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*Success in Community College:
Do Institutions Differ?*

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Abstract

Community colleges are complex organizations and assessing their performance, though important, is difficult. Compared to four-year colleges and universities, community colleges serve a more diverse population and provide a wider variety of educational programs that include continuing education and technical training for adults, and diplomas, associates degrees, and transfer credits for recent high school graduates. Focusing solely on the latter programs of North Carolina's community colleges, we measure the success of each college along two dimensions: attainment of an applied diploma, or degree; or completion of the coursework required to transfer to a four-year college or university. We address three questions. First, how much variation is there across the institutions in these measures of student success? Second, how do these measures of success differ across institutions after we adjust for the characteristics of the enrolled students? Third, how do our measures compare to the measures of success used by the North Carolina Community College System? We find that most of the system's colleges cannot be statistically distinguished from one another along either dimension.

1. Background

Beginning in the middle of the 20th century, with post-WWII industry requiring workers with enhanced technical skills, community colleges assumed an increasingly important role in the nation's postsecondary education. More recently, community colleges have enhanced this role with increased emphasis on the mission of facilitating educational opportunities for degree completion (Dougherty and Townsend, 2006). The mission of community colleges has expanded to include short-term training programs designed to serve the interests of local business, courses to enhance the skills of adults, programs to allow high school dropouts to obtain a high school equivalency degree (a GED), and programs intended for recent high school graduates interested in gaining skills for a job or preparing for further education.

As a proportion of total college enrollment, public two-year institutions have grown steadily, reaching 20 percent of all enrollees in 1967 and 35 percent by 2008.¹ Among the states, North Carolina, which provides the context for the current study, has been a leader in the development of and reliance on these community colleges. Compared to that 35 percent share for community colleges in the nation, in North Carolina they accounted for 40 percent of all postsecondary enrollments in 2008.² In 2009 the Obama Administration highlighted the central role of community colleges when it announced what it termed the American Graduation Initiative, an effort to “reform and strengthen community colleges” (U.S. White House, 2009). Community colleges are also the focus of reform efforts funded by private foundations, such as Achieving the Dream, a nonprofit organization “dedicated to helping more community colleges succeed.”³

Efforts to strengthen the potential for community colleges to contribute to more effective education for the nation's workforce also raise the central question of how to evaluate their

¹ NCES, *Digest of Education Statistics 2009*, Table 190.

² *Digest of Education Statistics 2009*, Table 214. In full-time-equivalent units, the public two-year share of all postsecondary enrollments in the U.S. was 27%, compared to 31% in North Carolina (Table 219).

³ Website for Achieving the Dream, <http://www.achievingthedream.org/>, 8/15/11.

performance. In its 2006 report, a commission put together by Secretary of Education Margaret Spellings castigated higher education for ignoring technological advances in teaching and urged the development of “new performance benchmarks designed to measure and improve productivity and efficiency” (U.S. Department of Education, 2006, pp. 14, 19). Merely adopting the approach now accepted at the K-12 level – assessment regimes based on standardized tests – is widely viewed as impractical for postsecondary institutions. Yet the Spellings Commission spoke for many observers in calling for the development and use of measures that would make it possible to “weigh and rank comparative institutional performance” (U.S. Department of Education, 2006, p. 20). For example, an institution’s graduation rate could be used as a measure of its ability to produce successfully-trained graduates, ready to enter the labor market or continue with further training.

Congress in effect endorsed this indicator of quality when, in the 1990 Student Right to Know Act, it mandated that postsecondary institutions report graduation rates.⁴ The Act required that institutions calculate and disclose a precisely and uniformly defined graduation rate: the percentage of first-time, full-time students who graduate within 150 percent of the “normal” completion time for a degree at the institution where they first enrolled. In the case of four-year institutions, for example, this is the percentage of first-time students who graduate within six years of first enrolling. When Congress was debating the bill, in 1990, Senator Edward Kennedy argued in favor of such quantitative outcome measures, stating that transparency would drive improvement: “Sunlight is the best disinfectant. Once colleges begin disclosing this vital information, those with the poorest records will be under the greatest pressure to improve.”⁵

⁴ The Student Right to Know Act, also known as the “Student Right-to-Know and Campus Security Act” (P.L. 101-542), was passed by Congress on November 9, 1990. Title I, Section 103, requires institutions eligible for Title IV funding to calculate completion or [graduation rates](http://nces.ed.gov/ipeds/glossary/index.asp?id=625) of certificate- or degree-seeking, full-time students entering that institution, and to disclose these rates to all students and prospective students. <http://nces.ed.gov/ipeds/glossary/index.asp?id=625>, 12/27/1.

⁵ Irvin Molotsky, “Congress Pressing Colleges to Give Figures on Crimes,” *New York Times*, October 8, 1990.

One nagging worry about using a measure like this is that some institutions enroll students with much stronger educational backgrounds than others, giving those institutions a built-in advantage in achieving high graduation rates that might have little to do with their own effectiveness in educating students. This worry is especially acute for community colleges. Compared to four-year colleges and universities, community colleges serve a more diverse population with many students attending part time and trying to balance school, family, and work obligations. Community colleges also provide a wider variety of educational programs than do most four-year institutions. Not only do they offer two-year associate's degrees, they provide course work for students hoping to transfer to four-year institutions. In addition, they offer a smorgasbord of course offerings ranging from specialized certificates and other vocational training to general-interest courses emphasizing avocation more than vocation. As a stepping stone to four-year college, their role has been debated vigorously (Brint and Karabel, 1991). What is clear, however, is that their students have high dropout rates, low graduation rates, and long periods for completing degrees.

In this context of anxiety and ambition to pursue educational attainment through community colleges, policy makers and researchers are increasingly struggling to develop appropriate measures of success. Some of the prior research on community colleges has focused on student trajectories and the personal challenges they face in completing degrees. Instead, our attention in this paper is on success at the institutional level. We ask whether there are important differences across community colleges in North Carolina that make personal success for students more likely at some colleges than at others. Leaders in the North Carolina Community College System (NCCCS) have been addressing this question for over a decade. Under pressure from the state legislature, the community college system in 1999 adopted a dozen explicit performance measures. In 2007 the list was shortened to eight "core indicators of student success." They are: a) progress of basic skills students; b) passing rates on licensure and certification exams; c) performance of college transfer students; d) passing rates of students in

developmental courses; e) success rates of developmental students in subsequent college-level courses; f) satisfaction of program completers and non-completers; g) curriculum student retention, graduation, and transfer; and h) client satisfaction with customized training.⁶ As it articulates in the annual *Critical Success Factors* report, the NCCCS has developed explicit indicators of success, and it backs them up by specifying quantitative performance measures. Among these “core indicators” is the graduation rate as required and defined by the Student Right to Know Act. Although well-intentioned, these legislative efforts to monitor community colleges provoke the worry noted above: colleges that appear to be the most successful along any of these dimensions may be the ones who enroll the best prepared students, rather than those that educate students the most effectively.

Our purpose in this paper is to extend the comparison of institutional success that is contained in assessment efforts such as the federal Student Right to Know Act and North Carolina’s *Critical Success Factors*. We focus only on the curriculum programs that are intended primarily for recent high school graduates, and we use measures of individual student success to assess the institutional success of each North Carolina community college. Specifically, we define two measures of individual success within a community college: a) the attainment of an applied diploma or degree and b) the completion of coursework required to transfer to a four-year college or university. We address three questions. First, how much variation is there across institutions in our measures of institutional success? Second, how much of this variation is attributable to the characteristics of the students enrolled? Third, how do our measures compare to those used by NCCCS?

While we do find evidence of potentially important variation in success rates across colleges, particularly once we adjust for observed student characteristics, our measures of success are statistically imprecise. While conventional *F*-tests permit us to reject the hypothesis that all observed variation across colleges is attributable to sampling error, our test statistics are driven by a relatively small

⁶ *Critical Success Factors*, 2009, p. 5.

number of outlier colleges. We further find that our measures of success are poorly correlated with metrics used in official NCCCS publications. The results illustrate how difficult it is to estimate educational effectiveness in community colleges.

Section 2 of the paper discusses the concept of institutional success with attention to the challenges of measuring it, section 3 describes our data, and section 4 quantifies institutional success for most of the state's 58 community colleges. In section 5, we ask whether any easily observed characteristics of the institutions themselves can account for the variation in success and in section 6 we examine correlations among four measures of success. Section 7 concludes the paper.

2. Conceptual Issues in Measuring Institutional Success of Community Colleges

In this section we briefly explore the concept of institutional success for a community college and discuss how measures of success may be operationally defined.⁷ Like all forms of education, community college represents an investment – by the student and the public taxpayers who subsidize that education – in return for future benefits that will accrue to the student or to the broader society. Some of these benefits are decidedly private: they go to the student in the form of access to higher paying, more rewarding jobs as well as the opportunity to pursue further education. They also include a host of non-pecuniary benefits, from better health to happier marriages (Oreopolous and Salvanes, 2011). The wider community gains as well, enjoying the benefits of a stronger and more flexible local economy that comes with a well-trained local labor force, and potential savings in the form of lower expenditures on public services such as health care or prisons.

Ideally, one might compare the success of one community college to another based on the magnitude of the benefits each generates. Measuring these benefits is difficult, if not impossible, for a

⁷ The conceptual framework for this section is based on the more general discussion of measuring education quality in Ladd and Loeb (in press).

number of reasons. First, the very definition of success is contentious because of the varied roles that community colleges play. In particular, there is dissatisfaction with the recent policy of evaluating colleges on degree attainment because many students enter not with the goal of getting a degree but rather of obtaining the course credits needed to transfer to four-year institutions. Another confounding issue is that students may complete all or most of the requirements for a diploma or certificate but not actually apply for this credential if it is not required for a job. A second challenge in measuring success is the absence of good data on many of the outcomes of interest. Success in the labor market, for example, can in principle be measured through careful analysis using earnings data, but data of the required detail and quality are often not available. Third, measuring success is complicated by the problem of attribution. Even if some of the outcomes, such as higher wages, could be measured, it would be difficult to determine how much of the additional wages are attributable to the education provided by the community college, how much to the background characteristics of the student, and how much to the vitality, or lack thereof, of the local labor market.

For these reasons, analysts and policy makers have little alternative but to rely on one or more imperfect proxy measures for success, each of which has strengths and weaknesses. These proxies may be of three types: direct market outcomes, measures of student progress in the form of graduation rates or credits received, and input measures.

In its *Critical Success Factors report* (NCCCS, 2009), the NCCCS uses the first of these approaches: direct measures of the employment success of community college completers. For example, the NCCCS uses as one measure the percentage of community college completers who are employed within one year of last attendance. Another measure is the percentage of a sample of businesses that employ individuals trained or educated by a community college who indicated that they are satisfied with the quality of those employees as that quality is related to the training or education provided by the community college.

The advantage of such measures is that they directly reflect the types of benefits the community colleges are trying to produce. The disadvantages include the fact that they represent only a portion of the total benefits generated, the satisfaction measure is much better suited to programs providing specific training to a well identified group of workers than to the general education programs of the community colleges, the evaluation data may be expensive to compile, and these measures suffer from the attribution problem mentioned above.

The second approach to measuring institutional success is to look at students' progress through their required courses of study, with a particular focus on graduation rates, as promoted by the federal government.⁸ The main advantages of such progress or graduation measures are their apparent simplicity and their parallel to the graduation rates for four-year institutions. Using the 150 percent metric accounting period alluded to earlier, the time frame would be six years for four-year institutions and three years for two-year associate's degrees at community colleges. But graduation rates are flawed as a measure of community college success in a number of ways, some of which have been highlighted by an effort of six states to pilot a better approach (Achieving the Dream, n.d.). Among the flaws of the graduate rates measure is that it does not track the many part-time students enrolled in community colleges; does not take into account that a major mission of many community colleges is to give students an opportunity to transfer to a four-year college; and allows too little time for graduation given the challenges that many community college students face in balancing school, family, and possibly work obligations.

Although the attribution problem also arises for this approach, it is easier to address than is the case for the market outcome approach, provided data are available on the background characteristics of the students. Specifically, one would want to adjust any measures of graduation rates or persistence through college for student background characteristics that are predictive of student success. If one did

⁸ Besides being included in the Education Department's College Navigator, by virtue of the Student Right to Know Law, they are also used, for example, by Achieving the Dream and Complete College America.

not do so, community colleges that served large proportions of economically disadvantaged students, students with low academic ability, or those who attended weak high schools, would typically look less successful than colleges that served more advantaged students.

The third approach is simply to measure institutional quality by the quantity and quality of its inputs relative to the number of students served. By this proxy, community colleges with similar enrollments that have more resources, more highly qualified faculty, or more student support services would be judged higher quality than those with fewer resources. But even this apparently straightforward measure would be difficult to implement. One problem is that community colleges offer differing combinations of programs with differing resource requirements, leading to inappropriate comparisons of apples and oranges. Another problem is that the focus on inputs provides no information on how effectively they are deployed toward the desired goals. Finally, any measure of this type would need to be adjusted for the types of students enrolled. Students who require remedial courses, for example, may put greater demands on the community college than other students. The one advantage of this input approach is that it avoids the attribution problem associated with a measure based on outcomes.

In section 4, we use a variant of the second approach, evaluating student progress through required courses of study, to measure the relative success of the community colleges in North Carolina. In using this approach, we take into account the two important and distinct educational functions pursued by most community colleges with regard to the recent high school graduates. The first is the preparation of students directly for the workplace, through applied training that leads to diplomas and certificates as well as two-year associate's degrees. The second, and rather different, function is preparing students for further education by way of transfer to a four-year college or university. We devise measures of success based on each of these two functions: a measure of success in applied training, calculated in terms of applied degrees or diplomas, and a measure of success in terms of

readiness for transfer, calculated in terms of associate's degrees or transferable credits earned. We use these gauges of progress for measuring community college success in part because we do not have access to the labor market outcome data that would be required for the first approach. Furthermore, even if we had such data, addressing the attribution problem would be a challenge. Fortunately, our ability to link community college students with their school records, as we describe in the next section, means that we have good information on the student background characteristics needed to address the attribution challenge that arises with success measures based on progress through college.

3. Data and Methodology

The data for this study refer exclusively to the community college system in North Carolina. As was the case across the United States, community colleges in North Carolina began springing up shortly after World War II. By 1957 the state had established two publicly funded postsecondary systems: one composed of industrial education centers and one made up of two-year junior colleges emphasizing arts and sciences. Six years later, the two systems were consolidated into a unified Community College System that by 1979 had grown to encompass the 58 institutions in existence today. The 58 community colleges in the North Carolina Community College System (NCCCS) offer a wide range of programs, organized under broad categories. These are defined as: continuing education, comprised primarily of non-credit courses; specialized programs, targeting economic opportunities in the community; and curriculum programs, involving courses taken for credit toward the associate's degree, diploma, certificate, or college transfer. The current study focuses exclusively on the success of the institutions' curriculum programs, which in 2009 accounted for approximately 37 percent of community college student enrollment state-wide.

Between 1998 and 2009, enrollments in the community college system increased by 47 percent, as shown in Figure 1. By comparison, enrollment at the 16 four-year colleges and universities in the University of North Carolina system was lower but grew at about the same rate.

The analyses in this study require data that allow us to follow individual students over time as they progress from high school to community college. For that purpose, we use data from both the North Carolina public school system and the North Carolina Community College system that were merged and prepared by the North Carolina Education Research Data Center (NCERDC) at Duke University, under an agreement between Duke University and the NC Community College System. The NCERDC linked student-level records from its archive with student records provided by the NCCCS Data Warehouse. Information on institutions was also drawn from these administrative sources as well as from the data files maintained by the National Center for Education Statistics. Thus, information on the public school experiences of students, including test scores, was integrated with information on the experiences of students enrolled in the curriculum programs of NC community colleges between fall 2001 and spring 2009.

The analyses presented in the current paper are based on information for one cohort of students – those who were enrolled in a North Carolina public school and took the state’s 8th grade End of Grade test in math in 1999 and who first enrolled in a North Carolina community college curriculum program any time between fall 2003 and fall 2004. If these students made normal progress in subsequent years after eighth grade, they would have been in 12th grade in 2002/03 and would have graduated from high school in 2003. Since some students are retained in grade, we include in the analyses those students who graduated from high school in either the spring of 2003 or 2004. There were 89,201 students in this cohort. We restrict ourselves to a single cohort because we wish to take advantage of the linked student records while assuring that we have sufficient data to construct measures of successful community college outcomes. We had to further limit the study cohort by

excluding students who attended high school in Wake or Mecklenburg counties, or who first registered in a community college in Wake or Mecklenburg counties, because of incomplete data for those two institutions. We also excluded students enrolled in programs not leading to a formal college-level award, such as those completing a high school degree through college coursework.

The student-level public school and college variables included in our statistical analyses are described in Appendix 1. While the public school information is complete, and we are reasonably certain that we also have complete community college course information for our students, we are still missing some degree information related to program completion. That is true because our degree completion totals do not include diplomas for which students, even those who had completed all the requirements, did not officially apply. Also, while students may move between colleges, we do not take this movement into account; that is, we assume students remain in the community college where they first registered. Appendix 2 contains the descriptions of the community college institution-level variables that are included in the analyses described in sections 4 and 5.

4. Quantifying Variation in Success Rates across Colleges

We adopt a two-dimensional measure of institutional success – “applied” success and “transfer” success. The first measure includes students who obtained, within four years of enrolling in their first course, a diploma or applied associate’s degree in any one of the vocational areas offered in the state’s community colleges. Examples include the diplomas in culinary arts and hospitality management as well as the Associate’s Degree in Applied Science in such fields as criminal justice technology or early childhood education. The other measure of success includes students who attained an associate’s degree (in arts, science, fine arts, or general education) or successfully completed 10 transferable courses or about 30 transferable credits also within four years of their initial enrollment. Because students need not complete a degree in order to transfer to a four-year college or university, it is

important to count as successful a student whose progress in courses completed made transferring a reasonable option, even if no associate's degree was obtained. Some students, in fact, achieve success by both measures.

Figure 2 shows for each of the state's community colleges the percentages of the 2003-2004 entering cohorts who were successful according to one of the two measures. The figure shows that the success rate for the applied outcomes in the state's community colleges ranged roughly from 5 percent to 30 percent. For the measure of transfer success, the rates ranged from about 8 percent to 35 percent. If these measures of success are taken at face value, the graph suggests both that institutions specialize and that they differ in their effectiveness. Specialization is suggested by the loosely negative slope of the points, which indicates that some community colleges – those near the top and left, such as college 894 – had high transfer success rates but low success in applied degrees, and those on the right and bottom were high in applied success but low in transfers. One college that stands out on the applied dimension, but is only middling on the transfer measure, is college 846. To the extent that colleges are arrayed southwest to northeast on the graph, however, there is the strong presumption of differences in effectiveness, with those to the northeast dominating those to the southwest on both criteria.

Yet these comparisons are surely biased as measures of institutional effectiveness in at least one regard. To the extent that the entering students attending some colleges are academically stronger or financially better off, those colleges would appear to have a natural advantage in achieving higher rates of success than colleges with less prepared or economically disadvantaged students. To remove this bias from our comparisons, we control for the differences in the “inputs” at each institution using information from the detailed administrative records on the middle and high school characteristics of students that are likely to be predictive of their subsequent success in community college.

Table 1 reports estimates based on ordinary least squares regressions estimated for individual students, in which the dependent variable is either success at applied outcomes or success at transfer

outcomes. The regressions show consistent and predictable associations between student success and a number of their personal characteristics. First, a student's 8th grade math end-of-grade test score is predictive of higher success along both dimensions. Second, females are more likely than males to be successful by either metric. Third, students whose parents graduated from college are less likely to be successful at applied outcomes and more likely to be successful at transfer outcomes than students whose parents terminated their education after graduating from high school (the omitted category for this categorical variable). Fourth, students who were ever eligible to receive free or reduced price lunch, which is commonly used as a measure of low family income for students within the K-12 system, were less likely to be successful than those with higher family incomes. In the analysis below, we control for these four personal characteristics that are predictive of college success to produce measures of institutional success that neutralize their influence. Thus, our adjusted institutional success measures are not influenced by the relative affluence or academic preparedness of a college's student population. In addition to these four variables, the regressions also accounted for differences by race and ethnic group. Compared to white students (the omitted category), black students were less likely to be successful by either measure, and Asian students were less successful in applied outcomes.

Using these estimated equations, we statistically control for some of the most important differences in the students who attend the various colleges by calculating the predicted probabilities that each student will achieve individual success in the applied or in the transfer realm. The difference between those predicted probabilities and the actual outcomes (measured by a 0 or 1 on both scales) for each student serves as the basis for our adjusted measures of institutional success – measures that control statistically for the measured characteristics of students who attend each college. Specifically, we calculate these residuals for every student in our cohort and then average them by community college.⁹ The resulting average can be thought of as an input-adjusted index of institutional

⁹ These mean residuals are equivalent to institution fixed effects.

effectiveness. A college whose students over-achieve (by being successful more often than what would have been predicted based on their characteristics alone) will have a positive mean residual. A college whose students succeed less often than would be predicted will have a negative residual.

We think of these mean residual scores as *adjusted college effects* on student success rates, and we believe they represent one reasonable indicator of institutional effectiveness. We have calculated such adjusted college effects for all colleges and for both categories of success and have arrayed them graphically in Figure 3. In comparison to the pattern shown by raw success rates in Figure 2, there is less in the adjusted college effects to suggest specialization. An exception is college 846, which is at the mean in transfers but 0.2 *above* the mean for applied outcomes. For the most part, though, colleges simply differ by effectiveness on both fronts: some colleges appear to excel at both kinds of outcomes while other colleges look like under-achievers along both dimensions. Differences in adjusted college effects are quite large, implying ranges of up to 25 percentage points on both measures. Among the best on both measures are colleges 880, 806, and 847. On the other side of this coin are colleges whose adjusted effects on success rates are below-average on both scales, such as colleges 843, 870, and 844.

Although the evidence points to differences across community colleges in the adjusted effects on student success, two qualifications are worth noting. The first is that some of the measured variation across colleges is likely due to chance rather than actual differences in effectiveness. This fact is captured in the standard errors of the estimates of the applied residuals, which are on the order of 0.05 for applied success and 0.06 for transfer success. These values imply that differences between adjusted college effects less than 0.10 or 0.12 (two standard deviations) are not statistically different from each other. An *F*-test permits us to test the hypothesis that the observed variation in adjusted transfer or applied effectiveness across institutions can be attributed entirely to random variation, and it can be rejected. The *F*-statistic is driven primarily by a small number of colleges with adjusted college effects at

some distance from zero. The majority of colleges cannot be statistically distinguished from one another along either dimension¹⁰.

By way of further caveat, additional unobserved student characteristics might provide an alternative explanation for the patterns we observe, though we think this is unlikely. A more likely explanation is that the programs offered by community colleges differ in ways we have not captured in our analysis. For example, it could be that some community colleges prepare a higher proportion of their students for jobs where the actual diploma or certificate is required than is the case for other community colleges. These possibilities notwithstanding, we turn in the next section to ask whether successful community colleges, identified in this two-dimensional way, have any particular characteristics in common.

5. Explaining Variation in Institution-Level Success Rates

Our goal in this section is to examine the extent to which any characteristics of the community colleges themselves might be statistically associated with our estimated adjusted college effects. To do so, we regressed both of our unadjusted success measures and both of our measures of adjusted college effects on a number of college-level covariates (defined in Appendix 2). These efforts produced little in the way of statistical association. The regressions in Table 2 have as dependent variables the two raw measures of success. Those in Table 3 are based on adjusted college effects; that is, college effects on students, holding constant the characteristics of the students.

The first of the institutional characteristics considered is the college's proximity to a campus of the University of North Carolina. This dichotomous variable takes on the value of 1 if a UNC campus is in a county served by the community college and 0 otherwise. Since many students may well see four-year

¹⁰ For applied success, this test produces an F-statistic of 3.92, which is significant at the 1 percent level. Dropping the 20 outliers with the largest deviations from the mean adjusted college effect produced an F-statistic of 1.56, which is not significant at the 1 percent level. For transfer success, the comparable test produces an F-statistic of 3.07, but dropping just 11 outliers in this case makes it impossible to reject the hypothesis at the 1 percent level.

institutions as substitutes for two-year ones, especially when access to them is comparable, we reasoned that this measure might be associated with our measures of success. Indeed they were. Both measures of adjusted college effects were negatively associated with this proximity measure, but significantly so only in the equation for adjusted transfer success. This finding is consistent with the following explanation. If a student plans at the outset to attend a four-year institution, he or she may be likely to head there right away if the costs – both out-of-pocket and time– are not too burdensome. If the students with a four-year degree in mind tend to head directly to the local four-year institution rather than to the local community college, the remaining community college students will be less likely to try for transfer credits than similar students living farther away from any four-year institution.

All but one of the remaining institution-level variables are statistically insignificant as explanatory variables. Community colleges with more than one campus probably increase access, which could make completing a course easier, but which might also encourage enrollment by marginal students. In any case, the coefficients are not significantly different from zero. The coefficients on expenditures (which refer to curriculum programs alone) per full-time equivalent student (FTE), for which we anticipated positive coefficients on the ground that more resources might mean smaller classes and better support services, are also statistically insignificant. To account for the possibility of economies of scale, we included the log of total enrollment. Again, there was no statistically significant coefficient. A fifth explanatory variable, also not significantly associated with the success measures, is the portion of students who are taking curriculum courses, as opposed to high school or adult education courses.

To capture any effects of specialized faculty training, we include the ratio of faculty and staff who participated in a state-funded professional development program to FTE enrollment.¹¹ This

¹¹ The program is the Tier I Professional Development Program, which allows faculty and staff funds and released time for industry training.

variable is statistically significant for transfer success in our unadjusted measure but insignificant in our adjusted measure; that is, after we control for the characteristics of the students. Lastly, we include two indicators of customized training – the number of companies with customized training arrangements and the number of trainees per FTE.¹² Only the last of these had a significant coefficient – a negative one for applied success. We have no intuition to explain this result.

6. Correlations

As noted above, the North Carolina Community College System has made it a practice of evaluating its constituent colleges using quantitative measures of effectiveness. It is a matter of practical importance to know how the measures of institutional success based on degree and transfer readiness developed in this paper compare to these NCCCS measures. As a partial answer to this question, we present correlations between our measures (four in all) with two of the principal measures used in the NCCCS's report *Critical Success Factors 2010*. The correlations are shown in Table 4. The first of those measures is the percentage of graduates from the community college who transferred to a UNC campus and were earning a GPA of at least 2.0 after two semesters at that UNC campus. The second is the passing rate in the community college's math developmental courses. As is readily apparent from the table, the correlations between these two published measures and our measures, with or without adjustment for student characteristics, are very modest. These low rates suggest that these published measures must either be reflecting very different qualities than our success measures or that some set of measures – including our own – are subject to considerable measurement error. These low

http://www.nccommunitycolleges.edu/Business_Finance/docs/Budgets/Budget%20Package/BudgetPackage_2011_08_08_REVISED%5B1%5D.pdf, 12/1/11.

¹² Sources are shown in Appendix 2, along with definitions.

correlations are sobering and support a healthy dose of humility in our efforts to come up with useful institution-wide outcome measures.

7. Conclusion

This paper asks whether it is possible to come up with meaningful measures of the effectiveness of community colleges. With a nod to the diverse missions of community colleges, even as those missions relate solely to recent high school graduates, we define two measures: one based on obtaining proficiency in an applied field of study and one based on earning transferable credits. We find that the proportion of students who succeed according to either or both of these measures (within four years of first enrolling) varies widely across community colleges. To account for differences across institutions in the preparation, aptitude, and resources of their students, we statistically correct for differences in several student-level predictors of success. The unexplained residuals, comparable to institutional fixed effects, yield measures of institutional effectiveness corrected for differences across colleges in the academic readiness of students. We call these measures adjusted college effects. Although these measures also show a great deal of variation, they are measured fairly imprecisely, implying that we cannot statistically distinguish among most campuses in the state.

Perhaps because of this imprecision, we find precious little association between these adjusted college effects and published measures of institutional characteristics, such as size, expenditures, staff training, and cooperation with industry. The only institutional characteristic that is statistically significant in our study is having a campus of the state university system nearby and that one enters with a negative coefficient. We also find no statistically significant correlations between either the unadjusted success rates or our adjusted college effects and two of the quality measures used by state administrators.

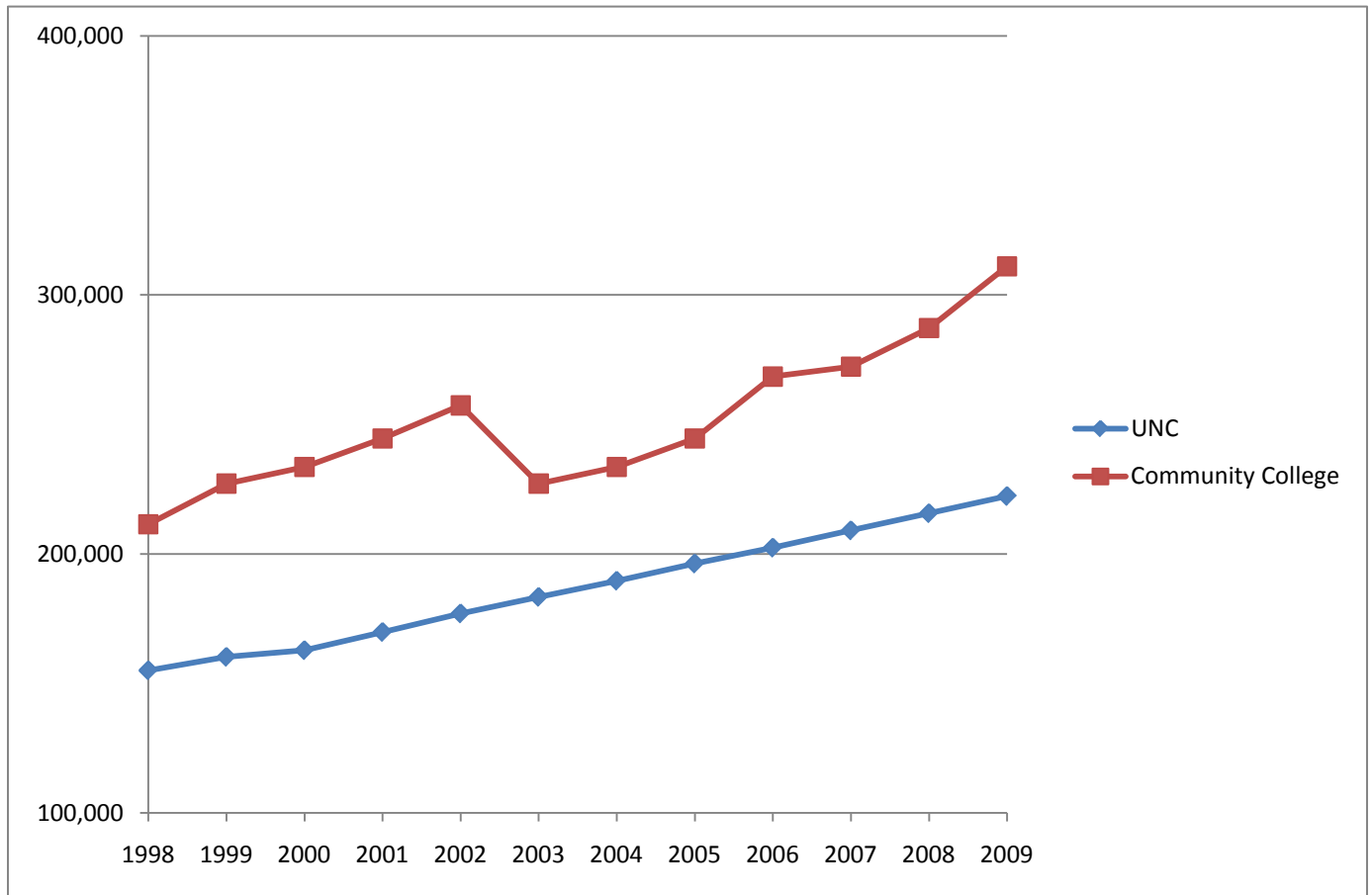
These findings illustrate the significant challenges in identifying meaningful variation in the performance of community colleges. One promising avenue may be to explore curricular differences across institutions, particularly differences in the share of programs connected to certification in which employers demand a document that can be obtained only by finishing all requirements.

We conclude by noting a viewpoint that looks skeptically upon all attempts to assign overall assessments of quality to institutions as a whole. From this point of view, institutions such as community colleges are much too different one from another, with far too much variation across programs, to make such aggregation meaningful. The best defense we can offer to this reasoned objection is a pragmatic one. Legislators, policy makers, and funders are already putting into practice policies by which entire institutions are being compared. Our paper contributes to the discussion of such policies.

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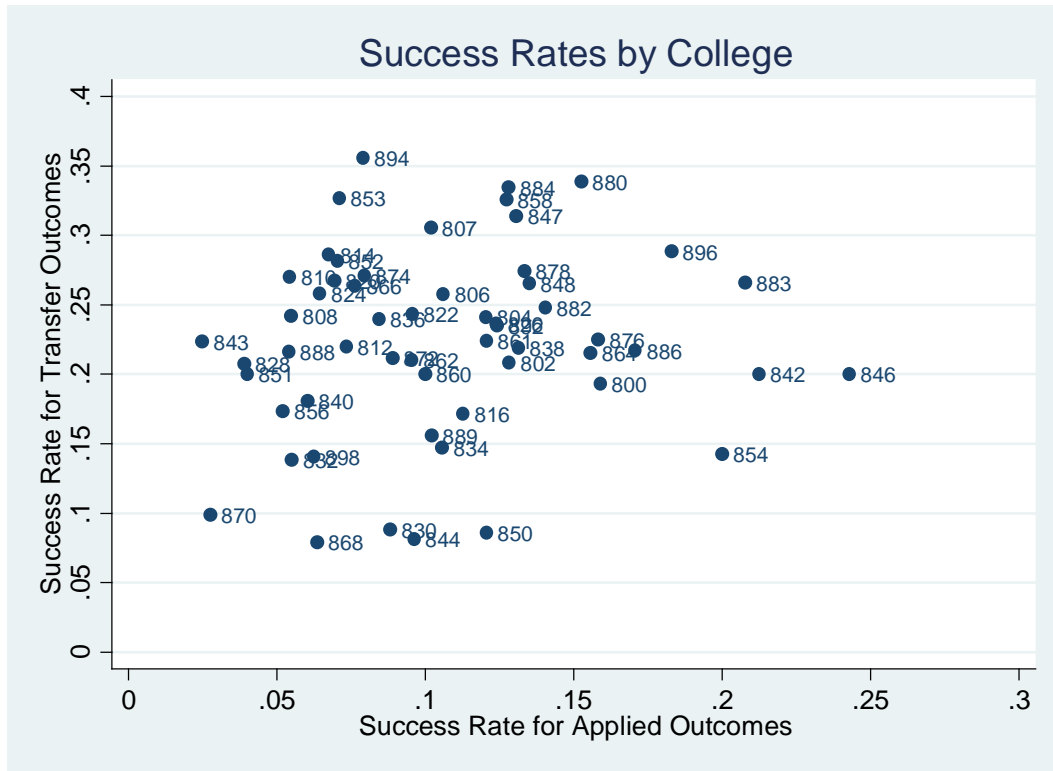
Figure 1. Enrollment Trends in North Carolina Community Colleges and in the University of North Carolina System



* Community college numbers refer to unduplicated headcounts of students enrolled in curriculum programs during the academic period ending in the spring of each year; UNC numbers refer to headcount of degree-credit students enrolled in the fall semester of each year.

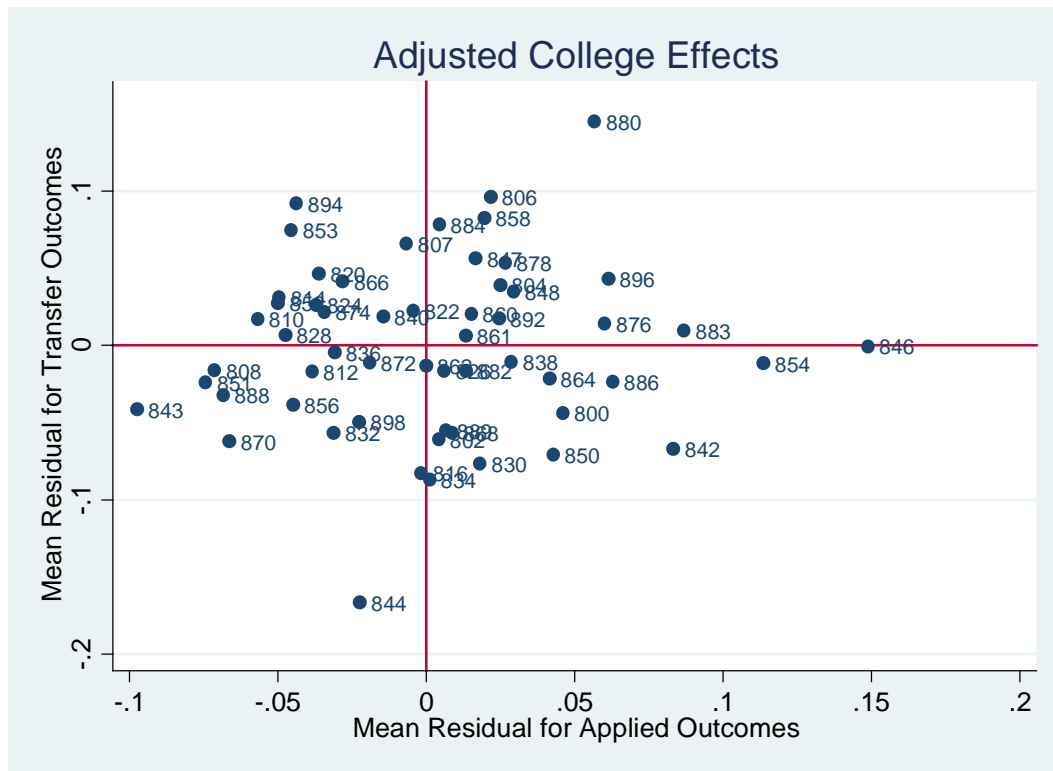
Sources: UNC-GA and NCCCS Annual Statistical Reports, 2008-2009.

Figure 2. Success Rates for Transfers and Applied Outcomes, N.C. Community Colleges



Note: Success rates refer to the proportion of students in each community college who succeed by either or both of our definitions of applied and transfer success. See Table 1, note.

Figure 3. College-Specific Effects on Success Rates, Adjusted for Student Characteristics



Note: Values represented by points are differences from the mean, for each community college, in applied and transfer success, after adjusting statistically for differences across colleges in characteristics of students. These differences are equivalent to the residual success rates not statistically explained by characteristics of students attending each college. See Table 2.

Table 1. Regression of Success Outcomes on Student Characteristics, student level

| Variables | Applied | Transfer |
|------------------------------------|-----------------------|-----------------------|
| EOG Math | 0.003 *** (0.000) | 0.007 *** (0.000) |
| Female | 0.022 *** (0.006) | 0.095 *** (0.008) |
| American Indian | 0.010 (0.024) | -0.060 ** (0.030) |
| Asian | -0.041 * (0.022) | 0.110 *** (0.042) |
| Hispanic | -0.028 (0.019) | -0.001 (0.031) |
| Black | -0.045 *** (0.007) | -0.081 *** (0.010) |
| Multiracial | -0.042 (0.028) | 0.033 (0.050) |
| Parent education: no high school | 0.056 (0.042) | 0.032 (0.050) |
| Parent education: some college | -0.009 (0.009) | 0.012 (0.011) |
| Parent education: college graduate | -0.026 *** (0.009) | 0.063 *** (0.011) |
| Received free or reduced lunch | -0.033 *** (0.007) | -0.031 *** (0.010) |
| Institutional fixed effects | Yes | Yes |
| Observations | 11,111 | 11,111 |
| R ² | 0.04 | 0.08 |

Standard errors in parentheses.
 *** denotes p<0.01, ** denotes p<0.05, * denotes p<0.10

Note: Applied success is defined as earning an Associate’s of Applied Science or a Diploma within 4 years of first course. Transfer success is defined as earning an Associate’s degree (other than an Associate’s of Applied Sciences) within 4 years of first course or passing at least 10 transferable courses within 4 years of first course. Sample consists of students who took the 8th grade End of Grade test in math in 1999 and who entered any curriculum program at any North Carolina community college between fall 2003 and fall 2004, excluding (a) students enrolled in programs not leading to a formal award, (b) students enrolled in Wake or Mecklenburg counties in 8th grade, and (c) students enrolled in Wake or Central Piedmont community colleges.

Table 2. Regression of Unadjusted Success Rates on Institutional Characteristics

| Variable | Applied | Transfer |
|---|----------------------|----------------------|
| UNC branch in county | -0.030 * (0.017) | -0.078 ** (0.026) |
| More than one campus | -0.005 (0.015) | -0.022 (0.023) |
| Expenditures per FTE (in thousands of dollars) | -0.041 (0.030) | -0.034 (0.044) |
| Enrollment (ln) | -0.012 (0.016) | 0.018 (0.026) |
| Proportion of students in curriculum courses | -0.006 (0.066) | 0.091 (0.110) |
| Tier A per FTE | -0.0760 (0.380) | -0.848 * (0.452) |
| Customized training: number of companies | 0.004 (0.003) | -0.001 (0.005) |
| Customized training: number of trainees per FTE | -0.268 ** (0.112) | 0.041 (0.192) |
| Observations | 56 | 56 |
| R ² | 0.15 | 0.25 |

Standard errors in parentheses.

*** denotes $p < 0.01$, ** denotes $p < 0.05$, * denotes $p < 0.10$

Note: The applied outcome reflects the proportion of students who earn an Associate's of Applied Science or a Diploma within 4 years of first course. The transfer outcome reflects the proportion of students who earn an Associate's degree (other than an Associate's of Applied Sciences) within 4 years of first course or who pass at least 10 transferable courses within 4 years of first course. See Appendix 2 for definitions. Dependent variables are average unadjusted success rates by college.

Table 3. Regression of Adjusted College Effects on Institutional Characteristics

| Variable | Applied | Transfer |
|---|----------------------|----------------------|
| A UNC branch in county | -0.018 (0.018) | -0.054 ** (0.021) |
| More than one campus | -0.005 (0.017) | -0.018 (0.018) |
| Expenditures per FTE (in thousands of dollars) | -0.028 (0.032) | -0.014 (0.038) |
| Enrollment (ln) | -0.014 (0.015) | 0.006 (0.019) |
| Proportion of students in curriculum courses | 0.020 (0.062) | 0.079 (0.094) |
| Tier A per FTE | 0.160 (0.363) | -0.470 (0.333) |
| Customized training: number of companies | 0.003 (0.003) | -0.002 (0.004) |
| Customized training: number of trainees per FTE | -0.263 ** (0.115) | 0.043 (0.152) |
| Observations | 56 | 56 |
| R ² | 0.12 | 0.20 |

Standard errors in parentheses.

*** denotes $p < 0.01$, ** denotes $p < 0.05$, * denotes $p < 0.10$

Note: The applied outcome reflects the proportion of students who would be predicted to earn an Associate's of Applied Science or a Diploma within 4 years of first course based on student characteristics. The transfer outcome reflects the proportion of students who would be predicted to earn an Associate's degree (other than an Associate's of Applied Sciences) within 4 years of first course or to pass at least 10 transferable courses within 4 years of first course based on student characteristics. See Appendix 2 for definitions. Dependent variables are adjusted college effects, as described in the text.

Table 4. Correlations among Alternative Measures of Institutional Effectiveness

| | Applied (adjusted) | Transfer (adjusted) | Applied (unadjusted) | Transfer (unadjusted) | UNC GPA \geq 2.0 | Math passing rate |
|--------------------------|-----------------------|------------------------|-------------------------|--------------------------|-----------------------|-------------------------|
| Applied (adjusted) | 1.000 | | | | | |
| Transfer (adjusted) | 0.067 | 1.000 | | | | |
| Applied (unadjusted) | 0.947 *** | 0.096 | 1.000 | | | |
| Transfer (unadjusted) | -0.054 | 0.865 *** | 0.124 | 1.000 | | |
| UNC GPA \geq 2.0 | 0.086 | 0.020 | 0.111 | 0.063 | 1.000 | |
| Math passing rate | 0.195 | 0.083 | 0.324 ** | 0.224 * | 0.171 | 1.000 |

*** denotes $p < 0.01$, ** denotes $p < 0.05$, * denotes $p < 0.10$

Note: For definitions of applied and transfer success, see Tables 1 and 2 and text. Adjusted measures are adjusted college effects, as described in the text, and displayed in Figure 3. UNC GPA \geq 2.0 is the proportion of transfers from each college who, after two years at a UNC branch, had achieved a GPA of 2.0. Math passing rate is the passing rate in developmental math courses. See Appendix 2.

Appendix 1. Variable Definitions for Student-Level Table

| Variable | Definition |
|------------------------------------|---|
| Applied success | An indicator variable equal to 1 when a student earns an Associate's of Applied Science or a Diploma within 4 years of first course and 0 otherwise |
| Transfer success | An indicator variable equal to 1 when a student earns an Associate's degree (other than an Associate's of Applied Sciences) within 4 years of first course or passes at least 10 transferrable courses within 4 years of first course and 0 otherwise |
| EOG Math | End of Grade math score in the 8 th grade |
| Female | An indicator variable equal to 1 when a student is female and 0 otherwise |
| American Indian | An indicator variable equal to 1 when a student is American Indian and 0 otherwise |
| Asian | An indicator variable equal to 1 when a student is Asian and 0 otherwise |
| Hispanic | An indicator variable equal to 1 when a student is Hispanic and 0 otherwise |
| Black | An indicator variable equal to 1 when a student is Black and 0 otherwise |
| Multiracial | An indicator variable equal to 1 when a student is multiracial and 0 otherwise |
| Parent education: no high school | An indicator variable equal to 1 when a students' parent did not complete high school and 0 otherwise |
| Parent education: some college | An indicator variable equal to 1 when a students' parent completed some college and 0 otherwise |
| Parent education: college graduate | An indicator variable equal to 1 when a students' parent completed college and 0 otherwise |
| Received free or reduced lunch | An indicator variable equal to 1 when a student was ever eligible to receive free or reduced lunch and 0 otherwise |

Appendix 2: Variable Definitions for Institutional-Level Tables

| Variable | Definition |
|---|--|
| Applied (unadjusted) | The proportion of students who earn an Associate's of Applied Science or a Diploma within 4 years of first course. |
| Transfer (unadjusted) | The proportion of students who earn an Associate's degree (other than an Associate's of Applied Sciences) within 4 years of first course or who pass at least 10 transferable courses within 4 years of first course |
| Applied (adjusted) | Adjusted college effect for applied outcomes: residual difference between actual applied success rate and predicted success rate, based on applied outcome. |
| Transfer (adjusted) | Adjusted college effect for applied outcomes: residual difference between actual transfer success rate and predicted success rate, based on applied outcome |
| UNC branch in county | An indicator variable equal to 1 when there exists a UNC campus in the county that the college serves and 0 otherwise |
| More than one campus | An indicator variable equal to 1 when the community college has more than one campus and 0 otherwise <i>Source: Matter of Facts 2008, pp. 55-58</i> |
| Expenditures | Amount of curriculum program expenditures per curriculum FTE <i>Source: Matter of Facts 2008, pp. 52-53</i> |
| Enrollment (ln) | Natural log of total FTE <i>Source: Critical Success Factors 2010, p. 29</i> |
| Curriculum | Proportion of FTE students who are curriculum students <i>Source: Critical Success Factors 2010, p. 29</i> |
| Tier A per FTE | Number of faculty and staff who participate in Tier A funded professional development activities per FTE <i>Source: Critical Success Factors 2010, p. 76</i> |
| Customized training: number of companies | Number of companies served by customized training projects <i>Source: Critical Success Factors 2010, p. 41</i> |
| Customized training: number of trainees per FTE | Number of trainees served by customized training projects per FTE <i>Source: Critical Success Factors 2010, p. 41</i> |
| UNC GPA \geq 2.0 | Percent of college transfer students from 2007-08 with a GPA \geq 2.0 after two semesters at a UNC institutions <i>Source: Critical Success Factors 2010, p. 21</i> |
| Math passing rate | Percent of students passing developmental math courses, 2008-09 <i>Source: Critical Success Factors 2010, p. 23</i> |