NC STATE UNIVERSITY
Belk Center for Community College Leadership and Research

The Effect of the Career and Technical Education Pathway on Community College Attainment: An Instrumental Variables Approach

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BRIEF DESCRIPTION

This brief is the third of three briefs that address the relationship between North Carolina's dual enrollment program, Career and College Promise (CCP), and community college attainment in the state. The purpose of this study is to understand participation trends for one of the two pathways within CCP – the Career and Technical Education Pathway. This brief also presents observed outcomes for Career and Technical Education Pathway from an instrumental variables, quasi-experimental design.

INTRODUCTION

Enacted in 2012, College and Career Promise (CCP) provided pathways that were intentionally structured to lead to a credential at the community college, as opposed to students taking courses ad hoc.[1] The immediate short-term goal of CCP was to increase access for underserved populations in North Carolina with the mid-term goal of increasing the number of students earning a degree in order to fill the anticipated gap in the workforce.[2] The long-term goal of CCP is to help North Carolinians earn a family sustaining wage thereby increasing the tax base in North Carolina and increasing overall funding available for educational initiatives.[3]

High school juniors and seniors who meet admissions requirements are eligible[4] for the program and have the option to choose one of two pathways; Career and Technical Education (CTE) or College Transfer Pathway. This brief focuses on the CTE Pathway which is designed to prepare students for skilled employment immediately after earning a credential. Classes within the CTE pathway are vocationally focused and lead to an industry recognized credential.[5] CTE pathways are often in partnership with local employers whereby students, as a part of their curriculum, participate in internship, apprentice, or work-based experiences.

The purpose of this brief is to present CTE participation trends and to use an instrumental variables approach[6] to estimate the causal impact of CTE participation on community college outcomes.

[1] North Carolina State Law, 2011
[2] Ibid.
[3] Ibid.
[4] The cohort of students in this brief was eligible for the program In 2015-2016, where the program was limited to the 11th grade/junior year with the exception of 2 CTE pathways where 9th and 10th graders could enroll (North Carolina State law, 2011). At the time this brief was written the State Board of Community Colleges had approved further expand CCP eligibility for 9thand 10th graders, though participation is still limited (Operating Procedures approved by State Board of Community Colleges Revised 06/23/2020).
[5] Ibid.
[6] Dunning, 2012

KEY POINTS

» Compared to the College Transfer Pathway, the CTE pathway more closely reflects the diverse North Carolina high school population, indicating that CTE may be more effectively opening college access for historically underrepresented students.

» Outcomes are greater for CTE students compared to the CCP program at-large and the College Transfer Pathway, indicating that there are structural and policy lessons to learn from the CTE pathway that can inform future efforts to increase community college attainment.

THE PROJECT

This brief expands findings about the overall Career and College Promise program presented in the first brief of this series and explores the outcomes related to participation in the Career and Technical Education (CTE) Pathway. Table 1 reminds us that students in CTE tend to be more racially diverse than the College Transfer Pathway[7] and more closely reflect the overall population.

Table 1
Characteristics of Career and Technical Education Participants Compared to All Students

	All Students	Career and Technical Education	College Transfer Pathway
Students' Demographic Characteristics			
Female	50%	52%	63%
White	56%	64%	76%
Black	24%	20%	11%
Latin*	12%	11%	6%
Economically Disadvantaged	44%	48%	30%
Home Language			
English	86%	87%	93%
Spanish	11%	11%	5%
Other	4%	2%	2%
Mean Weighted High School GPA	3.2	3.2	4,0
Observations	82,816	8,024	7,446

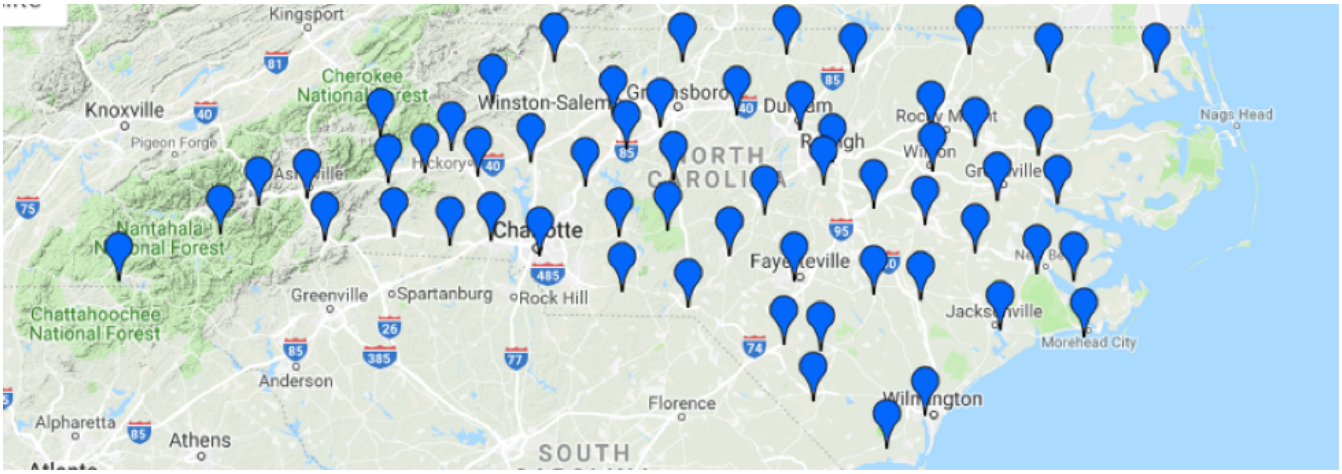
Note. Sample includes students who ever participated in the College Transfer Pathway, were juniors in 2015-2016 in traditional North Carolina high schools, who remained enrolled at the same high school through 12th grade; "Other" languages include more than 80 languages. Observations by pathway are not mutually exclusive, there are n = 765 students enrolled in both pathways and are not included here.[8]
Source: The North Carolina Department of Public Instruction, 2014-2015 academic year.

[7] For results on the College Transfer Pathway, please see the second brief in this series.
[8] For additional information on the data source and sample, please see the first brief in this series.

In estimating the effects of CCP and the CTE pathway on community college attainment, we must consider that a student's likelihood of attending college is influenced by family educational background, access to advanced coursework, and socio-economic status. It is plausible that if a student's parents attended college, that their child may be influenced to attend college at a higher rate than a first-generation student. This study uses a novel instrumental variable technique to control for these unobserved variables and self-selection that bias the naïve results of CCP and the CTE pathway's impact on community college attainment and therefore our ability to make causal claims.[9]

I use distance of a student's high school to the local community college as an instrument to predict a student's participation in CCP and the CTE pathway. In North Carolina, there is a community college within a 30-minute drive from more than 99% of residents within the state (see Figure 1).[10] The equi-distant distribution of community colleges results in, essentially, random variations in the distance from any individual's home (or school) to the nearest community college. The proximity of a community college has been shown as an important predictor of postsecondary enrollment and outcomes.[11] I use this distance as an instrument to remove selection bias in earlier estimates and to causally examine the effects of CCP and the CTE pathway on student outcomes. This instrument serves as an external (outside of the treatment (CCP) and the outcomes) and natural randomizer to carve out a subpopulation of participants in the CTE pathway and students who did not participate in CCP or the CTE pathway, where unobserved confounding variables are controlled.[12] These predicted estimates of participation in CCP and the CTE pathway are then used to predict community college attainment outcomes and draw causal links between CCP, the CTE pathway, and community college attainment.[13]

Figure 1
North Carolina Community College Main Campus Locations



Note. Retrieved from Google Maps on April 13, 2019, https://www.nccommunitycolleges.edu/about-us/main-campuses

Estimates (Table 2) suggest that participation in CCP and the CTE pathway have a significant ($p<0.05$ or greater) positive impact on number of college credits and credential attainment (see Table 2).

[9] For additional information studies who use Instrumental Variables see Card, 1995; Dee, 2004; Kane and Rouse, 1993; Mallar, 1979; Xu & Smith Jaggars, 2013.
[10] Deal, 2019; NCCCS, 2019
[11] Dee, 2004; Card, 1995
[12] Dunning, 2012
[13] Ibid.

Interestingly, results of this study show that the effects of CCP on community college attainment are even larger for CTE students who are 5.6 percentage points more likely to earn their credential and earn about 8 more credits than the overall CCP population. Results are similar for other outcomes where CTE students exceed the overall CCP population.

This observed increase in CTE outcomes, compared to the CCP program at-large, could be due to their structured pathways where there are short-term certificates and diplomas built into the program of study on the way to the degree.[14] This differs from the College Transfer Pathway students where the only credential is an associate's degree. These results suggest that the CCP legislation requiring pathways to be organized into a structured series of courses leading to a credential has been effective in increasing the completion rate. Furthermore, earning more credits increases the opportunity for students to be exposed to additional college faculty, which may suggest that CCP students are better prepared because they are familiar with the expectations of college faculty and structures of college courses.[15] Taking CCP classes in high school also ensures students will be part-way to earning a degree, which accelerates momentum toward community college attainment. These findings imply that the growing investment by North Carolina's legislature in the CCP program, and the CTE pathway in particular, result in returns to education.

Table 2

Estimates of the Effect of Career and Technical Pathway on Community College Attainment Compared to all Career and College Promise Students

OUTCOME	(1) CCP	(2) CTE
Enrollment in College after High School	0.587 (0.313)	0.731 (0.386)
# Community College Credits Earned	24.058** (7.404)	31.624** (10.800)
Persisted Year 1 to Year 2	(0.366) (0.243)	0.461 (0.287)
Earned a Community College Credential (Certificate, Diploma, Associate's)	0.307* (0.153)	0.363* (0.182)
Observations	16,235	8,024

Note. *p<0.05, **p<0.01, ***p<0.001; *Source:* Author's calculations based on student's 10th grade demographics in 2014-2015, who were juniors in 2015-2016 in traditional North Carolina high schools, and who stayed in the same high school through 12th grade. Students in column 2 are limited to those enrolled in the Career and Technical Education pathway (CTE). All standard errors are clustered at the school level. These quasi-experimental results control for unobserved variables and therefore these results differ from raw, descriptive results around credit earning behaviors.

[14] North Carolina State Law, 2011
[15] Tobolowsky & Allen, 2016

FOR DECISION MAKERS: IMPACT ON PRACTICE & POLICY

1. The structure of the CTE pathway points to higher rates of community college attainment.

Results that show CTE students experience greater community college outcomes could be a result of having stackable credentials within the CTE pathway. Pathways are also aligned directly with the community college degrees and with industry credential. This alignment increases the ability of earned credit to be applied toward additional credentials and ensures credentials earned are usable in the job market. Having clearly defined, relevant, and stackable pathways could be a key policy reason for why participation in the CTE pathway, and CCP at-large, increases returns to education.

2. Participation in the CTE pathway can save students time and money, but only if they are able to make informed decisions about their pathway.

It is also important for practitioners to understand the policy mechanisms behind why CCP is working so that adherence to the pathway structure can be a priority. Ensuring students are on the right pathway will further accelerate CCP students and help even more students realize the benefits of participation. Career Coaches and other support staff advise students in pathway decisions and ensure a smooth transition from high school to college. It is important that Career Coaches and other advisors are trained in the benefits of CCP, as presented in this study, so that all students who are eligible to participate are receiving proactive messaging about the opportunities available through CCP.

3. Given the close proximity, collaboration between high schools and community colleges can be levers to support students transitioning to college.

This study leverages the unique and equi-distant distribution of community colleges in North Carolina. My data suggest that over 50% of the high schools are within 10 miles of their local community colleges and 99% are within 30 miles. This close proximity not only provides a strong instrument for this CCP study, but also presents opportunities for collaboration between high schools and community colleges. To strengthen this collaboration, there should be statewide professional development that facilitates the sharing of promising practices in partnership between administrators, faculty, and staff in high schools and community colleges – particularly those who are located within 10 miles of each other. Goals of the convening should focus on further alignment of curriculum and student supports that help students transition smoothly and lead to increased postsecondary enrollment.

CONCLUSION

CTE pathway students more closely reflect the diverse demographic population of North Carolina and the outcomes for CTE students are higher than the CCP program at-large or the College Transfer Pathways. Given the CTE pathways seems to be the open access way for diverse students to participate in dual enrollment, lessons can be learned and extrapolated to the College Transfer Pathways, including the CTE pathway's stackable credential structure, policies for access and enrollment, and alignment with industry. Integrating these aspects into the College Transfer Pathway could increase access to college during high school for historically underrepresented students and lead to an overall increase in postsecondary attainment.

ABOUT THIS BRIEF

Deal, S. (2020). The Promise of Free College: Three Essays on Dual Enrollment in North Carolina. (Unpublished doctoral dissertation). North Carolina State University, Raleigh, NC.

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