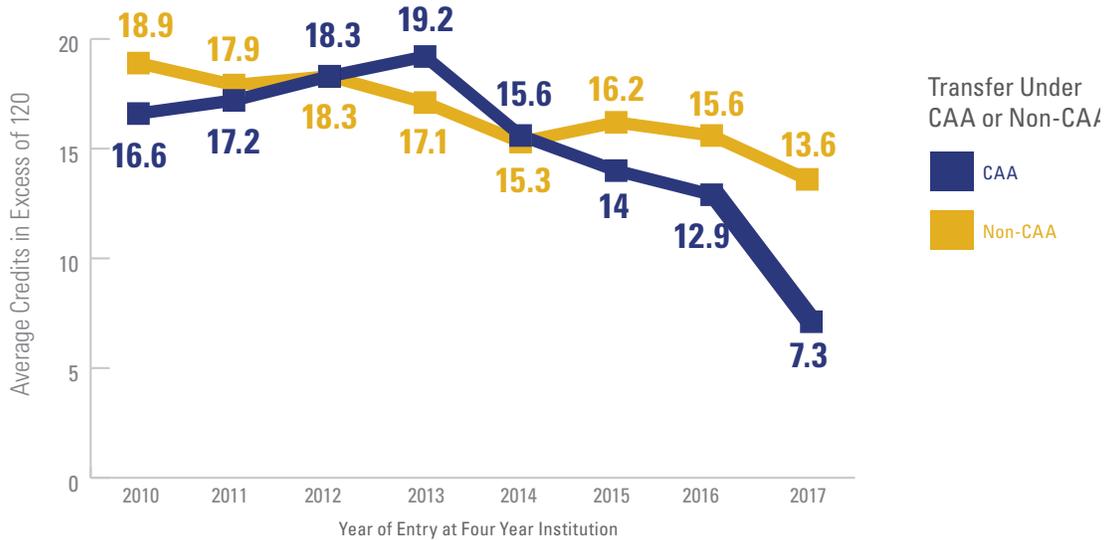


Figure A3.  
Average Number of Credits in Excess of 120 among Transfer Students who Graduated from UNC System Institutions Before and After the Revised CAA (N=25,773)

Note that these figures serve to describe changes in our outcome variables over time, but are not able to detect causal relationships between policy changes and student outcomes. Our DID estimates, summarized in the main content of this report, are the results that speak to the true impact of the CAA.

Our study used regression to estimate our DID models so that we could incorporate control variables, namely a student's race/ethnicity and gender, whether a student transferred from a rural community college, whether a student received a Pell grant, whether a student majored in a STEM field, whether a student earned AP or IB credits in high school, whether a student was ever part-time, and a student's number of major changes. Our regression models took the following form:

$$Y_{ist} = \alpha + \beta CAA_i + \gamma Post_t + \delta_{DID} CAA_i * Post_t + \theta X_i + \vartheta X_s + \varepsilon_{ist} \quad (2)$$

where  $Y_{ist}$  represents our outcomes (bachelor's degree completion, time to degree, and excess credit accumulation) for  $i$  student following  $s$  transfer pathway during  $t$  semester. The coefficient  $\delta_{DID}$  on the  $CAA_i * Post_t$  interaction term estimates the effect of CAA implementation for those students who transferred from a NCCCS institution with an AA or AS transfer degree.  $\theta X_i$  represents student-level covariates and  $\vartheta X_s$  are transfer pathway fixed effects. Our models clustered standard errors at the four-year institution level. The models included in this report employ propensity score weighting to correct for demographic differences between treatment and control groups in our sample.

# Appendix B

## Demographic Characteristics of Each Sample (Percentages)

	Bachelor's Degree Completion	Time to Degree	Excess Credits Over 120
White	66.5	69.1	71.2
Black	16.3	13.4	11.6
Latinx	6.6	6.8	6.9
Asian	3.2	3.5	3.3
Other	4.5	4.3	4.1
Unknown Race	2.9	2.9	2.9
Attended Rural Community College	25.2	24.9	25.3
Received Pell Grant	59.9	59.5	56.4
Female	56.6	56.8	58.6
STEM Major	17.9	18.2	16.3
Took AP/IB Courses	7.9	9.7	11.1
Part-Time	58	56.3	-
Number of Major Changes	1.30	1.35	-
<b>N Count</b>	<b>58,055</b>	<b>33,709</b>	<b>25,781</b>

## Summary of Outcomes Pre- and Post-2014

	AA/AS		Non-AA/AS	
	Pre-2014 revision	Post-2014 revision	Pre-2014 revision	Post-2014 revision
Completion*	61.5	56.2	49.8	40.5
Time to degree	7.6	6.7	8.9	7.5
Excess Credits	17.9	13.5	18.1	17.7

Note: \*denote percentages



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