

**IS STUDENT-RIGHT-TO-KNOW
ALL YOU SHOULD KNOW?**

**AN ANALYSIS OF
COMMUNITY COLLEGE
GRADUATION RATES**

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Abstract

Over the last decade, policymakers, educators, and researchers have increasingly sought to understand community college policies and practices that promote students' success. This effort has been partly driven by an increased emphasis on outcome accountability, but it has also promoted a productive discussion about improving institutional performance. The research reported here has two related goals. One goal is to work towards strengthening the ability to assess and compare institutional performance. We thus have developed a model that can be used to adjust simple graduation rates for institutional characteristics, such as student composition, college resources, size, and location, all of which might influence those rates. Our long-term goal is to understand how to improve student outcomes, so the paper also uses the model to measure the effect of those institutional characteristics on graduation rates. We use data from the Integrated Postsecondary Education Data System (IPEDS) surveys, applying a weighted least-squares procedure for grouped data to estimate an institutional-completion rates model. This analysis confirms several hypotheses about institutional determinants of graduation rates at community colleges. Our results indicate a consistent negative relationship between enrollment size and completion. Additionally, colleges with high shares of minority students, part-time students, and women have lower graduation rates. A final significant finding among institutional characteristics is that greater instructional expenditures are related to a greater likelihood of graduation. The method developed here can be used to better assess the performance of community colleges.

Is Student-Right-to-Know All You Should Know?
An Analysis of Community College Graduation Rates

I. Introduction

Community colleges have long been recognized as open-door institutions, with an emphasis on providing a wide range of students with access to college. In the last decade, several forces have converged to bring about increased attention on the outcomes of students once they start at a college, with a particular emphasis on graduation rates. For example, in the ongoing debate over reauthorization of the Higher Education Act, the Bush administration and many in Congress have indicated a desire to hold higher education to new standards of accountability, just as they have with the public schools through the No Child Left Behind Act. In 1999, the Student Right-to-Know and Campus Security Act, which amended the Higher Education Act, required colleges to report their graduation rate for fall semester cohorts of first-time, full-time students in degree programs. This information is known as the Student Right-to-Know (SRK) data.

The accountability movement has been further spurred by an increasingly difficult state funding environment where other demands on state resources, such as health care and corrections, have squeezed community college funding in many states (Kane, Orszag, & Gunter, 2003). Tuition increases have been one response to reduced public funds, and they encourage both parents and state policymakers to focus increasingly on the returns to their private or public investments in education.

An increased focus on student outcomes has generated a discussion about what an appropriate outcome measure should be, but it has also promoted a productive discussion about what institutional characteristics and policies might promote student success. Similarly, this paper has two related goals. One goal is to work towards strengthening the ability to assess and compare institutional performance. Thus, we have developed a model that can be used to adjust simple graduation rates for institutional characteristics that might influence those rates. Our second and long-term goal is to understand how to improve student outcomes. Therefore, the analysis uses this model to measure the effect of institutional characteristics on graduation rates.

This paper contributes to two related discussions. The first concerns the most appropriate way to benchmark community college performance and the second involves the search for characteristics and policies that can improve that performance. The variables that we have available for the analysis primarily consist of institutional *characteristics* such as location, size, expenditures, and student composition. They explain about 60 percent of the variation in raw graduation rates, but some variation does remain. Thus, this analysis will set the stage for future, more qualitative investigations to try to determine the institutional *policies and practices* that might influence graduation rates.

In Section II we discuss the use of graduation rates, in particular the SRK graduation rate, as a measure of community college performance, and we present different approaches to using graduation rates and other outcome variables to benchmark community college performance. In Section III we review the existing research that analyzes the relationship between college outcomes and college characteristics and policies. Then in Section IV we introduce our empirical model, which uses data from the National Center for Education Statistics Integrated Postsecondary Data System (IPEDS) to measure the institutional effects on community college

graduation rates. This approach has now been used widely in the analysis of four-year college performance, but the research reported here is the first to apply it to community colleges. Section V presents the findings from this analysis, explores some of them in more detail, and tests the robustness of our analysis. Our conclusions are presented in Section VI.

II. Benchmarking Community College Performance

Any accountability system must be built on some measure of success in order to assess institutional effectiveness. Accountability in K-12 education has been based primarily on test scores, yet there is no equivalent widely available learning-related measure for postsecondary institutions. Six-year bachelor's degree graduation rates have been used to evaluate four-year colleges, although this practice has not been without controversy (American Federation of Teachers, 2003). Graduation rates have been the basis of several studies analyzing four-year college performance (see Section III for a review of the literature).

One common measure of community college performance is the graduation rate for students within 150 percent of the time in which they would be expected to complete a degree or certificate (if they took a full-time program of courses and were academically prepared for college level courses when they began). This is the SRK rate and is based on an entering cohort of all first-time students who attend full-time when they initially enroll. Students in associate programs are tracked for three years (150 percent of normal time for a two-year degree), those in certificate programs proportionally less. The graduation rate is the ratio of all students who completed a certificate or associate degree *at that college* within the 150 percent time period to the total number of students in the initial cohort.

For the purposes of assessing college performance or investigating the determinants of high performance, the SRK data have the advantage that they are available for almost 1,000

institutions throughout the country. There is no other outcome measure for such a large sample of community colleges.¹

Use of Graduation Rates as an Outcome Measure

Community college personnel and advocates have resisted the use of graduation rates in general, and the SRK rate in particular, as an accountability measures normative goal or the basis for research on institutional performance. They have advanced three broad arguments for this stance.

First, they argue that graduation rates are misleading outcome measures for community colleges. Many of the students at these institutions are seeking neither degrees nor transfer to a baccalaureate institution. The broad range of non-degree objectives of students is an indication that community colleges are serving multiple student needs, as they are chartered to do. Criticizing community colleges for low completion rates would reflect a misunderstanding of their mission and the diverse goals of their students.

This is a reasonable argument. Nevertheless, data on goals and expectations do indicate that community college students are ambitious and that a majority of students who state that they want to complete a degree do not do so (Bailey, Jenkins, & Leinbach, in press). Moreover, high aspirations make economic sense since research suggests that earning small amounts of credits

¹ The Community College Survey of Student Engagement (CCSSE, 2004) includes data on students from 152 colleges in 2004 that contains substantial cross-section information on student and program characteristics. The survey does not contain information on graduation rates or other student outcomes. The National Community College Benchmark Project includes 110 community colleges in 2004 and does have several student outcome measures including graduation, retention, and course completion (<http://www.nccbp.org/>). Colleges must pay to participate in both CCSSE and the Benchmark study.

without completing a certificate or degree has little economic value (Bailey, Kienzl, & Marcotte, in press; Grubb, 2002).

A second reason community college advocates resist the use of completion rates as an accountability measure is that many factors that may thwart students' graduation are beyond the control of the colleges. Many community college students face serious barriers to success in college, such as family and work responsibilities and deficient academic preparation. Indeed, it is precisely students such as these who may not have access to baccalaureate institutions, whom community colleges seek to serve. Furthermore, many of these barriers are not under the control of community colleges, nor can the colleges mitigate them. Therefore, advocates argue, community colleges should be neither criticized nor penalized for the failure of many of their students to complete.

Certainly community college students face serious problems that hinder their chances of graduating. Nevertheless, as we demonstrate, some colleges have higher graduation rates even after taking account of the characteristics of their students. There is potentially interesting and useful information in that variation.

A third reason applies particularly to the SRK rate. Increasingly, college students may attend several colleges before completing their degrees. For example, one out of five students in the National Education Longitudinal Study of 1988 (NELS:88) who earned a bachelor's degree received it from a baccalaureate institution other than the one in which they enrolled initially (Adelman, 2003). Adelman pointed out that students change colleges for many reasons, asking in a recent article in *The Chronicle of Higher Education*, "Why should institutions be judged for choices, made by students, that are beyond their control? College students are legal adults, after all," (Burd, 2004, p. A1). An institutional graduation rate, such as the SRK rate, in effect counts

a successful transfer as a “dropout.” Thus a successful student outcome, transfer and possibly eventual graduation from another institution, is categorized as an institutional failure.

This is also a reasonable criticism of institutional graduation rates. Data that allow individuals to be tracked across institutions are more revealing, but such datasets are now only beginning to become available and only in a handful of states. National longitudinal datasets are useful for many purposes, but are not large enough to be used to study student outcomes at individual institutions. Nevertheless, the distortion caused by using a three-year institutional graduation rate based on graduation from a student’s initial institution (the measurement used by SRK) rather than from any institution is not very large (Bailey, Jenkins, & Leinbach, in press).²

For all these reasons, the SRK graduation rates need to be used with caution. The low overall graduation rates reflect both the characteristics of community college students and the distortions caused by using an institutional rate. The published SRK rates do give an overly negative and restrictive picture of community college performance; nevertheless, there is potentially important information in the wide variation among institutions and states in those rates, even if rates for all colleges are in some sense too low. Thus it makes more sense to use graduation rates to compare institutions rather than to assess individual community college graduation rate performance.

² Three-year graduation rates from any institution for first time, full-time community college students are only slightly higher than the SRK graduation rate from the first institution. Some critics argue, however, that three years is too short a time period. See Bailey, Jenkins, and Leinbach (in press) for a discussion of this issue.

Use of Graduation Rates for College Comparisons

Using graduation rates or other outcome variables to compare institutions is now a widely used practice. However, the usefulness of a comparative approach depends on choosing an appropriate comparison. Should Miami Dade College in Florida be compared with Big Bend Community College in rural Washington State? Should Harold Washington College in Chicago be compared with Collin County Community College District in a prosperous and growing suburb of Houston?

One approach to the difference among institutions has been to create discrete comparison groups and compare colleges within those groups—for example, all large, urban, public two-year institutions. The National Center for Education Statistics (NCES) has created software that allows users to select comparison schools, either by name or according to various criteria, such as institution size, control, or urbanicity. The National Community College Benchmark Project also allows participating colleges to create a comparison group based on institutional characteristics and then provides lists of outcome measures such as graduation and retention rates for that comparison group.

These approaches to benchmarking allow colleges to make interesting and useful comparisons within a selected group of colleges, but sample sizes often limit the number of variables that can be included in the comparison selection criteria. For example, a study of four-year colleges by Muraskin and Lee (2004) used public or private control to partition the sample. The reports on the Community College Survey of Student Engagement (2004) create comparison groups by college size. Clearly, a great deal of heterogeneity remains within these groups. For example, differences among state policies regarding higher education, such as the extent of

articulation between community colleges and universities, are particularly important for community colleges, so comparisons ought to be able to take account of state characteristics.

The second approach to comparing colleges is to use multivariate statistical technical techniques to analyze the relationship between some outcome measure, usually graduation rates, and a variety of institutional characteristics. Comparisons are done by calculating an expected graduation rate for each individual college using the characteristics of that college and the coefficients generated by the multivariate analysis. The expected graduation rate can then be compared to the actual graduation rate. Colleges with expected rates lower than actual rates can be considered to be performing at a level higher than would be expected by their characteristics. Thus, according to this approach, a well-funded college in a prosperous suburb with a 50 percent graduation rate might be considered to be performing at a lower level than a college in a depressed urban area with a 30 percent graduation rate, assuming that funding and location are important determinants of graduation rates.

In addition to allowing the use of many variables in developing a comparison, this approach also measures the influence that each institutional characteristic has on the outcome. This type of information can be useful in setting priorities and developing institutional policy.

This is the approach used in this paper, both to lay the groundwork for benchmarking college performance and to measure the relationship between institutional characteristics and outcomes. The approach is now common for four-year colleges and is even used in developing the *U.S. News and World Report* college rankings. This paper is the first to carry out a multivariate analysis of graduation rates for community colleges.

III. Existing Research on Institutional Graduation Rates

Several studies have analyzed the effect of institutional characteristics on graduation rates, although the majority of them focus on baccalaureate institutions. We discuss here only those studies at baccalaureate institutions most relevant to our analysis of community colleges. In the classic reference on the effect of institutional characteristics on student outcomes, Pascarella and Terenzini (1991) found that colleges serving students with higher SAT scores and from higher income families, and with higher proportions of full-time and female students, had higher graduation rates. Private and residential institutions also had higher rates. Specifically, they found at baccalaureate institutions that characteristics promoting social integration, such as residential campuses, same-sex or same-race institutions, smaller enrollments,³ and private institutions, have positive impacts on student outcomes. Finally, the researchers noted that institutional factors such as instructional expenditures also increase the likelihood of student attainment of a bachelor's degree. In the 2005 edition of their book, *How College Affects Students: Volume 2. A Third Decade of Research*, Pascarella and Terenzini generally found less influence of institutional characteristics, especially after taking account of the specific types of experiences students had in college. However, they still did find that college size was negatively related to retention, that students in private institutions and in more selective institutions graduated at higher rates, and that women enrolled in women's colleges and African Americans in historically black colleges and universities did appear to have small advantages over similar counterparts in mainstream institutions.

³ However, Pascarella and Terenzini (1991) concluded that, because of conflicting findings from investigations of the direct effect of institutional size on student performance, the evidence is inconclusive or at least the effect is dependent on individual student characteristics.

Astin, Tsui, and Avalos (1996) used data from a nationally representative sample of first-time, full-time students to compare the graduation rates of 365 baccalaureate institutions in 1985. They found that private universities had the highest graduation rates, and believed that this finding resulted from the fact that such institutions tend to enroll better prepared students. They also found that highly selective institutions and those that enroll large numbers of students in fields like business, psychology, and the social sciences have higher graduation rates. Institutions with large engineering programs, commuter schools, and larger student bodies have lower rates. Mortenson (1997) and Porter (2000) used a regression model to estimate graduation rate models for baccalaureate-granting colleges. Their findings were similar to those of Astin et al., namely that institutions whose students have higher average SAT scores and those with a higher percentage of freshmen living on campus had higher graduation rates, while those with many part-time students and relatively large engineering programs had lower rates. Some more structural characteristics, such as expenditures per student, undergraduate enrollment, and the percentage of students who are female, were also related to higher graduation rates.

Ryan (2004) used data on 363 baccalaureate institutions to estimate the impact of institutional expenditures for instruction, academic support, student services, and administrative support on the six-year graduation rates of cohorts within each institution. His findings suggest that instructional and academic support expenditures have positive and significant effects on cohort graduation rates, as previously indicated by Astin (1993). However, expenditures on student services and expenditures on administrative (institutional) support failed to produce any significant impact on graduation rates. Ryan suggested that there are trade-offs in the utilization of financial resources within an institution in terms of degree attainment, and that institutions should be careful when deciding where to allocate resources.

In a related paper, Goenner and Snaith (2004) used Bayesian averaging methods to estimate a graduation rate model. They argued that using different model specifications can lead to contrary findings given the uncertainty about the true set of covariates that explain the phenomena of interest. Similar to previous results, their findings suggest that students' GPA and SAT scores are important and positive predictors of institutional graduation rates. In contrast, they also found that institutions in urban areas, the percentage of Native American students, the percentage of male students, and a student body with higher average age are all factors associated with lower institutional graduation rates.

More recently, Scott, Bailey, and Kienzl (in press, 2005) conducted an analysis of six-year graduation rates for baccalaureate-granting institutions based on data from the College Board's American Survey of Colleges and IPEDS. Using grouped logistic regression, they found that private colleges and those with students with higher average SAT scores, a higher proportion of women, and higher instructional expenditures per full-time equivalent (FTE) student had higher graduation rates. Institutions with higher proportions of minority students, older students, and part-time students had lower graduation rates. In addition, they found that institutions with higher in-state tuition also tended to have higher graduation rates, even after controlling for student characteristics.

A recent study by Habley and McClanahan (2004) analyzed the association between outcome measures for community college students and institutional practices. Their study was based on data collected from 386 colleges (out of 991 that received questionnaires). Colleges were classified as "high performing" if their first-to-second year retention rates *and* their three-year graduation rates were both above the median for those rates; they were classified as "low performing" if they were below the median for both rates. Colleges were given a list of 82

retention practices and were asked to report whether or not they used each of them. Respondents were also asked to state whether each practice made a “major,” “moderate,” or “no” contribution to retention. Of the 82 practices, those that were reported to have more than a “moderate” contribution and for which there was at least a ten percentage point difference in the incidence of use between high performing and low performing colleges were deemed to be “successful” retention practices. This evaluation yielded the following list of “successful” practices: mathematics center, writing center, reading center, advising interventions with special populations of students, learning communities, foreign language center, and programs for racial/ethnic minorities.

Habley and McClanahan’s study is unique in that it used a relatively large sample of community colleges and collected data on specific institutional practices rather than on institutional characteristics. It therefore presents interesting and suggestive conclusions. The study does not, however, control for any institutional characteristics (for example, institutional size) and it examines practices one by one, making it difficult to determine whether each practice is effective individually or in combination with other factors, or whether those measured practices are correlated with some other characteristics (either measured or unmeasured) that are the true determining factors.

What can community colleges learn from existing research on this topic? Assuming that the factors analyzed in these studies will have similar effects for community colleges, then the problems that these colleges face in increasing their graduation rates become clear. Studies consistently find that the typical characteristics of community college students are also those that predict lower graduation rates. Yet, as indicated, attempting to improve graduation rates by becoming more selective would violate one underlying mission of the colleges. Consequently,

the research models we developed here examine the outcomes of students who attend *community colleges* using models that reflect the characteristics of those institutions. This information can be used to assess more fairly the performance of community colleges.

IV. Empirical Model and Data

Econometric Analyses

Institutional graduation rates, defined as “the proportion of students of the cohort in year y that received a degree by year x ,” can be seen as outcomes of educational production functions. The statistical association of this output and the inputs can be modeled as follows:

$$\text{logit}(p_{ij}) = \text{logit}\left(\frac{m_{ij}}{n_{ij}}\right) = X'_{ij} \beta + C'_{ij} \phi + F'_{ij} \delta + S'_j \gamma + \varepsilon_{ij} \quad (1)$$

where p_{ij} is the institutional graduation rate of community college i in state j and is constructed as the total number of students who received a degree (m_{ij}) divided by the population cohort (n_{ij}) and the logit transformation is defined as $\log(p_{ij}/(1-p_{ij}))$. The vector X_{ij} is a set of *fixed characteristics* of the institution, C_{ij} is the vector of *compositional characteristics* like size or proportion of minority students and F_{ij} represent *financial characteristics* and include tuition or expenditures. Finally, S_j is a set of dummies that indicate the state where the institution is located. Fixed-effect dummies will capture any unobserved factor shared by institutions in the same state. For instance, a state’s policies may affect the graduation rates of colleges, and community colleges play very different roles within the overall systems of higher education in different states.⁴

Note that differences in the size of the population cohorts n_{ij} generate a heteroskedastic regression format and simple ordinary least squares (OLS) or logistic regression models will not

⁴ For example, Florida has a statewide articulation agreement that guarantees admission to a public baccalaureate institution as a junior to any student who earns an associate degree. This agreement would give Florida community college students a strong incentive to complete a degree.

be efficient. Moreover, the institutional graduation rate, while a continuous variable, is a proportion constrained to lie within 0 and 1. Thus, weighted least squares method for grouped data is proposed to estimate equation (1) as developed by Maddala (1983) and Greene (2003). The method is often called group logit and was first used for similar purposes by Scott, Bailey, and Kienzl (in press, 2005). The weights can be estimated in the first step of the procedure as follows:

$$w_{ij} = \sqrt{n_{ij}p_{ij}(1 - p_{ij})} \quad (2)$$

Clearly, using institution-level data has limitations. The method explains institutional characteristics associated with completion rates, while the behavior of each individual in each cohort is not explicitly taken into account. Moreover, the model assumes that each individual in a given institution has the same probability of graduation. In another words, the method assumes that each cohort member is affected by the geographic, student body, and financial characteristics in a similar way.

Further, the method captures only cross-sectional variation. Year-to-year volatility in graduation rates might be a function of institutional size, as was shown by Kane and Staiger (2001) and Chay, McEwan, and Urquiola (in press) in the context of test scores and school size. Kane and Staiger used a time-series cross-section framework to decompose persistent patterns from sampling variation or non-persistent components. Notably, we should not expect large noise or non-persistent components since our outcome measure requires three years to complete. These results need further analysis in a time-series cross-section framework although data restrictions and missing values limit the possibilities with the datasets used here.

Dataset and Variables

The Integrated Postsecondary Education Data System (IPEDS) is a set of annual surveys gathered by the National Center of Education Statistics and designed to collect data from all primary providers of postsecondary education. It includes information about the entire population of higher education institutions in the United States and its outlying areas. To extract a community college sample, we first considered only public two-year institutions in the 50 states. We also excluded institutions without regional accreditation and those that are non-degree-granting (i.e., grant only certificates). Finally, we used the procedure recommended by Hadi (1994) to identify outliers, and eliminated three institutions with improbably high values for instructional expenditures.⁵ The final sample contains 915 community colleges.⁶

To measure the institutional graduation rate we used the degree completion rate for each institution from the 2002-03 IPEDS Graduation Rate Survey (GRS). Beginning with the IPEDS 2002-03 survey, colleges are now required to report overall student graduation rates, as well as those for black, Hispanic, and female students separately. As indicated, the rates are referred to collectively as the Student Right-to-Know (SRK) data, after the legislation that established the reporting requirement. The “degree completion rate” refers to the proportion of first-time, full-time (FTFT) students who entered a community college during the fall term (by October 15) of the 1999-2000 academic year and completed a certificate or associate degree program from that

⁵ These community colleges are Ilisagvik College (AK), College of the Marshall Island (MH), and Los Angeles County College of Nurse and Allied Health (CA).

⁶ Note that our more comprehensive model includes only 824 observations because 10 percent of the institutions have missing values in one or more of the variables. Missing values mostly occur for graduation rates themselves or for part-time faculty rates and expenditure variables.

same institution within 150 percent of the normal time to completion for the program (three years for an associate degree, shorter for certificates).⁷

These time-restricted completion rates at community colleges are low because most students attend part time (and therefore take longer to complete, even if they eventually do complete) and because many may not be seeking degrees (they may enroll in a limited number of courses in order to advance their job skills or pursue a personal interest). First-time students who were enrolled full time represent only a minority of all community college students: 10 percent of headcount enrollments (56 percent of all first-time students) in 1999-2000, according to IPEDS. Similarly, many students leave community colleges prior to earning a credential and subsequently enroll in another institution. These transfers should be considered successful outcomes for the transfer-out institutions. In this later case, the 2002-03 GRS also provides data on transfer-out students from community colleges. We use this and the credential completion measure to compute an alternative dependent variable collectively referred to as the institutional “success rate.”⁸

Figure 1 shows the distribution for the SRK completion rates and the success rate for all community colleges. It indicates that completion rates cluster between 10 and 30 percent. But colleges exhibit wide variation in the outcomes measures, and we exploited this variation to determine the institutional characteristics that are related to higher institutional completion rates. Overall, 22.3 percent of FTFT community college students in the sample earned a postsecondary credential in their starting institutions after three years (s.d. 0.146), while 38 percent completed a

⁷ Institutions that do not offer programs based on standard academic terms use the 12-month period (September 1 to August 31) to determine their cohort. This description comes from the NCES “Instructions for Graduation Rates – 2-year Institutions.” See http://nces.ed.gov/ipeds/pdf/webbase2002/grs_2yr_form.pdf. See the IPEDS GRS data dictionary in http://nces.ed.gov/ipeds/pas/dct/download/data/GR2003_Dict.zip.

⁸ See the IPEDS GRS data dictionary in http://nces.ed.gov/ipeds/pas/dct/download/data/GR2003_Dict.zip.

degree or transferred out (s.d. 0.176). These findings are consistent with other results from the research literature.

We selected the explanatory variables for eq. (1) for the model based on factors that previous studies have indicated are related to degree completion in community colleges. To create these variables, we compiled data from three IPEDS surveys (Institutional Characteristics, Fall Enrollment, and Finance) for 1999-2000, the base year for the cohort of students for which we had the most recent GRS completion data. Previous research has shown that college size is related negatively to graduation rates. Minority students also graduate at lower rates than white students, and women graduate at higher rates, so we included appropriate demographic characteristics. Although the graduation rate variable includes only full-time students (measured during the student's initial enrollment) we expect that the more varied and unstable atmosphere in colleges with large numbers of part-time students might lead to lower graduation rates. A relatively large number of part-time faculty might also weaken graduation rates. High tuition (controlling for expenditures) would be expected to have a negative effect if it makes it difficult for low-income students to persist. Higher expenditures on academic and student services and on instruction would be expected to increase graduation rates.

Our dependent variable does have limitations. IPEDS does not provide complete data to break out the degree completion measure by type of credential awarded. Since graduation rates for certificate programs are higher than they are for associate programs (Alfonso, Bailey, & Scott, 2005), institutions such as technical colleges that specialize in awarding certificates may have higher overall graduation rates than comprehensive community colleges, which tend to emphasize programs leading to associate degrees. To account for this fact, we included a dummy variable indicating whether an institution awards more certificates than associate degrees. We

also included a variable indicating whether an institution was a “technical” college.

Traditionally, these institutions focus on terminal degrees and so graduation rates would be less distorted by students transferring without having completed a degree.

Our list of explanatory variables has some other key omissions. As discussed, studies of the graduation rates of baccalaureate institutions show, not surprisingly, that institutions that enroll better-prepared students as measured by standardized test scores tend to have higher graduation rates. The IPEDS dataset does not include data on the academic preparation or readiness of entering students. In general, there is not a widely used and available measure of the academic preparedness of community college students. Moreover, the IPEDS dataset does not include information on the income characteristics of students. We used the amount of federal aid per FTE undergraduate (primarily Pell Grants) as a proxy for the extent of financial need among a college’s students.⁹

Table 1 presents the mean values of each variable in the model for the sample studied. Based on these data, we see that most community colleges in our sample are located in suburban areas. The “average college” enrolls 3,044 FTE students, most of whom are female (57.5 percent) and one-fifth of whom are from a minority group, defined as black and Hispanic students. These colleges charge an average of \$1,659 per academic year for in-state tuition. One in five colleges awards more certificates than associate degrees. Table 1 also presents basic descriptive statistics for certificate and associate-degree-oriented institutions that verify previous findings.

⁹ However, this measure is problematic. For example, an institution might serve a large number of low-income students, but still receive relatively little funding through federal financial aid because of high default rates among its students or, for whatever reason, does not encourage and assist students to apply for aid. The amount of institutional aid a college provides to its students may be a better measure of the resourcefulness of the institution than of the financial need of its students.

V. Empirical Results

Table 2 presents the results of grouped logistic regressions of three sequential models when the outcome variable is the institutional graduation rate. The group logit coefficients are not readily interpreted; therefore, to make the results easier to understand we include the marginal effect for each variable in the table. The marginal effect represents the change in the institutional graduation rate of a one-unit change in the characteristic, holding all other characteristics constant. Given that we are dealing with institutional-level data, the interpretation of these coefficients represents the effect of campus or other environmental factors on the likelihood of FTFT community college students in our sample of colleges to earn a credential or transfer and not the likelihood of a *particular* individual with *particular* characteristics to achieve such an outcome.

Fixed Characteristics

The first model uses only the fixed characteristics and state fixed-effect dummies to control for state differences. In general, colleges located in urban areas have 3.7 percent lower graduation rates than those located in suburban areas, while rural colleges have completion rates nearly 4 percent higher. Note that the performance of historically black community colleges and tribal colleges is not significantly different from the performance of other institutions. As expected, colleges that award more certificates than associate degrees and technical colleges have higher rates of credential completion. We introduced into this model the state dummies as control variables. These state variables do not tell us *why* the average performance differs among

states. However, the state regulatory, economic, and social environment comprises an important part of the fixed institutional measures and has important effects that should be investigated further with detailed state-by-state analyses. With just these fixed institutional variables the model explains roughly 41 percent of the variation in institutional graduation rates.

Compositional Characteristics

The second model adds dummy variables for compositional characteristics, including enrollment size and the racial/ethnic and gender makeup of the student body. Using dummy variables for FTE undergraduates reveals that size is an important predictor of an institution's degree completion rate. Larger community colleges, especially those with more than 2,500 FTE undergraduates, have a 9 to 13 percent lower graduation rate than do smaller colleges. This result remains even after controlling for the urbanicity of the college, which remains negative, but now becomes insignificant. Students complete at higher rates in smaller colleges, perhaps because such institutions can provide a more personalized environment. It may also be true that smaller institutions have a more limited and focused set of programs, which may attract students who know what they want or provide a structure to guide students who do not know what they want toward completion.

In terms of the demographic characteristics of the student body, having a large proportion of minority students enrolled at a college lowers the probability of FTFT students completing, even after controlling for other characteristics of the college. Colleges with relatively larger part-time student populations have lower completion rates (even for initially full-time students). Similarly, a high proportion of women in the student body is negatively associated with

completion rates. In this case, the marginal effect represents the difference in the graduation rate between a community college with no females to a similar college that is female only. This relationship is surprising and will be analyzed in detail below.

Financial Characteristics

The final model adds the financial characteristics. Only instructional expenditure is statistically significant, but the magnitude of the effect is not very large. Community colleges that invest relatively more in instruction have higher rates of degree completion. An additional \$1,000 spent on instruction per FTE undergraduate improves graduation rates by 1.3 percent. The effect of other variables is not changed substantially from the previous models, and the model fit does not improve greatly with the addition of the finance-related measures. Model 3 explains approximately 60 percent of the variation in the outcome.

The last column on Table 2 shows the results when combining institutional graduation with transfer-out to form the dependent variable. Interestingly, urban colleges are now predicted to have 2.4 percent lower success rates than suburban ones, while the performance of historically black community colleges is roughly 13 percent higher than other institutions. Note also that the unexpected negative result for females is still statistically significant, although less important. Other than these effects, the distortion caused by including transfer-out information is not very large for three-year rates although this model represents a loss of fit as measured by the Adjusted R-squared.

Female Enrollments

As noted above, the relationship between graduation rates and the share of women in the student body is surprising. Almost all the research on retention and graduation at the individual level shows that women graduate at higher rates than men, after controlling for other individual characteristics and enrollment variables. Furthermore, studies of baccalaureate institutions like those by Porter (2000) and Scott, Bailey, and Kienzl (in press, 2005) found a positive relationship between the proportion of female students and graduation rates. Indeed, even in the SRK data, FTFT women have higher graduation rates than FTFT men. Nevertheless, our analysis found that colleges with more female students tend to have lower graduation rates. Of course it is possible, but unlikely, that women graduate at higher rates while the FTFT graduation rate of the college is lower. After all, the SRK sample includes, on average, only 56 percent of an institution's first-time student population.

To investigate this conundrum we conducted a similar analysis separately for the graduation rates for men and for women. Columns 1 and 2 on Table 3 show that the negative effect of the proportion of females remains; however, the proportion of part-time students in an institution has no statistically significant effect for males. This finding suggests that the relationship between the proportion of part-time and female students needs further investigation. To examine this relationship in the original model, we created a variable that indicates whether an institution's student body is more than 50 percent female. We then interacted this dummy variable with the continuous measure for the proportion of the student body that is part-time. The interaction term isolates the effect of part-time students on institutions with a high proportion of females. We added the interactions in the original Model 3 and got two important results. First,

the direct effect of part-time students in the institution vanished after controlling for the interaction between the share of part-timers and female students. Second, the proportion of part-time students is negatively associated with institutional completion rates only if the institution has more than 50 percent women. These findings suggest that the negative effect of the enrollment share of women is stronger in institutions with more part-time students.

Clearly, this result needs further study. Interestingly, Muraskin and Lee (2004) presented similar evidence for four-year institutions with a high share of low-income students. The authors used data for the academic year 1998-1999 to identify 20 institutions with a high proportion of low-income students enrolled and then classify them as “higher than average graduation rates” (HGR) and “lower than average graduation rates” (LGR). Their descriptive statistics show that LGR institutions have higher female enrollments than HGR institutions. Moreover, some preliminary evidence by Bailey, Calcagno, Jenkins, Leinbach, and Kienzl (2005) using NELS:88 and IPEDS suggests that the negative impact vanishes after controlling for individual level variables like SES, ability, enrollment intensity, and major.

VI. Conclusions

The Student Right-to-Know graduation rates are published by NCES so that students can get a sense of the level of performance of any college that they might be interested in attending. The raw graduation rates give some useful information, but the variations among colleges can also be used to search for college characteristics that are related to higher probabilities of graduation.

The research presented here confirms several hypotheses about institutional determinants of graduation rates at community colleges. Our analysis indicates a consistent negative relationship between enrollment size and completion. In addition, colleges with a high share of minority students, part-time students, and women have lower graduation rates. Another significant finding among institutional characteristics is that greater instructional expenditure per FTE is related to a greater likelihood of graduation. Finally, the state in which a college is located is significantly related to its graduation rate, suggesting that a state's policy environment has a strong bearing on the measured performance of colleges.

All of these results are worth further study. Why do colleges with high minority shares have lower graduation rates? What is it about large size that influences graduation rates? What state policies have an influence on student success? And why do institutions with a larger share of women students have lower graduation rates even though research consistently shows that women graduate at higher rates than men?

We recognize the weaknesses in the SRK graduation rates, so this study should be seen as the beginning of a broader research agenda that combines quantitative and qualitative research to further identify institutional and state characteristics and policies that promote student success.

One strategy is to use national longitudinal data on individuals such as the National Education Longitudinal Study of 1988 (NELS:88) or the Beginning Postsecondary Students Longitudinal Studies (BPS) and link those data to the institutions that each student attends. While the sample sizes are not large enough to analyze performance of individual colleges, the analysis can be used to measure the effect of institutional characteristics. A second approach is to conduct similar analyses using individual longitudinal records from state datasets. While such an approach does not allow the study of state effects, state datasets are large enough to study the experience at individual institutions, controlling for individual characteristics. State data, which allow the use of many more comprehensive outcome measures (such as transfer rates to public institutions, retention, course completion, and others), can also be used to evaluate the usefulness of the SRK graduation rates.

As we have pointed out, our model can also be used to benchmark colleges. This can be done by comparing the raw graduation rate to the expected graduation rate based on the estimated coefficients and each institution's characteristics. An actual rate that exceeds an expected rate suggests that the college is over-performing relative to its characteristics. Although such an approach could be used for accountability purposes or to rank colleges, we see it as much more useful as a research tool to identify samples for further study using qualitative methods. Case studies that compare over- and under- performing colleges can begin to reveal the institutional policies and behaviors associated with greater student success.¹⁰

¹⁰ Something like this method was used for studies of four year colleges by Muraskin and Lee (2004) and by Kuh, Kinzie, Schuh, Whitt and Associates (2005). Muraskin and Lee (2004) use raw six-year graduation rates to compare high and low graduation rate institutions in a sample partitioned by public or private control. Kuh et al. (2005) selected 20 over performing colleges for study using a multivariate regression approach, although they did not compare them to under performing institutions.

The focus on community college outcomes has opened up a rich research agenda that moves away from specific evaluative studies of individual programs, such as learning communities or other discrete interventions, and focuses attention on overall institutional performance. This broad effort is being enhanced by the growing availability of datasets that span different institutions and that are large enough to track individuals *and* to examine individual colleges. While each dataset or methodology has limitations, a comprehensive research agenda that uses a variety of different datasets and that combines quantitative and qualitative approaches can provide many opportunities to develop knowledge that can be useful for educators and policymakers seeking to increase institutional effectiveness and improve student outcomes.

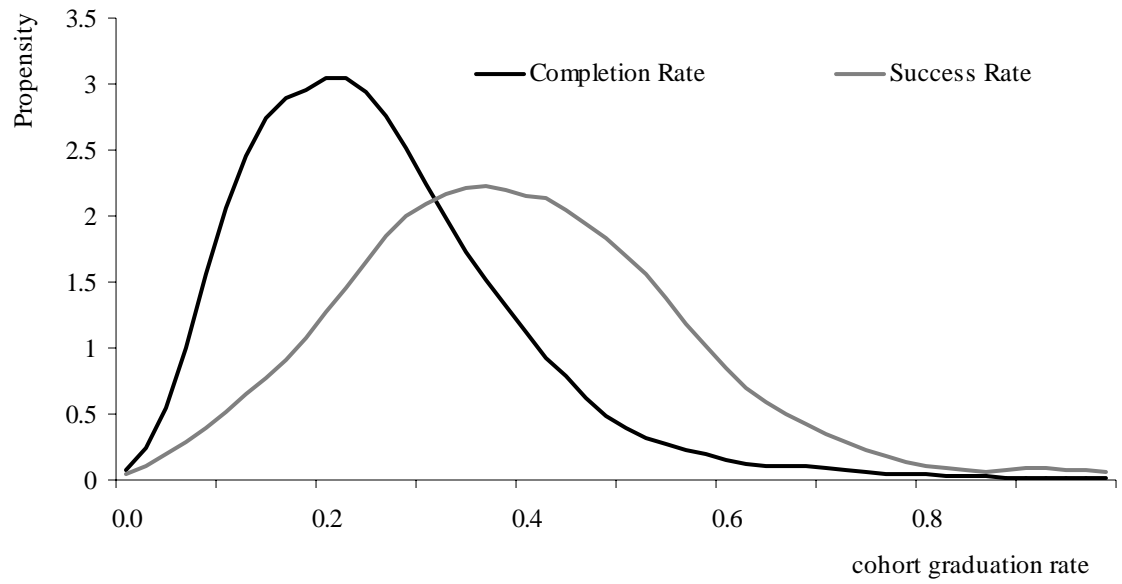
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Figure 1. 1999-2000 First-Time, Full-Time Students: Three-year Community College Graduation and Success Rate



Source: IPEDS Graduation Rate Survey 2002-03; authors' calculations.

Table 1. Descriptive Statistics of the Sample of Community Colleges

Variable	Complete Sample	Degree Orientation	
		Certificate	Associate
<i>Cohort</i>			
Full-time, first-time degree-seeking undergraduates	505 (16.58)	318 (24.49)	546 (19.05)
Number who attained a degree within three years	112.64 (4.15)	100.63 (11.27)	116.27 (4.51)
Number who attained a degree or “transfer out” within three	192 (7.11)	140.45 (14.35)	204.45 (7.83)
<i>Fixed Characteristics</i>			
College is located in urban area	38.7%	33.6%	40.2%
College is located in suburban area [reference group]	52.4%	56.6%	51.5%
College is located in rural area	9.0%	9.9%	8.3%
College is a historically black college or university	0.9%	1.3%	0.8%
College is a tribal college	1.9%	3.3%	1.5%
Certificate degree oriented college	17.1%		
Technical College	19.2%	51.3%	12.8%
<i>Compositional Characteristics</i>			
Total full-time equivalent undergraduates	3,044 (0.096)	1,834 (0.16)	3,345 (0.112)
1,000 FTE undergraduates or less [reference group]	20.7%	39.5%	15.7%
1,001-2,500 FTE undergraduates	37.0%	38.2%	37.0%
2,501-5,000 FTE undergraduates	25.0%	16.4%	27.2%
More than 5,000 FTE undergraduates	17.3%	5.9%	20.1%
Proportion FTE minority undergraduates (black and Hispanic)	20.3%	26.4%	19.3%
Proportion FTE part-time undergraduates	33.9%	34.1%	34.2%
Proportion FTE female undergraduates	57.5%	57.0%	57.5%
Proportion part-time faculty	52.6%	45.9%	53.9%
<i>Financial Characteristics</i>			
In-state tuition	\$1,659 (0.039)	\$1,317 (0.081)	\$1,699 (0.045)
Instructional expenditures ^a	\$4.157 (0.049)	\$5,090 (0.165)	\$3,970 (0.047)
Academic support ^a	\$817 (0.022)	\$925 (0.103)	\$788 (0.018)
Student services ^a	\$981 (0.023)	\$1,090 (0.087)	\$961 (0.022)
Administrative expenditures ^a	\$1,461 (0.032)	\$1,735 (0.138)	\$1,409 (0.028)
Federal aid (Pell Grants) ^a	\$824 (0.015)	\$944 (0.041)	\$808 (0.017)

Source: Authors' calculations using data from IPEDS Graduation Rate Survey 2002-03.

Notes: ^a per FTE undergraduates. Standard errors in parenthesis for continuous variables.

Table 2. Results of Group Logit Regression on Institutional Graduation and Success Rate

	Dependent Variable							
	Institutional Graduation Rate						Institutional Graduation Rate plus Transfer Out	
	Coeff	dy/dx	Coeff	dy/dx	Coeff	dy/dx	Coeff	dy/dx
College is located in urban area	-0.199 (0.043)	-0.037	-0.028 (0.037)	-0.006	-0.028 (0.038)	-0.006	-0.097 (0.037)	-0.024
College is located in rural area	0.208 (0.091)	0.038	0.043 (0.078)	0.009	0.042 (0.08)	0.009	-0.003 (0.08)	-0.001
Historically black college or university	0.170 (0.247)	0.031	0.419 (0.202)	0.093	0.437 (0.204)	0.097	0.515 (0.182)	0.128
College is a tribal college	-0.821 (0.631)	-0.151	-1.283 (0.821)	-0.189	-1.202 (0.821)	-0.179	-1.074 (0.698)	-0.230
Certificate degree oriented college	0.298 (0.070)	0.051	0.277 (0.061)	0.057	0.251 (0.063)	0.051	0.098 (0.063)	0.024
Technical college	0.457 (0.072)	0.089	0.224 (0.067)	0.048	0.196 (0.069)	0.041	-0.069 (0.067)	-0.017
1,001-2,500 FTE undergraduates			-0.144 (0.075)	-0.029	-0.14 (0.078)	-0.028	-0.182 (0.080)	-0.044
2,501-5,000 FTE undergraduates			-0.511 (0.081)	-0.093	-0.501 (0.087)	-0.091	-0.386 (0.087)	-0.092
More than 5,000 FTE undergraduates			-0.741 (0.085)	-0.127	-0.728 (0.093)	-0.124	-0.456 (0.092)	-0.108
Proportion FTE minority undergraduates			-0.704 (0.114)	-0.145	-0.774 (0.143)	-0.158	-0.838 (0.136)	-0.207
Proportion FTE part-time undergraduates			-0.788 (0.203)	-0.162	-0.786 (0.220)	-0.161	-0.836 (0.215)	-0.206
Proportion FTE female undergraduates			-2.425 (0.319)	-0.500	-2.303 (0.348)	-0.471	-1.388 (0.350)	-0.343
Proportion part-time faculty			-0.035 (0.086)	-0.007	-0.025 (0.089)	-0.005	0.048 (0.084)	0.012
In-state tuition					-0.065 (0.038)	-0.013	0.006 (0.034)	0.001
Instructional expenditures					0.064 (0.020)	0.013	-0.014 (0.02)	-0.004
Academic support					0.002 (0.05)	0.000	-0.061 (0.051)	-0.015
Student services					-0.059 (0.042)	-0.012	0.038 (0.044)	0.009
Administrative expenditures					-0.045 (0.037)	-0.009	0.009 (0.037)	0.002
Federal aid (Pell Grants)					0.044 (0.072)	0.009	-0.064 (0.069)	-0.016
Number of observations	884		844		825		824	
Adjusted R squared	0.41		0.60		0.61		0.51	

Notes: Bolded coefficients are significant at the 5% level. Regressions also include fixed-effect state dummies and are available from the authors on request. Marginal effect is for discrete change of dummy variables from 0 to 1.

Table 3. Group Logistic Regression on Institutional Graduation Rate by Gender

	Dependent Variable					
	SRK Female		SRK Male		SRK	
	Coeff	dy/dx	Coeff	dy/dx	Coeff	dy/dx
College is located in urban area	-0.071 (0.038)	-0.013	-0.029 (0.043)	-0.005	-0.034 (0.038)	-0.007
College is located in rural area	-0.017 (0.08)	-0.003	0.078 (0.088)	0.013	0.062 (0.079)	0.013
Historically black college or university	0.589 (0.200)	0.126	0.450 (0.232)	0.085	0.440 (0.203)	0.097
College is a tribal college	-1.076 (0.782)	-0.150	-1.295 (1.059)	-0.145	-1.226 (0.813)	-0.181
Certificate degree oriented college	0.226 (0.065)	0.043	0.252 (0.067)	0.042	0.220 (0.063)	0.044
Technical College	0.179 (0.071)	0.035	0.236 (0.074)	0.041	0.209 (0.069)	-0.170
1,001-2,500 FTE undergraduates	-0.15 (0.079)	-0.028	-0.080 (0.086)	-0.013	-0.133 (0.077)	-0.026
2,501-5,000 FTE undergraduates	-0.492 (0.089)	-0.087	-0.404 (0.096)	-0.064	-0.485 (0.086)	-0.088
More than 5,000 FTE undergraduates	-0.633 (0.097)	-0.107	-0.592 (0.105)	-0.089	-0.705 (0.092)	-0.121
Proportion FTE minority undergraduates	-0.649 (0.140)	-0.123	-0.722 (0.165)	-0.121	-0.766 (0.142)	-0.156
Proportion FTE part-time undergraduates	-0.594 (0.226)	-0.112	-0.436 (0.242)	-0.073	-0.166 (0.272)	-0.034
Proportion FTE female undergraduates	-2.206 (0.382)	-0.416	-2.258 (0.360)	-0.379	-1.528 (0.400)	-0.312
Interaction term: more than 50 percent of female* proportion FTE part-time undergraduate					-0.834 (0.219)	-0.007
Proportion part-time faculty	0.042 (0.089)	0.008	-0.169 (0.097)	-0.028	-0.032 (0.088)	0.045
In-state tuition	-0.058 (0.037)	-0.011	-0.034 (0.042)	-0.006	-0.067 (0.037)	-0.014
Instructional expenditures	0.061 (0.020)	0.012	0.101 (0.022)	0.017	0.063 (0.020)	0.013
Academic support	0.038 (0.05)	0.007	-0.003 (0.055)	-0.001	0.012 (0.050)	0.002
Student services	-0.057 (0.043)	-0.011	-0.066 (0.045)	-0.011	-0.049 (0.042)	-0.010
Administrative expenditures	-0.028 (0.038)	-0.005	-0.062 (0.040)	-0.010	-0.050 (0.037)	-0.010
Federal aid (Pell Grants)	-0.159 (0.078)	-0.030	-0.092 (0.088)	-0.015	0.021 (0.072)	0.004
Number of observations	822		813		825	
Adjusted R squared	0.58		0.62		0.61	

Notes: Bolded coefficients are significant at the 5% level. Regressions also include state fixed effects and the full set of covariates included in Model 3, Table 2. Coefficients for these variables are available from the authors on request. Marginal effect is for discrete change of dummy variables from 0 to 1.