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The Economic Benefits of Attaining an Associate Degree Before Transfer: Evidence From North Carolina

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Abstract

Many students enroll in a two-year college with the intention of transferring to a four-year college and obtaining a bachelor's degree. These students must decide whether to first complete their associate degree at the two-year college and then transfer, or to transfer earlier without earning a degree from the two-year college. An informed decision on this matter requires information about several factors, many of which are hard to observe.

This paper presents a model for making the optimal transfer decision. I consider each possible outcome and use data on student credit accumulation, award receipt, and labor market returns from students in the North Carolina Community College System (NCCCS) to calculate which outcome is best, given its probability of occurring. The findings suggest that, on economic grounds, *more* NCCCS students should complete their associate degree before transferring to a four-year institution to attempt a bachelor's degree. This conclusion is made from the perspective of the state of North Carolina, comparing all college costs (composed of public subsidies and tuition revenue) with the labor market benefits of college.

Taking into account how many credits and which award (if any) a student earns, the total cost of providing public (two- and four-year) college education is approximately the same whether a student completes an associate degree first or whether that student bypasses that degree and transfers earlier to a four-year college. In absolute terms, the student will have received approximately the same amount of resources by taking either pathway. However, the benefits of first completing an associate degree exceed the benefits of early transfer, as relatively few students who transfer early ever complete a bachelor's degree and therefore leave college with no credential. Thus, the net benefits of choosing to complete an associate degree before transfer are greater than the net benefits of early transfer.

This conclusion is robust to many alternative scenarios as to the value of credits, the probability of completing each degree, and the labor market returns to college. For early transfer to be more valuable than earning an associate degree beforehand, the pool of early transfer students must have a bachelor's degree completion rate that exceeds 90 percent.

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1. Introduction

One important mission of community colleges is to offer programs that lead to an associate degree. Another important and often related mission is to prepare students for transfer to a four-year college, with the expectation that these students will complete a bachelor's degree (Bailey, 2011). However, the decision to transfer and when to do so involves a tradeoff: Some students who earn an associate degree before they transfer might have benefited from transferring earlier in their college careers, while other students who transfer early might have benefited from more preparation at the community college level and from having earned an associate degree as a labor market credential. The decision about the best time to transfer involves consideration of several factors, most notably the respective costs and benefits of a community college education versus one at a four-year college.

Many students face this decision; in fact, more community college students transfer to another institution than complete their associate degree at the initial college. In addition, for a given cohort of community college students, approximately the same number complete a four-year degree as do a two-year degree. However, almost two thirds of students who start out in community college have no recognized credential up to nine years later; many transfer to another institution—either in the public, private, or for-profit sector—with the intention of earning a bachelor's degree but ultimately terminate their postsecondary education without earning any degree. The decision about when to transfer also impacts enrollment shares and funding across postsecondary providers. Community colleges may be under pressure to let students transfer as early as possible. Four-year colleges may be under pressure if increasing numbers of underprepared students enroll; alternatively, four-year colleges may benefit from having more students in their lower-level, large section courses.

This paper provides evidence from a cost–benefit analysis about whether it is better for community college students to earn an associate degree first and then transfer or instead to transfer before earning an associate degree and then focus solely on completing a bachelor's degree. For this analysis, I adopt a social perspective and include

all costs and income benefits regardless of whether these are paid by or accrue to the student or to the state.

The specific question of whether it is better to earn an associate degree first has received little direct research attention. Research has considered whether students are inappropriately "diverted" to community college and has estimated the returns to college "quality" (Kane & Rouse, 1999; Sandy, Gonzalez, & Hilmer, 2006), but such research does not provide a complete answer to the question undertaken here because it omits key factors such as the cost of college and the *ex ante* probability of dropping out, which is the probability of dropping out before the outcome is known. Recent research has also sought to understand what information students use when deciding to drop out of college or switch majors (e.g., Stinebrickner & Stinebrickner, 2012). A critical element in these decisions is information students obtain as they progress through college that allow them to better assess their own capacity and preferences for college. Yet it seems unlikely—given the very high non-completion rates—that students have complete information and accurate expectations as to their likelihood of dropout. Similarly, college counselors may have incomplete information; they cannot fully know a student's plans, level of motivation, or financial constraints.

Many different pieces of information are also necessary to determine the optimal decision with respect to completing an associate degree or transferring early. These include the *relative* values of many elements, such as labor market returns to different degree awards, postponing entry into the labor market to earn extra credits, the costs of these extra credits in the two-year versus four-year sectors, and the costs of the labor market payoffs of community college credits versus four-year college credits. Thus the decision to transfer with or without attaining an associate degree first is an important one and may be subject to error.

Adjudicating on whether students have made good decisions requires a formal model that describes students' options and the payoffs across each outcome. In this paper, I derive such a model and offer an empirical adjudication on this question for the North Carolina Community College System (NCCCS) in consideration of the full costs and benefits to the state (not the student) across the various outcomes. I populate the model with data on associate and bachelor's degree attainment and credit accumulation from

NCCCS student transcripts and with earnings data for these students after they exit college. I use the model to calculate the net benefits (benefits minus costs) of each choice and outcome and perform sensitivity testing to check the robustness of the results. Based on this model, I find that completion of an associate degree before transfer is preferable to transferring without earning this credential. This finding is robust to alternative (plausible) assumptions about costs and benefits. By implication, therefore, it would be preferable if a greater proportion of students who transfer early actually remained within the NCCCS system and earned an associate degree before transferring to a four-year college.

This paper is structured as follows. I begin by reviewing the evidence related to optimal transfer and student decision-making and then describe the choices and outcomes for students and express these in terms of a payoff matrix. Next, using data on students in the NCCCS, I estimate these payoffs to determine empirically which choice is preferable. I then perform sensitivity testing to check the robustness of these findings. In the final section, I discuss policy implications.

2. Framework for Analysis

2.1 Prior Evidence

Existing research provides no obvious answer to the question of whether it is better to earn an associate degree before transferring or to transfer early. There has been considerable research on the "democracy versus diversion" debate, which concerns the question of whether it is better for a student to start at a community college and then transfer or for the student to begin at a four-year institution (Doyle, 2009; Long & Kurlaender, 2009; Melguizo, Kienzl, & Alfonso, 2011). But this debate is not directly relevant to the research question undertaken here, which presumes that the student is already enrolled at a community college. One might expect that, if community colleges do unnecessarily divert students, it would be better (in terms of eventually earning a bachelor's degree) to transfer as soon as possible to the four-year college. But this presumption may be invalid for two important reasons. First, attending community

college is much cheaper than attending a four-year college. Second, many transfer students fail to earn a bachelor's degree; as a result, these students have bypassed the associate degree and so leave college with no credential.[1] Almost all existing research in this field assesses bachelor's degree attainment rates or earnings effects and omits any consideration of the relative costs across the two sectors and of the risk of earning no credential (versus earning an associate degree).

In contrast, one study (Romano & Djajalaksana, 2010) assessed the relative costs of two-year and four-year colleges. This study found that community colleges appear to be less costly until one accounts for the fact that they disproportionately offer lower-division courses; once that is taken into account, they appear more expensive than four-year institutions. However, this analysis reviewed spending per full-time equivalent (FTE) student in cross section and did not address differential completion rates across student groups over time. In fact, it is not possible to use cross-sectional, college-level expenditure data to obtain a valid answer to the question about whether a student should earn an associate degree before transferring. Such an analysis requires longitudinal data on students.

Similarly, there is research on the returns to college quality, which asks whether credits from a four-year college are worth more than those earned at a two-year college (Hilmer, 2002; Long, 2008). Generally, the literature has found positive returns to college quality, although the size of the return has depended on the particular pathway chosen by the student and on the college's relative distinction in quality. In fact, Hilmer (2000) found no incremental returns to college quality for students who initially began at a community college and then transferred. Again, however, this literature offers only a partial answer to the present research question. Existing research has not factored in differences in college costs, differences in the types of courses taken in each sector, and differences in completion rates. Thus, even when the labor market gains from credits at a four-year institution exceed those earned at a two-year institution, the net return may not be large enough to offset the failure to gain any credential.

[1] Alternatively, students who fail to complete a bachelor's degree may reverse-transfer back to community college. This reverse-transfer is becoming increasingly common, but it carries significant time and cost penalties to the student (NSC, 2012).

Related research has suggested that students do make rational decisions about college enrollment and so should be able to make an accurate determination about when to transfer. Students do appear to account for expected earnings (Betts, 1996), and they factor in new information obtained during enrollment with respect to their aptitude and preferences for college (Stinebrickner & Stinebrickner, 2012). However, these decisions may be made with incomplete or imperfect information regarding costs, labor market returns across different awards, and probabilities of completion. Although college counselors may provide supplemental and more accurate information, they are unlikely to know key pieces of information such as student motivation, financial support, or program of study at the four-year college. Certainly, the very high rate of non-completion suggests that many students (with or without guidance) do not have a full understanding of what is required to earn a college award. There is also evidence that *ex post* high proportions of students wish that they had made different enrollment decisions and that they tend to be overconfident about their own abilities (see, respectively, Stange, 2012; Zafar, 2009). Both the high failure rate and overconfidence suggest that too many students are gambling on the likelihood that they will complete a bachelor's degree and so will not need an associate degree.

2.2 The Model: Student Choices and Possible Outcomes

To determine whether students should obtain an associate degree before transferring to a four-year institution, I build a simple model that analyzes the payoffs of each choice.

There are two choices for a student who is motivated to transfer after initially enrolling at a community college. The first choice [*AA_*] is for the student to obtain an associate degree before transferring. At the transfer institution, there are two outcomes: the student may either succeed at earning a bachelor's degree [*AA_BA*] or fail to earn one [*AA_0*]. The alternative choice [*0_*] is to bypass the associate degree and then either succeed at earning a bachelor's degree [*0_BA*] or fail to earn a bachelor's degree and so leave college with no award [*0_0*].[2]

[2] I discuss other options and extensions to these pathways in the sensitivity analysis below.

Table 1 shows how these choices translate into possible outcomes and lists some of the general merits and demerits of each possible outcome. Each possible outcome has benefits in terms of labor market earnings but also has costs in terms of tuition costs (as well as public spending) and delayed entry into the labor market.[3] It is not possible to tell which outcome is the best *a priori* because—leaving aside the many factors involved—outcomes with the highest benefits also tend to have the highest costs.

Table 1
Choices and Possible Outcomes for Transfer Students

Possible Outcomes	Merits/Demerits:
Obtain associate degree before transferring [*AA_*]	
Earn BA degree [*AA_BA*]	✓Obtain two qualifications: higher earnings ✓Use AA in labor market until use BA ✕May take longer if AA credits do not transfer ✕Value of BA may not be much more than AA
Fail to earn BA degree [*AA_0*]	✓Use AA in labor market: high earnings ✓Avoid re-taking credits at BA level ✓Save on expensive BA credits ✕No BA in labor market
Bypass associate degree before transferring [*0_*]	
Earn BA degree [*0_BA*]	✓Use BA in labor market: higher earnings ✓Do not have surplus community college credits ✕Pay more for college if BA credits more expensive than AA credits
Fail to earn BA degree [*0_0*]	✕No labor market qualification: lower earnings ✓Save on cost of credits ✓Option to return to earn AA degree later

This analysis seeks to determine which choices lead to the highest net benefits. For the state's postsecondary system, absolute costs are also of interest: they indicate how much and where funding for college should be allocated. But the students only make choices on whether to obtain an associate degree before transfer: presumably, they all

[3] This analysis focuses only on labor market outcomes. I do not include other benefits such as improvements in health or reductions in crime or welfare receipt. These other benefits are likely to be proportionately related to the income benefits (e.g., higher income allows for the purchase of more healthcare). The analysis also excludes the consumption value of education: some students might prefer to enroll at a four-year institution.

expect that they will earn a bachelor's degree, or else they would not transfer. Therefore, the value of obtaining an associate degree before transfer [*AA_*] depends on the net benefit of each of the two possible outcomes [*AA_BA* and *AA_0*] weighted by the probability of each outcome occurring. Similarly, the value of bypassing the associate degree [*0_*] depends on the value of earning a bachelor's degree [*0_BA*], accounting for the probability that the student will end up with no award [*0_0*].

The best outcome among these can be empirically determined. To calculate the value of each choice, it is necessary to derive the benefits and costs of each possible outcome and weight them according to their probabilities.

I express all benefits and costs relative to a person who does not enroll in college and observe data for students over a 20-year window from when they first enrolled in college. So for each year from the student's first year of enrollment, I calculate each benefit and cost according to the student's status in that year. All amounts are expressed as present values using a conventional discount rate of 3.5 percent (Moore, Boardman, Vining, Weimer, & Greenberg, 2004). All amounts are expressed in 2012 dollars, rounded to the nearest $100.

The benefits of each outcome depend on the returns to credits and to award receipt—measured separately for attendance at two-year and four-year colleges—minus the lost earnings from being enrolled in college. It is necessary to calculate the returns to credits because students who transfer early and do not receive any award [*0_0*] may still have higher labor market returns than students who only complete an associate degree, if the returns to credits at the four-year college are relatively higher. It is also necessary to calculate the returns to awards because there is evidence of *sheepskin* returns, or returns to having a credential beyond having an equivalent number of credits. For lost earnings, I assume that students in college cannot work as intensively as non-enrollees. I do not assume that students cannot work while in college—this is strongly contradicted by the evidence (Riggert, Boyle, Petrosko, Ash, & Rude-Parkins, 2006)—only that they work less. Thus, lost earnings are a fraction of potential full-time earnings.

These returns to credits and awards and lost earnings are measured annually depending on the student's status in that year. This allows the model to account for the fact that the timing of benefits and costs matter. For example, a student who earns an

associate degree receives her sheepskin return before a student who earns a bachelor's degree. As another example, a student who drops out relatively early is then able to participate more intensively in the labor market at an earlier date.

The costs of each outcome depend on the number of credits accumulated across the two-year and four-college sectors times their respective expenditures per credit. I factor in registration costs as a fixed cost of enrollment. I also model imperfect articulation, or the cost of taking additional credits because some community college credits are not accepted at the four-year college (*overlap* credits). The costs of enrollment are modeled over time in the same way that earnings are modeled over time. So, for a given number of credits, a student who transfers early to a four-year college sustains higher costs than a student who transfers later: four-year college tuition is more expensive and is incurred at an earlier date.

2.3 Data

I use multiple sources to populate the model. One source is the academic literature on student progression and completion rates, as well as evidence on the returns to college pathways. However, the primary sources for the calculations are datasets on NCCCS students.

For credit accumulation and associate degree receipt during community college I use detailed transcript data from cohorts of NCCCS students enrolled between 2001 and 2010. This dataset allows me to model credit accumulation each year across the four outcomes. For credit accumulation and bachelor's degree receipt at a four-year college, I use data from the National Student Clearinghouse (NSC). This NSC dataset does not include full transcripts but it does include information about semesters enrolled and bachelor's degree awards for all NCCCS student cohorts. That is, I am able to follow those students who left NCCCS and entered four-year colleges so as to obtain estimates of their credits and awards. These merged datasets yield evidence on a parameter that is important for the analysis: the probability that a student who transfers to a four-year college will successfully complete a bachelor's degree.

A third dataset used contains earnings data from 2001 to 2012 on these same community college students. These earnings data are used to obtain estimates of the labor

market returns to college—both the returns to credits accumulated before and after transfer, as well as the sheepskin returns to awards—and the loss in income from being in college (for details on this dataset and the returns to college, see Belfield, Liu, & Weiss, 2013).

Finally, for costs I use data from college prospectuses and IPEDS for North Carolina's state colleges.[4] I include all costs in the analysis (i.e., not just registration and tuition costs but also the public subsidies for colleges). The resulting figures provide an overall calculation from the state's perspective on resource use at the two-year and four-year levels.

I emphasize that these results apply to the context of North Carolina and may not apply in other states. Each of the benefits and costs may vary across states, as might policies regarding early transfer and articulation agreements between two-year and four-year institutions.

3. Model Results

3.1 Model Parameters

The parameters of the model are described in the Appendix in Table A.1. These parameters are based on student-level, longitudinal data from NCCCS, with additional sources provided in the table notes. Students who obtain an associate degree at the two-year college are estimated to accumulate 70 credits. Those students who then complete a bachelor's degree are assumed to accumulate an additional 60 credits at the four-year institution; those who fail to complete a bachelor's degree accumulate an additional 20 credits. By contrast, early transfers have on average 23 community college credits and then 100 four-year degree credits if they meet the award requirements or 25 four-year credits if they do not. Thus, not all two-year credits transfer across the respective colleges: students who transfer with an associate degree must retake 8–10 additional credits at the four-year institution; students who transfer without an associate degree must

[4] This dataset can be found at http://www.nccommunitycolleges.edu/business_finance/docs/Resources/Tuition%20and%20Fees/Historical%20Curriculum%20Tuition%20Rate%20Summary.pdf

retake two credits at the four-year college.[5] These overlap credits are costs to the system, and they are not counted as benefits in terms of enhanced human capital. Finally, I estimate that the full cost per credit at a two-year college is approximately one quarter of that at a four-year institution ($446 versus $1,682). Following recent trends, I assume that the costs of college will increase by 4 percent more than inflation over time.

The middle panel of Table A.1 shows the values for the labor market model (see Belfield et al., 2013). At initial enrollment, the average student is earning $21,600 annually. Over the next 20 years (the window of analysis), this income will grow with experience (3 percent per annum) and productivity growth (1 percent per annum). Students with more credits earn more: each additional two-year college credit adds 0.45 percent to earnings and each additional four-year college credit adds 0.65 percent. Separately, students with awards earn more: the sheepskin return to an associate degree is 8 percent over baseline earnings and the sheepskin return to a bachelor's degree is 15 percent. Thus, both credits and awards from four-year institutions are more valuable in the labor market than those from two-year institutions. Finally, each credit reduces a student's earning capacity by 0.05 percent during the time they are in college, so a student taking 30 credits each year would earn 15 percent less than baseline during their time enrolled in college.

Finally, we report a key parameter in Table A.1 (as well as the discount rate and window for analysis).[6] This key parameter is the probability that a student will complete a bachelor's degree conditional on their community college performance. Based on analysis of NCCCS data linked to information on four-year state colleges, I estimate that 53.4 percent of students who transfer with an associate degree will earn a bachelor's degree but that only 41.3 percent of students who transfer without an associate degree will do so. These degree completion probabilities are based on transfers to all public, private, and for-profit colleges. Students who transfer from NCCCS to the University of North Carolina (UNC) have much higher degree completion rates than these averages:

[5] These overlap credit estimates assume that every credit above 120 credits is an overlap credit. In the model, students who earn an associate degree and bachelor's degree accumulate 130 credits, so 10 are overlaps. Students who earn a bachelor's degree without transfer are assumed to accumulate 123 credits, so 3 are overlaps. These estimates are probably biased against the associate degree pathway because some of the overlaps might simply be extra, different credits that students chose to accumulate.

[6] Based on evidence found in Doyle (2011), I assume that the number of credits accumulated does not influence the probability of transfer.

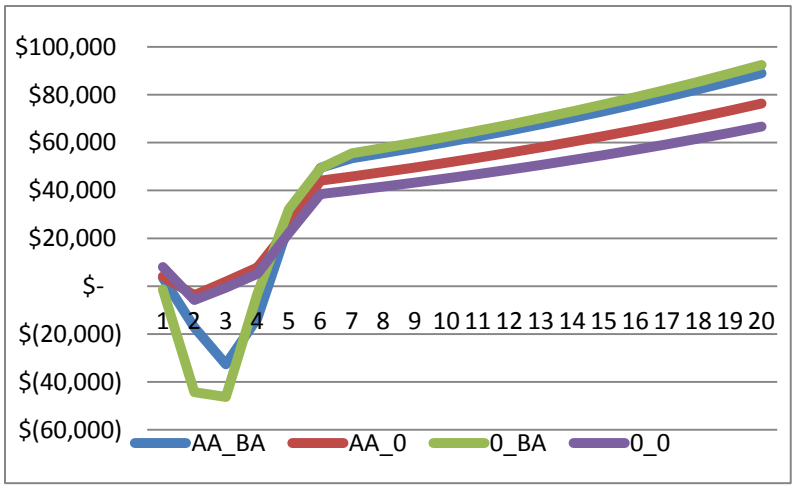
over 75 percent of those who transfer with an associate degree graduate from UNC with a bachelor's degree (UNC, 2013, Figure 5). But the key figure is the relative completion rate: students who earn an associate degree first are more likely to earn a bachelor's degree at any institution to which they transfer. Students who transfer from NCCCS to UNC without an associate degree graduate at rates of approximately 60 percent (UNC, 2013, Figure 5), which is a rate that is above the average for all transfers across all institutions but is still lower than if the students had entered UNC with an associate degree first. This differential is plausible given that the award-holders already have many more credits (and have much more knowledge about their own capacity for college). These probabilities determine a key element in this analysis: the likelihood of obtaining no credential at all.

These parameters are used for the baseline best-estimate model of benefits and costs across the four outcomes. Alternative values would of course affect the results, and so I perform sensitivity testing below. In addition, I examine changes to the options, such as when a student decides not to transfer early but then does not complete an associate degree.

3.2 Payoffs per Outcome

A simple illustration of the results is presented in Figure 1. This shows the results from following each of the four outcomes in terms of a net income stream, or individual earnings minus the total cost of college (undiscounted).

Figure 1
Annual Net Income Stream Over 20-Year Horizon:
Earnings Minus Costs of College



All four pathways thus result in negative or very low income streams over the first four years, as any earnings are offset by the costs of college. Students who do not earn a bachelor's degree [*AA_0* and *0_0*] generate relatively more income in the first five years, but by the sixth year those students who earn a bachelor's degree are earning relatively more, and this differential is sustained over the subsequent decade and beyond. The tradeoffs can be seen by comparing these streams. Outcome [*0_BA*] has higher initial costs than outcome [*AA_BA*], and its higher subsequent earnings do not appear to make up the difference. Outcomes [*AA_0*] and [*0_0*] have very similar initial costs, but by the sixth year the former [*AA_0*] diverges from the latter. Table 1 illustrates how the model can be useful in assessing which choice is preferred, given these income streams and the respective probabilities that each stream will occur.

Table 2 shows the discounted payoffs for each outcome in terms of benefits, costs, and net benefits relative to not enrolling in college. It is clear that each outcome generates substantial benefits over not enrolling and that the benefits far outweigh the costs, at least on average (with the recognition that some college dropouts can be extremely successful). However, there are substantial differences among the outcomes.

Table 2
Benefits and Costs of Possible Outcomes per Transfer Student

Choices/Outcomes	Present Value Benefits	Present Value Costs	Net Benefits (B−C)
Obtain associate degree before transferring			
Earn BA degree *[AA_BA]*	$764,400	$134,100	$630,300
Fail to earn BA degree *[AA_0]*	$656,200	$65,600	$590,600
Bypass associate degree before transferring			
Earn BA degree *[0_BA]*	$803,000	$180,300	$622,700
Fail to earn BA degree *[0_0]*	$571,600	$52,500	$519,100

Note. Present value benefits derive from higher income over 20 years as a result of college minus lost earnings during enrollment. Present value costs are public and private direct expenditures for enrollment.

The outcome with the highest benefits is that of a student who earns a bachelor's degree without first completing an associate degree ($803,000). A student who follows this path has accumulated most of his credits at a four-year institution, and these have high value in the labor market. However, the outcome where a student earns both an associate degree and a bachelor's degree also returns high benefits ($764,400).[7] On average, students whose terminal qualification is an associate degree earn significantly less than bachelor's degree holders ($656,200), but significantly more than students who end up with no award ($571,600).

The outcome with the highest cost is the one in which a student enrolls most intensively at a four-year institution ($180,300). The lowest cost outcome is for a student who obtains neither an associate nor a bachelor's degree ($52,500); such students do not accumulate many credits.

The final column of Table 2 presents the net benefits from each outcome. This column shows which outcome is the most valuable. The most preferred outcome occurs when the student earns both an associate degree and then a bachelor's degree: the lifetime net benefit of this outcome is $630,300. The next preferred outcome is when the student transfers to earn a bachelor's degree without first completing an associate degree; this outcome has the highest benefits but also the highest costs (with net benefits of

[7] These estimates show very little difference in the earnings profiles of bachelor's recipients across those who attended two-year institutions and those who did not. This equivalence was also found by Light and Strayer (2004, Table 5).

$622,700). The third best outcome is when the student earns an associate degree but despite transferring does not complete a four-year degree (net benefits of $590,600). Finally, the least preferred outcome is when the student transfers without an associate degree and does not complete a bachelor's degree (net benefits of $519,100). The difference between the most and least preferred outcomes is substantial ($111,200)—it therefore matters a lot which college outcome a student obtains.

3.3 Calculating the Returns to Choices

The important statistic is which choice yields the highest return *ex ante*, or before the final outcome is known. This depends on the net benefits of each outcome times the probability of it occurring. Table 3 shows these calculations.

Given an associate degree from NCCCS, outcome [*AA_BA*] is weighted 0.534, which is the likelihood such a student will earn a bachelor's degree. Correspondingly, outcome [*AA_0*] is weighted 0.466. Using the results from Table 2, the benefits of college under this scenario are $714,000 and the costs are $102,200; the net benefits are therefore $611,800.

Table 3
Benefits and Costs of Weighted Outcomes per Transfer Student

Choices/Outcomes	Present Value Weighted Benefits	Present Value Weighted Costs	Weighted Net Benefits (B−C)
Obtain associate degree before transferring	$714,000	$102,200	$611,800
Bypass associate degree before transferring	$667,200	$105,300	$561,900
Difference of *[AA_]* over *[0_]*			
Amount	+$46,800	−$3,100	+$49,900
Percentage	+7 percent	−3 percent	+9 percent

Note. Results from Table 2 weighted according to probability of completing a bachelor's degree.

Without an associate degree, outcome [*0_BA*] is weighted 0.413, which is the likelihood an early transfer student will obtain a bachelor's degree. The more likely outcome, weighted at 0.587, is that this transfer student will fail to get a bachelor's degree and so terminate her postsecondary education with no award. Again using

estimates from Table 2, I calculate the weighted benefits of this choice at $667,200 and the weighted costs at $105,300. The weighted net benefits are therefore $561,900.

The more valuable choice is to transfer with an associate degree first. This choice has higher benefits ($46,800 or 7 percent higher) and it also has slightly lower costs ($3,100 or 3 percent lower). Accordingly, it has higher net benefits: the difference is $49,900 or 9 percent more than the early transfer option. Therefore, the net benefits of obtaining an associate degree before transfer significantly exceed the net benefits of transferring without completing an associate degree first. The costs of the two choices are quite similar (at around $105,000), but it is useful to note that students who stay longer in the community college system are not costing the state any more than if these students were to transfer earlier (and they are probably costing less). The gain in net benefits is economically meaningful—it is worth approximately half the entire amount spent per student during the student's entire time in college.

3.4 Sensitivity Testing of the Returns to Choices

The above results strongly suggest that completing an associate degree before transfer makes economic sense. However, these results depend on a set of assumptions across outcomes, including number of credits earned, returns to each credit, sheepskin returns, award probabilities, college costs, and the discount rate. Therefore, I apply sensitivity testing to see how alternative assumptions would change the results. Specifically, I focus on alternative assumptions that should reduce the returns to the associate degree outcomes. The results from these alternative assumptions illustrate the robustness of the finding that attaining the associate degree is the preferred choice.

Table 4 presents a series of sensitivity tests and compares these with the baseline benefits from Table 3. The baseline advantage of the choice to earn an associate degree before transferring is 9 percent, which means that the net benefits of this choice are 9 percent higher than the net benefits of bypassing this choice and transferring before attaining an associate degree. Alternative assumptions show that this advantage is quite robust.

Table 4
Sensitivity Tests for Weighted Net Benefits

	Weighted Net Benefits			
	Obtain Associate Degree Before Transfer *[AA_]*	**Bypass Associate Degree Before Transfer *[0_]***	**$ Advantage of Choice *[AA_]***	**% Advantage of Choice *[AA_]***
Baseline	$611,800	$561,900	$49,900	9%
Sensitivity tests				
S1. All credits equal in labor market at 0.65%	$672,100	$582,500	$89,600	15%
S2. Discount rate is doubled to 7%	$421,800	$384,000	$37,800	9%
S3. Observe 10 year window (not 20)	$216,200	$198,100	$18,100	9%
S4. AA degree holders retake twice as many credits (20) at four-year college	$600,400	$561,900	$38,500	7%
S5. Early transfer students do not retake any credits (from 2)	$611,800	$570,600	$41,200	7%
S6. Reduce sheepskin effects by 50 percent to 4% and 7.5%	$589,400	$551,500	$37,900	7%
S7. Probability of BA equal across both choices	$610,400	$570,900	$39,500	7%
S8. No AA degree student transfers to four-year college	$599,000	$561,900	$37,100	7%
S9. Four-year college 50 percent cheaper	$647,200	$609,400	$37,800	6%
S10. Earnings loss when in college is quadrupled to 4% per credit	$523,500	$499,300	$24,200	5%
S11. Four-year credits twice as valuable as two-year credits	$641,000	$615,100	$25,900	4%

The first test assesses how the results would differ if the model assumed that two-year and four-year credits have the same labor market value. This assumption is not implausible, at least for students who begin at community college, and in fact this credit equivalence has been found by Kane and Rouse (1999) and Hilmer (2000). As shown in row S1, raising the value of two-year college credits to equal those at four-year colleges would increase the advantage of earning an associate degree to 15 percent.

The second check involves the discount rate (the value of terminating college early). Perhaps students who drop out earlier will have higher earnings at an earlier date, so it may make sense to attempt a bachelor's degree as soon as possible even if the

student fails. However, as shown in row S2, raising the discount rate has no effect on the relative advantage of earning an associate degree, which remains at 9 percent (even as the net benefits are generally lower). The same conclusion is found when I reduce the window of analysis (S3). Instead of looking over a 20 year horizon, I reduce it to 10 years: this has no effect on the advantage, which remains at 9 percent, although of course the net benefits are much smaller in dollar amounts.

The associate degree advantage is reduced under some different assumptions. One important issue is whether students who transfer to a four-year college do so with invalid credits. It may be better to transfer early so as to minimize re-taking of two-year college credits. The baseline model assumes that associate degree transfer students must retake 8–10 credits and that transferring early necessitates only two overlap credits. Test S4 assumes that students who earn an associate degree and then a bachelor's degree must re-take 20 credits, which implies a very high overlap. The advantage falls but remains significant at 7 percent over early transfer. Similarly, when the model assumes that early transfer students do not have to retake any credits at the four-year institution, the advantage remains at 7 percent (test S5).

A second issue is how important it is to actually earn a degree. Studies have consistently shown that it is better to complete a program of study, not only because completion necessitates greater credit accumulation but also because the award conveys sheepskin effects in the labor market (Belfield & Bailey, 2011). Yet even when I arbitrarily reduce the sheepskin effects for both associate degrees and bachelor's degrees by half, the advantage remains significant (at 7 percent, see test S6).

Third, the decision to transfer depends significantly on the likelihood that the student will complete a bachelor's degree. I assume that, despite the fact that associate degree holders have much more college experience when they transfer, the completion rate is equal at 50 percent for all transfer students (test S7). Despite this being an improvement of one-quarter in the completion rate for early transfer students, the advantage remains robust at 7 percent. A related issue is whether the associate degree student will in fact transfer. A student who wants to transfer early to a four-year college may be persuaded to stay and earn an associate degree with the intention of then transferring. But this student may then terminate his postsecondary education after

completing the associate degree. Test S8 shows that the advantage remains significant even when associate degree holders never in fact transfer. This result is useful because it implies a decision-making heuristic of "Stay to complete an associate degree—even if you decide not to go on to a four-year college afterward, the returns are still higher than those for early transfer."

Other assumptions do reduce the advantage of completing an associate degree. These assumptions are more severe, and there is little evidence they would be valid for most students. For example, if the four-year college is 50 percent cheaper than the average, then the advantage of earning an associate degree before transfer falls to 6 percent (test S9). Alternatively, if the earnings loss when in college is extremely high—at 4 percent lower earnings per credit—then the advantage falls to 5 percent (test S10). Finally, if the labor market value of four-year credits is twice as valuable as two-year credits, then the advantage falls to 4 percent (test S11).[8]

Overall, the advantage from obtaining an associate degree before transfer remains robust. It would certainly be difficult to make the case that it is better for a student to decide to transfer early, based on these findings. However, another way to frame the decision is to look at what assumptions would be needed to make the two choices equivalent in terms of their net benefits.

I identify six assumptions that would—if they were valid—make the choices equivalent (i.e., the net benefits would be the same across earlier transfer and later transfer with an associate degree). These assumptions and the results are given in Appendix Table A.2. One assumption is that the bachelor's degree completion rate of early transfer students would need to be 90 percent (i.e., more than double the current rate). A student would need to be almost certain of completing the bachelor's degree to decide to forgo the associate degree (see row A1 in Table A.2). A related assumption is this: a student would have to have a probability of completing a bachelor's degree with early transfer that is four times as great as the probability of completing a bachelor's

[8] Finally, the model assumes that all students transfer to a public four-year college. I recognize that many students transfer to private colleges. This assumption is imposed because of data restrictions: the data are not available for the credit accumulation and completion rates at private colleges (or their costs), separated according to whether the student has first obtained an associate degree. However, the majority of community college students do transfer to public institutions.

degree given possession of an associate degree (A2).[9] A third assumption is that the cost of community college would rise by a factor of 3.35: if community colleges became very expensive (relative to four-year colleges), it would be more beneficial to transfer early (A3). Fourth, if the returns to credits at four-year colleges became much more valuable, it would be better to transfer early. This change in value would have to be a factor of 3.3 (A4). Fifth, if the student can work at a very high-paying job during their college years, then it would be more sensible to transfer early (and in fact drop out earlier). However, this labor market tradeoff would have to be very steep: only if college credits reduce college labor market earnings by 7 percent each will the two choices be equivalent (A5). By assumption, taking 15 or more credits in a given year (i.e., being more than half time) would have to preclude any form of employment.

A sixth assumption is that a student would not complete the associate degree at all. It is likely that some of the students who transfer early would not have been able to complete an associate degree anyway (although Light and Strayer [2004] reported that transfer students typically have above average ability). I test the implications of this non-completion scenario by calculating the net benefits for students who, after 23 community college credits, drop out of all types of college. I then include these students in the group of students who are completing an associate degree before transfer [*AA*_]. I estimate that students who leave college after accruing 23 credits would have to comprise 45 percent of the associate degree group in order for the two choices to have equivalent net benefits. Expressed differently, students should be encouraged to earn an associate degree before transferring only if it is expected that these students would have an associate degree completion rate of 55 percent or above. Across the general community college population, this completion rate appears high (although perhaps not so high for students who already have 23 community college credits). However, in the alternative choice I assume that 41 percent of transfer students would complete a bachelor's degree. (Plus, I assume that the students exit immediately after "not transferring"; it is likely that they would accumulate some more credits before dropping out).

[9] In fact, the probability of completing a bachelor's degree conditional on having an associate degree is less critical than might be initially supposed. If more students fail to attain a bachelor's degree, this reduces the benefits but also the costs of college.

Overall, it is unlikely that these assumptions would hold for most community college students. Moreover, even these assumptions only mean that the choice to transfer early is equivalent to the choice to earn the associate degree first. Finally, I note that these results are calculated from a social perspective—looking at all the costs and all the labor market benefits. Yet it is also the case that the conclusions are unchanged if I adopt the student's perspective and consider only tuition payments and labor market benefits. Obviously, given these calculations, the student net benefits significantly exceed the social net benefits.

4. Discussion and Conclusion

Based on analysis of the data on community college students in North Carolina, there is certainly no evidence that too many students are being hindered from transferring to a four-year college. Instead, a much stronger case can be made that too many students are starting at community college and then prematurely transferring to a four-year institution. In so doing, these students forgo the associate degree, which, as has been established in multiple studies (Belfield and Bailey, 2011), imparts large benefits in the labor market. From the state's perspective, having more students remain in and complete associate degree programs conveys a double advantage: not only will North Carolina students experience greater labor market benefits, but postsecondary expenditures will be lower (by approximately 3 percent).

The analysis conducted in this paper is reflective of the fact that the question "What is the optimal time for a community college student to transfer to a four-year institution?" is difficult to answer. Some students are eager to transfer to a four-year institution as soon as possible; others recognize the value of accumulating community college credits and gaining a valuable credential first. Even when graduation rates for all transfer students are high, such as those for students moving between NCCCS and UNC, the key factor to consider is the relative graduation rates of award-holders and non award-holders. Deciding when to transfer requires consideration of multiple factors and how these factors interact; the best way to make this decision is therefore to place the factors in a systematic framework. More salient than the multiplicity of factors, however, is the

likelihood that students will not know how important each factor is. Students are unlikely to know with precision the labor market returns to particular college pathways. They may also be unsure of their own capacity, willingness, and preferences for studying at a four-year versus a two-year college. Critically, this uncertainty may be mitigated by longer enrollment at the two-year college: students will then have more knowledge about their own likelihood of completion and so make a more successful transfer decision (Stinebrickner & Stinebrickner, 2012). In fact, the findings in this paper are consistent with results from other research that indicates that students transfer too early because they are overconfident about their ability to complete a four-year degree (Zafar, 2009).

Community colleges also play an important role in student transfer decisions. Instructors and counselors provide direct guidance. In addition, the structure of college programs and the availability of courses may create incentives for students to transfer early. Alternatively, colleges may be under pressure to increase award completion rates and so encourage students to complete program requirements at the community college. Similar to students' circumstances of having incomplete information about a variety of important factors relevant to the transfer decision, colleges must consider many factors that are typically hard to observe in order to provide sound guidance to students. The analysis undertaken in this paper suggests that community colleges—and the state systems of which they are a part—may want to create stronger incentives for making the completion of an associate degree before transfer a priority among students.

It is nonetheless important to keep in mind that these results are based on averages across entire community college populations. Also, the results assume that if more students stay in community college rather than transfer, then the composition of courses will be unchanged. One would not expect these same results if students who would have otherwise transferred early without an associate degree were simply to accumulate lower-level credits and/or take the shortest or easiest route to any associate degree award. Therefore, it is important to consider the resource implications and availability of high-value courses for students who might have otherwise transferred.

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Appendix

Table A.1
Parameter Values for Baseline Model

Parameters	Value in Baseline Model
College enrollment and costs	
Credits at 2-year/4-year college *[AA_BA]*[e]	70/60
Credits at 2-year/4-year college *[AA_0]*[e]	70/20
Credits at 2-year/4-year college *[0_BA]*[e]	23/100
Credits at 2-year/4-year college *[0_0]*[e]	23/25
Overlap credits at 4-year college *[AA_BA]*[e]	10
Overlap credits at 4-year college *[AA_0]*[e]	8
Overlap credits at 4-year college *[0_BA]*[e]	2
Overlap credits at 4-year college *[0_0]*[e]	2
Cost per 2-year credit[f]	$446
Cost per 4-year credit[f]	$1,682
Rate of net inflation of college costs[h]	4%
Labor market	
Average earnings of NCCCS student at baseline[b]	$21,600
Return to years of experience[b]	3%
Productivity growth [a]	1%
Returns per 2-year college credit[b, c, d]	0.45%
Returns per 4-year college credit[b, c, d]	0.65%
Sheepskin returns to associate degree beyond credits[b]	8%
Sheepskin returns to BA degree beyond credits[b]	15%
Earnings loss per credit[b]	0.5%
Other	
Discount rate[g]	3.5%
Probability complete BA if transfer with AA degree[e]	0.534
Probability complete BA if transfer without AA degree[e]	0.413
Years for analysis (beginning with first enrollment)	20

Note. With multiple superscripts, averages are used.
[a]Bureau of Labor Statistics [www.bls.gov/lpc/]. [b]Belfield et al. (2013). [c]Kane and Rouse (1999). [d]Marcotte (2010). [e] Email communications, M. Shen and S. W. Cho, January 2013. Includes transfers to all institutions in all public, private, and for-profit sectors. [f]IPEDS data from www.nces.ed.gov (2012). [g]Moore et al. (2004). [h]Projection based on HECA index beyond general inflation.

Table A.2
Assumptions Needed to Yield Equivalent Weighted Net Benefits Across Choices

	Weighted Net Benefits			
	Obtain Associate Degree Before Transfer *[AA_]*	**Bypass Associate Degree Before Transfer *[0_]***	**$ Advantage of Choice *[AA_]***	**% Advantage of Choice *[AA_]***
Baseline	$611,800	$561,900	$49,900	9%
<u>Equivalence assumptions</u>				
A1. Probability that student who transfers without AA degree earns BA degree must equal 90%	$611,800	$611,800	$0	0%
A2. Probability that student who transfers without AA degree earns BA degree must be four times that of student who transfers with AA degree	$598,500	$599,600	($1,100)	0%
A3. Cost at community college must increase by factor of 3.35	$538,100	$537,800	$300	0%
A4. Credits at four-year college must be worth 3.3 times as much as credits at two-year college	$536,500	$536,100	$400	0%
A5. Each college credit must reduce earnings during enrollment by 7%	$447,800	$445,800	$2,000	0%
A6. Forty-five percent of students do not complete their AA degree	$562,600	$561,900	$700	0%