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ANALYZING THE SUCCESS OF STUDENT TRANSITIONS FROM 2-YEAR TO 4-YEAR PUBLIC INSTITUTIONS WITHIN A STATE

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I. Introduction

Public higher education institutions enroll about 80% of American college and university students. In the fall of 1996, 55% of freshmen enrolled in public institutions and 42% of full-time freshmen in public institutions began their study at two-year colleges. These proportions vary widely across states. However in a number of large states, including California, Florida, New Jersey and New York, two-year colleges provide the entry point to higher education for the majority of full-time first year students enrolled in public institutions (table 1).

We are likely to see a growing reliance on 2-year institutions in the years ahead to meet the growing demand for higher education opportunities that is occurring in many of our nation's states. Middle range projections are that between 1999 and 2011, college enrollments will rise by 20% with most of the growth in enrollment occurring in public higher education.[1] This growing demand for enrollments in public higher education is occurring at the same time that state budgets are becoming increasingly tight because of both the short-run financial impact of the recession that started in 2001 and of longer run factors, including the increased demand for state funding for other public needs, such as public elementary and secondary education, and the unwillingness of most states to consider raising state taxes.[2]

The likely growing importance of two-year colleges in the years ahead suggests that higher education researchers and policymakers should increase their attention to them.[3] Two-year colleges are as complex, or more complex, than their research university

[1] See Gerald and Hussar (2001)
[2] See Ehrenberg (2000) for a more complete discussion of this point.
[3] Pascarella (1997) has also stressed the importance of researchers devoting more attention to two-year colleges and their students.

counterparts. Their missions include adult education, providing contract courses for companies and different levels of government, training students for careers, and preparing students for transfer to 4-year institutions.[4] Previous research by economists has addressed some of these missions and asked if there is an economic payoff to taking some 2-year college courses but not obtaining a degree, if the economic payoff to 2-year college courses is the same as that to 4-year college courses, if there is a "sheepskin" effect from receiving a 2-year degree and if the presence of 2-year public colleges in a state serves to increase or decrease overall educational attainment of young adults in the state.[5]

Our paper focuses on the last mission of the 2-year colleges, namely preparing students to transfer to 4-year institutions. The method by which public higher education is organized and governed varies widely across states and this might be expected to influence the flow of students from 2-year institutions into and through completion of 4-year institutions.[6] In some states, for example New York (in both the CUNY or SUNY systems) and Florida, 2-year and 4-year institutions are members of the same system. Florida also has a common course numbering system that should also facilitate transfers. In other states, for example Pennsylvania, some (but not all) of the 2-year public colleges are branch campuses of the flagship public university, which also should be expected to facilitate transfers. In still other states, for example Massachusetts, there are coordinating

[4] See Bailey (2002), Cohen and Brawer (2003) and Dougherty (1994) for a more complete discussion of the multiplicity of roles that 2-year colleges play.
[5] See for example, Grubb (1993, 1995, 1997, 2000a, 2000b), Kane and Rouse (1995a, 1995b, 1999), Leigh and Gill (1997, forthcoming) and Rouse (1995, 1999). Higher education scholars also have studied issues relating to 2-year college students including their persistence in college and the effects that 2-year colleges have on their students. Examples and surveys of the literature include Pascarella and Terezini (1991), Pascarella (1999), Pascarella et. al. (1998) and Tinto (1993).
[6] Details of the governance relationships between 2-year and 4-year colleges, by state, are available from the Center for Community College Policy at its web page http://www.communitycollege.org.

boards for all public (and sometimes also private) higher education institutions in a state, which in principle should also help to facilitate transfers. We know of no research that has looked at the optimal way to organize public higher education in a state to facilitate transfers.

Within many large states there are multiple 2-year and 4-year institutions. In 1998-99, only 19 states had less than 15 public 2-year institutions. Of the 31 states with 15 or more public 2-year institutions, only 3 had 5 or fewer public 4-year institutions.[7] State policymakers and system administrators should want to know how well each 2-year public institution is doing in preparing those of its students who transfer to public 4-year institutions in the state to successfully complete 4-year college study. Similarly, they should want to know how successful each 4-year college in the state is in graduating those students from 2-year colleges that transfer to it.[8]

This information could then be used in formative evaluations in which knowledge of the best practices of the most successful institutions are transmitted to their sister institutions in the state. If general agreement is reached across institutions in the state on the validity of the methodological approach used to generate this information then, and only then, could the information be used in summative evaluations that relate to resource

[7] U.S. Department of Education (2000), table 246.

[8] A related concern of policymakers, which our paper does not address, is how well each 2-year institution is doing in terms of the percentage of its entrants that ultimately transfer to 4-year institutions. However, efforts to compute such percentages face many difficulties (Romano and Wisniewski 2003). For example, unpublished data provided to us by the Office of Institutional Research and Analysis of the SUNY system indicate that during the 1985-86 to 2001-2002 period the percentage of graduates of SUNY 2-year institutions in one year that were enrolled in a 4 –year SUNY institution in the following fall varied across years between 13.8 and 19.9 percent. However, the number of students who transferred prior to receiving a 2-year degree is often as large as the numbers that transfer after receiving such a degree. Furthermore, such calculations do not take into account students that enroll in 4-year private institutions, 4-year public institutions in other states or enroll in 4-year SUNY institutions a year or later after graduating from the 2-year institutions.

allocation decisions. In either case, the information could be used to help improve the performance of a state's public higher education system.

Our paper uses data provided to us by the Office of Institutional Research and Analysis of the State University of New York (SUNY) to illustrate a methodological approach that can be used to address these issues. The methodology we develop is applied to data from the SUNY system and we provide some findings that are interesting in their own right. However, our main purpose is to illustrate the methodology because we believe the approach can be usefully employed in other states that have multiple public 2-year and 4-year institutions and that collect data in their information systems that are capable of generating grouped data of the type that we use. Wellman (2002) reports that 33 states currently collect data that permit them to conduct statewide studies of transfer rates for their entire system (or systems) of public institutions.[9]

In the next section, we describe the SUNY system, discuss the data to which we have been granted access and sketch out our methodological approach. Empirical findings are provided in the following three sections and the sensitivity of our finding to the specific model estimated and sample of data used are examined. Section VI presents a discussion of the some of the conceptual and statistical limitations of our approach and the types of data that, if available, would improve the analyses.

At the outset, we must stress several points. First, the identities of all of the SUNY campuses for which results are presented in the paper have been kept confidential and a random code assigned to each 2-year and 4-year campus. This was done by agreement

[9] New Mexico Commission on Higher Education (2002) provides an example of one state's data. Gary Barnes, former Vice President for Program Assessment and Public Service of the University of North Carolina System, assured us in private correspondence that the UNC System also has the capability of producing data of the type we have used.

with the SUNY Office of Institutional Research because until the campuses agree that the methodology we have developed, or a revision of it, is a useful one that will help the system to facilitate the flow of 2-year college transfers through to 4-year degree completion, it would be mistake associate specific institutional names with our findings. If each institution knew its code, those who faired poorly in the analyses would muster every possible objection to avoid having the system adopt the methodology for policy purposes. Hence when called by specific institutions that have seen reference to our work in the *Chronicle of Higher Education*, we have patiently explained to them why we cannot tell them how they fare and have referred them to the SUNY Office of Institutional Research to discuss what they think of the methodology and how they believe it might be improved.[10]

Second, as will quickly become clear to the reader, our approach uses grouped rather than individual data. In part this reflects the type of data to which the SUNY system was willing to grant us access. In part, it reflects our concern that staff of state systems may not always have the resources or time to analyze large individual data sets. However, if data at the individual student level could be analyzed it would be preferable to do so and we indicate at points below how one can easily generalize our approach to use individual level data.

Third, we must reemphasize that public two-year institutions are complex institutions that have multiple missions and produce multiple outputs. We address only one of those missions, how well they prepare those of their students that transfer to four-year public institutions within the same state. Hence the approach we propose is best thought of as one of the many components of a state accountability system for public higher education.

[10] Jamilah Evelyn (2002).

To be useful, a component of a state accountability systems should lend itself to institutional improvement, should be transparent to all participants, should be agreed upon by all participants and should stress information on differences across institutions that are significant in both a statistical and policy sense.[11]

II. The Data and Our Methodology

The State University of New York (SUNY) system consists of 64 institutions. These include 4 university centers that confer baccalaureate, master's, doctoral and first professional degrees, 13 university colleges that offer baccalaureate and master's degrees, 5 specialized colleges that offer instruction in a variety of specialized areas and baccalaureate and higher level degrees, 2 stand alone health science centers, 5 statutory colleges that are located on the campuses of private universities (Alfred and Cornell) that offer the same range of degrees as the university centers, 30 2-year community colleges and 5 colleges of technology that offer 2-year degrees.[12]

During the past 15 years the proportion of the SUNY community college graduates that received Associate in Arts (AA) or Associate in Science (AS) degrees in a year that enrolled at a SUNY 4-year institution by the following fall has fluctuated between about .22 and .27.[13] Other AA or AS graduates enroll at a SUNY 4-year institution more than a year after completing their 2-year degrees, or transfer to private colleges and universities. Some SUNY 2-year college students enrolled in AA or AS programs transfer to SUNY 4-

[11] We are grateful to a referee for stressing this point to us.
[12] A listing of the institutions in each category appears in the appendix table.
[13] Office of Institutional Research and Analysis (2000), 263. The AA and AS are 2-year degrees that are designed to prepare students for transfer to 4-year academic programs.

year institutions prior to receiving their degrees and some SUNY 2-year college students enrolled in other degree or certificate programs transfer to SUNY 4-year programs after, or before, receiving their degrees.[14] Finally some students transfer from private colleges or universities in New York State, or from colleges and universities in other states, to SUNY 4-year institutions.

As a result of all these student flows, transfer students represent a substantial share of undergraduate students (new first year students plus transfer students) at all SUNY 4-year campuses. Table 2 presents data on transfer students as a share of all new undergraduate students in the fall of 1999 for each of the SUNY University Centers and University Colleges that illustrate this point. Transfer students' shares ranged from .201 at Geneseo to .743 at Empire State.[15] Most of the institutions had transfer shares between .3 and .5. Because transfer students make up such an important component of the enrollment at SUNY 4-year institutions, their progression through the system is of great concern to the university system.

We have been granted access to grouped data on the number of students who transferred from each SUNY 2-year community college or college of technology to each SUNY 4-year university college, specialized college or university center and were enrolled full-time at the 4-year institution at the start of the 1995 and 1996 fall

[14] For example, of the 8,937 students transferring from SUNY 2-year institutions to SUNY 4-year institutions in the fall of 1999, 3,247 had received AA or AS degrees, 1,249 had received Associate in Applied Science (AAS) or Associate in Occupational Studies (AOS) degrees, and 4,441 transferred prior to receiving any degree (Office of Institutional Research (2000), 219).

[15] Empire State College is a nontraditional higher education institution that provides innovative adult-focused degree programs to students throughout New York State and beyond. Many of its students started college immediately after graduation from high school, subsequently dropped out of those institutions, and return to enroll at Empire State as older students.

semesters.[16] The data are grouped in each case by the educational attainment of the students at the time of transfer. Specifically, we know whether the students in a group had received a 2-year degree at the time of transfer, or any other type of degree or certificate. We also have been given access to information on the number of students in each group who had completed a 4-year degree, were still enrolled at the 4-year institution, or had dropped out of the 4-year institution by three years later (the falls of 1998 or 1999).[17] These data come from reports that the SUNY system regularly prepares for its own internal use.[18]

Let P_{1jht} be the proportion of those individuals from 2-year college j who transferred to 4-year institution h in the fall of year t, who had received a 4-year degree by three years later. Let P_{2jht} and P_{3jht}, respectively, be the analogous proportions that were still enrolled in the 4-year institution in the fall three years later and that had dropped out by the fall three years later. Our initial approach is to estimate equations (1) below in which each proportion is specified to be a linear function of a vector of dichotomous variables (d) indicating from which 2-year college the students transferred (d_j equals one if the students came from 2-year college j and zero otherwise), a vector of dichotomous variables (e) indicating to which 4-year institution the students transferred (e_h equals one

[16] Part-time students were omitted both because SUNY regularly publishes data of the type we are using only for full-time students and because including part-time students in the sample would create problems if the fraction of transfer students who were part-time, or the fraction of a full-time course load for which part-time transfer students enroll, systematically varied across the 4-year institutions.

[17] There is no way to distinguish in the data between individuals who permanently drop out of college from individuals who have temporarily "stopped out" for academic or nonacademic reasons.

[18] It would be preferable to use individual-level data that fully controlled for student ability, socioeconomic background, and gender, ethnicity and race, as well as for credits attained as of date of transfer (Surette (2001) provides evidence, for example, that persistence to degree for transfer students is related to gender). However, state systems do not always possess the staff resources, expertise, or time to conduct such analyses. Our approach takes grouped data that is either already regularly produced or can be easily produced and shows how it can be used in a straightforward and simple manner to obtain a measure of an institution's relative productivity on one dimension of its multiple activities. Using groups broken down more finely, for example by gender, is an obvious desirable extension.

if the students went to 4-year institution h and zero otherwise), three dichotomous variables (degt, dego and cert) indicating, respectively, whether the students in the group had each received a 2-year degree designed to prepare students for transfer to a 4-year academic program (an Associate in Arts (AA) or Associate in Science (AS) degree), another 2-year degree (an Associate in Applied Science (AAS) or Associate in Occupational Studies (AOS) degree), or a certificate of program completion prior to transferring (the omitted category is the receipt of no degree or certificate prior to transfer), the distance, in miles, between the 2-year college and the 4-year college, measures of labor market conditions during the years after the transfer date in the areas in which the sending and receiving institutions are located (lab_{jt} and lab_{ht}) and a dichotomous variable for the year in which the transfer occurred (year). In this model ε is a random error term and the a's, b's and c's are parameters to be estimated.

(1) $$P_{ijht} = c_0 + \Sigma\, a_k d_k + \Sigma\, b_r e_r + c_1 degt + c_2 dego + c_3 cert + c_4 dist_{jh} + c_5 lab_{jt} + c_6 lab_{ht} + c_7 year + \varepsilon_{ijht} \qquad i=1,2,3$$

The equation for the proportion of a group that had graduated by the fall three years after transfer specifies that this proportion depends only on the 2-year college from which students in the group transferred, the 4-year institution to which students in the group transferred, whether students in the group had received a 2-year degree designed for students planning to transfer, another 2-year degree, or a certificate of program completion before transferring, the distance between the 2-year and 4-year institution, labor market conditions during the three years after the transfer date in the areas in which both the sending and receiving colleges are located and the year in which the transfer

occurred. The equations for the proportions of each group that were still enrolled or had dropped out by the fall three years after transfer are analogously specified.

The distance variable is included because most 2-year college students live near the 2-year college at which they were enrolled and hence the distance measure is a measure of the distance between the students' homes and the 4-year college that they attended. Greater distances from home usually imply greater monetary or psychological costs of attending college and thus may lower the probability of graduating.

The labor market conditions variables that we employ are the average unemployment rate and the average annual earnings during the three years after the date of transfer in counties in which the sending and receiving institutions are located.[19] Better labor market conditions in the sending area may provide an incentive for transfer students to return home and seek permanent employment and drop out of college, or if they can commute to the 4-year college, may facilitate their working part-time while enrolled in college and facilitate remaining enrolled. Similarly, better labor market conditions in the area in which the receiving institution is located may facilitate the students finding part-time employment to help finance their education, which in turn may reduce their drop-out rate and increase their persistence rate. Whether this would increase or decrease their three-year graduation rate would depend upon whether the improved part-time employment opportunities led them to reduce their course loads.

The dichotomous variable for the year of transfer is included to control for differences in statewide labor market conditions that face the two entry cohorts that are

[19] SMSA averages were used whenever an institution was located in a metropolitan area. Unemployment rate data is available on the World Wide Web at http://www.labor.state.ny.us/labor_market/LMI_business/laus/search.htm. Wage data is available at http://www.labor.state.ny.us/labor_market/LMI_business/insured/search.htm.

not captured by the included area economic variables and differences in unobservable characteristics of students between the two cohorts that may influence students' decisions about times to degree and/or dropout.[20]

To avoid collinearity problems, one of the d and one of the e must be excluded from the model. Somewhat arbitrarily, we choose 2-year college that we denote by TAJ to be the omitted 2-year institution and a 4-year institution that we denote by CS to be the omitted 4-year institution.[21] With these exclusions, the interpretation of the remaining a and b coefficients are straightforward. For example, the estimate of a_k in the proportion of students in the group who graduate by the fall three years after transfer equation is an estimate of how much higher or lower, the probability of a 2-year college transfer student's having graduated by the fall three years after transfer was if the student had been enrolled at 2-year college k, rather than at 2-year college TAJ, holding constant all of the other variables in the model (the student's degree status at transfer, the 4-year college to which the student transferred and the distance from the 2-year to the 4-year institution). Similarly, the estimate of b_r in the graduation equation is an estimate of how much higher or lower a student's probability of graduating by the fall three years after transfer was if he or she was enrolled at 4-year institution r, rather than at 4-year institution CS, holding all of the other variables in the model constant. The a and b coefficients in the proportions of students who are still enrolled in a 4-year SUNY institution and had dropped out of the 4-year SUNY institution by the fall three years after transfer can be similarly interpreted.

[20] For example, the average annual unemployment rate in New York State fell from 6.4% in 1997 to 5.2% in 1999.

[21] We emphasize that the choice of the excluded 2-year and 4-year institutions influences only the interpretation of the coefficients of the included dichotomous variables in the models, not the relative rankings of the institutions that we obtain below.

Put simply, subject to qualifications that we discuss later, estimation of equations (1) provide estimates of the relative effectiveness of each SUNY 2-year campuses in preparing those of their students who transfer to SUNY 4-year institutions with the backgrounds that they need to succeed at the SUNY 4-year institutions. Similarly, the equations provide estimates of the relative success of each SUNY 4-year institutions in retaining and graduating those SUNY 2-year transfer students that it enrolls.

III. Initial Empirical Findings

There are 36 SUNY 2-year community colleges and colleges of technology and 19 SUNY 4-year institutions represented in the database to which we were granted access. Excluded from the database were the Health Science Centers, two of the Specialized Colleges (Maritime, Optometry), and the four Statutory Colleges at Cornell University. [22] Each 2-year college transferred students to some, but not necessarily all of the 19 4-year institutions, so there are less than 684 2-year college/4-year institution groups per year in the data. However, for each group, there were up to four subgroups consisting of students who had transferred from the 2-year to the 4-year institution with a 2-year degree designed to prepare them to transfer (AA, AS), students with another type of 2-year degree (AAS, AOS), students with a certificate of program completion, and students without any degree or certificate. When all the subgroups were taken into account, our sample consisted of 2107 grouped observations, which summarize information for 13,383 full-time transfer students.

[22] A list of the institutions in the sample is found in the appendix table. We also excluded Empire State College from our analyses because it offers flexible programs of individualized curriculum to primarily adult students and is not a residential college and the Institute of Technology at Utica-Rome because it was in the process of transitioning from an upper division undergraduate institution to a 4-year undergraduate program during the period.

Equations (1) were estimated by ordinary least squares. The coefficients of the 2-year and 4-year institution dichotomous variables for each institution appear in tables 3 and 4, respectively. The coefficients of the dichotomous variables for the degrees or certificates earned prior to transferring, the distance between the 2-year and 4-year institutions that the student attended, average hourly earnings in the areas in which the sending and receiving institutions are located and the year of transfer (fall 1995 or fall 1996) are also included in table 3 and we discuss these variables' coefficients first.[23]

Students that transferred with a 2-year "transfer" degree (AA or AS degree) already in hand not surprisingly had about a .20 higher probability of receiving their 4-year degree, a .07 lower probability of still being enrolled in the 4-year institution and a .13 lower probability of having dropped out of the 4-year institution by the fall three years later, than students who transferred before earning any degree or certificate of program completion, other variables held constant. Similarly transfer students that earned an AAS or AOS 2-year degree had about a .15 higher probability of receiving their 4-year degree within the three-year period, a .04 lower probability of still being enrolled, and a .12 lower probability of having dropped out of the 4-year institution, while transfer students that had some other degree or certificate of program completion prior to transferring had a .06 higher probability of graduating by the fall three years later, a .06 higher probability of still being enrolled in school and a .12 lower probability of dropping out by the fall three years later, all relative to students who transferred before receiving any degree or certificate of program completion, other variables held constant.

[23] The sending and receiving area unemployment rates were never statistically significantly different from zero and we excluded them from our final models.

The distance variable proved to be statistically significantly different from zero only in the still enrolled equation with larger distances being associated with higher probabilities of still being enrolled. Higher average annual earnings in the receiving area were statistically significantly associated with lower graduation probabilities and lower, but statistically insignificantly different from zero, still enrolled probabilities. Average annual earnings in the sending area were never statistically significantly associated with any of the probabilities. Finally, the dichotomous variable for the fall 1996 entry cohort was negative in the drop out equation, indicating that students who transferred in the fall of 1996 were less likely to have dropped out three years later than students who transferred in the fall of 1995. This may reflect either the declining statewide unemployment rate in New York State during the late 1990s, which may have facilitated part-time employment for students that needed to work to help finance their educations, or the effects of other year-specific omitted variables.

Table 3 shows the estimated impact on the probabilities, as of the fall three years after transferring, of having graduated from a SUNY 4-year institution, of still being enrolled in the SUNY 4-year institution and of having dropped out of the SUNY 4-year institution for transfer students to each 4-year institution in the SUNY system, as compared to the probabilities for transfer students to 4-year institution UD. As noted above, the identities of the institutions in the sample are masked in the table. The university centers and the 4-year university colleges and the included specialized 4-year colleges in the sample have been randomly assigned codes CA to CS.

The findings in table 3 are quite striking. Attendance at nine of the institutions – CA, CC, CD, CI, CJ, CK, CL, CN, and CP –was associated with about a .14 to .33 statistically

significantly lower probability of graduating by the fall of three years after transfer, than if the students had transferred to CS. In each of these cases transfer students also had a higher probability of dropping out by the fall three years after transfer than did students who transferred to CS. In two cases – CB, CG- attendance at the institution was associated, other factors held constant, with a lower probability of still being enrolled in the fall three years after transfer than if the student had attended CS.

Transfer students who attended CJ had by far the lowest adjusted probability of graduating by the fall three years after graduation, other factors in the model held constant. Their probability of graduating by the fall three years after transfer was over .32 lower than transfer students who had enrolled at CS. While this was partially due to their having a .14 higher probability of still being enrolled, transfer students to CJ also had about a .18 higher probability of dropping out by the fall three years after transfer than did transfer students to CS.

Ten schools had a higher transfer student drop out rate within three years after transfer than CS did; for three of them, this was primarily associated with a lower probability of graduation rather than a lower probability of being still enrolled, while for the other seven, a combination of lower probability of both graduation and of being still enrolled contributed to the higher drop out rate.

Only one of the SUNY 4-year institutions appeared to perform better than CS. Transfer students who attended CG had a statistically significantly higher probability of graduating by the third year after transfer of .135, other factors held constant.

Taken at face value, the results in table 3 suggest that by the falls of 1998 and 1999 some 4-year SUNY campuses had graduated a greater proportion of the 2-year SUNY

transfer students who transferred to them in the falls of 1995 and 1996 respectively, than did other 4-year SUNY campuses. While part of the difference was due to the differing speed at which transfer students progressed through their programs at the different 4-year campuses, part was due to differences in transfer student dropout rates within 3 years of enrollment at the different 4-year campuses. These differences were sufficiently large that system officials and policy makers should be interested in learning why these differences exist.

The coefficients in table 4 similarly show the estimated impact on the probabilities of having graduated from a SUNY 4-year institution by the fall three years after transfer, of still being enrolled in a SUNY 4-year institution and of having dropped out of the 4-year institution, of having transferred from each 2-year college of technology and each community college in the SUNY system, all as compared to having transferred from TAD. Again the institutions' identities have been masked and each college of technology and community college has been randomly assigned an institutional code.

Many of the estimated coefficients are statistically insignificantly different from zero, which means that one cannot distinguish the impacts of having transferred from the corresponding institutions from those from having transferred from TAD. However, a number of statistically significant coefficients did occur.

In particular the probability of graduating by the fall of 1998 appears to be about .27 to .35 lower for transfer students from TF, TI, and TL. In all three cases, this was primarily due to a higher probability of having dropped out. Finally, transfer students from TA, TG, and TAB appear to have a higher probability of graduating from the 4-year SUNY institutions within three years of transfer than did transfer students from TAD.

If one takes our results at face value, policy makers and system administrators should want to know why transfer students from the different 2-year SUNY institutions appear to have different probabilities of completing their 4-year degrees and of dropping out within three years after transfer. They might ask what policies have the institutions whose former students have the best graduation record pursued and then disseminate information about these policies to the other 2-year institutions in the SUNY system. Similarly, system administrators and policymakers should want to know why transfer students to different 4-year institutions have different graduation rate probabilities within three years and seek to disseminate information about what the best performing 4-year institutions are doing to the other 4-year institutions.

IV. Controlling for Heterogeneity in the Preparation of Transfer Students

The analyses presented above make use of a sample that consists of full-time transfer students who graduated from 2-year degree programs designed to prepare them to transfer to 4-year academic programs (AA and AS degrees), who graduated from other 2-year programs (AAS and AOS degrees), who received certificates of program completion or who transferred before receiving any degree or certificate. Dichotomous variables for which degree or certificate of program completion that a transfer student received were included as explanatory variables in the model to control for a student's academic preparation prior to enrolling in the 4-year institution.

A potential weakness of this approach is that students without AA or AS degrees who transfer to 4-year institutions may substantially differ in the number of credits that they are able to transfer towards the 4-year degree. If systematically students in this category from one 2-year college have earned fewer credits that apply towards their 4-

year degrees than students in this category from a second 2-year college, it would be reasonable to expect that students from the first 2-year college would take longer to complete their 4-year college program. However, our observing this result would be no reflection on the performance of the first 2-year college, relative to the second, in preparing students for transfer to 4-year colleges. Rather, it simply would reflect that students in the category from the first college transferred with fewer applicable credits towards their 4-year degrees than comparable students from the second college.

Similarly, if transfer students from 2-year colleges in this category who transfer to one 4-year institution systematically have earned fewer credits that are applicable to their degrees than transfer students from 2-year colleges in this category who transfer to a second 4-year institution, it would be reasonable to expect that transfer students in this category would, on average, take longer to receive their 4-year degree at the first 4-year institution than at the second 4-year institution. However, our observing this result would be no reflection on the performance of the first 4-year institution relative to the second 4-year institution in educating this category of transfer students. It simply would reflect systematic differences in the academic preparation of transfer students to each of the two 4-year institutions.

One way to control for this is to include information on the number of credits towards the 4-year degree that each student in our sample received at the time of enrollment in our estimating equations. If such information were available in a state university system's information system, we would encourage researchers to use it. However, in the absence of the availability of such data, a simpler approach is simply to eliminate from the sample all of the individuals who transferred without first receiving a

2-year college degree specifically designed to prepare them for transfer to 4-year colleges and to reestimate the models. We did the latter and the results are presented in tables 5 and 6. We must caution that when we did this the number of grouped observations in the sample declined from 2107 to 762 (with the number of students included falling from 13,383 to 5,271). Smaller sample sizes make it harder to "tease out" statistically significant findings in the data.

A comparison of the coefficients found in table 3 to those found in table 5 and of the coefficients found in table 4 to those found in table 6 at first glance appear to suggest that limiting the sample to transfer students who are graduates of AA and AS degree programs leads to some differences in findings. For example, turning first to the results for the 4-year institutions, the number of 4-year institutions whose fall 1995 and 1996 transfer students were estimated to have had a statistically significant lower probability of graduating by the fall three years later than transfer students to UD drops from 9 to 2. Similarly, the number that have statistically significantly higher drop out probabilities than UD fall from 10 to 3.

Also, when we turn to the results for the 2-year institutions, the number of institutions whose transfer students appear to have a statistically significant lower probability of graduating within three years than transfer students from TAD decreases from 3 to 1. While previously transfer students from three institutions, TA, TG, and TAB, were judged to have a statistically significantly higher graduation probability than transfer students from TAD, other factors held constant, when the restricted sample was used only TG had an estimated graduation probability that was statistically significantly higher than TAD.

Hence use of this restricted sample suggests that a much smaller number of 2-year institutions should be studied by policymakers to understand why students transferring from them do better (or worse) than the students from most 2-year institutions after transferring to the 4-year institutions. Similarly, a much smaller number of 4-year institutions need be examined to understand why transfer students to them tend to have lower three-year graduation probabilities than transfer students to other 4-year institutions within the system.

Do these results imply that it is important to control for heterogeneity in the types of students transferring from the different 2-year institutions in analyses of these types and that failure to do so may affect the conclusions of studies reached? For the purpose of analyzing system effectiveness, the answer is clearly yes. As noted earlier, attention should be directed only those differences that are significant in both a statistical and policy sense. However, lest the reader prematurely conclude that our methodology is very sensitive to the sample of transfer students included in the analyses, we emphasize that the comparisons above consider only those estimated institutional coefficients that were statistically significantly different from zero at at least the .05 level of significance.

If instead we consider the point estimates of each institution's coefficients, without worrying about the coefficients' statistical significance, a measure of how similar each coefficient estimate in table 3 is to the corresponding coefficient in table 5 (and similarly for the coefficients in tables 4 and 6) can be obtained from the Spearman rank correlation coefficient of the corresponding coefficient estimates.[24] The Spearman rank correlation coefficient of the estimated 4-year institutional coefficients found in tables 3 and 5 for the

[24] The Spearman rank correlation is a nonparametric test of the "similarity" of two rankings. See E.L. Lehmann and H. J. M. D'Abrera (1998), pages 292, 300 and 323 for details on how to calculate it.

probability of graduating by the fall three years after transfer is .657. This means that the ranking of which 4-year institutions are most successful in graduating transfer students from 2-year colleges is fairly similar in the two samples. Similarly, the corresponding Spearman rank correlation coefficients for the probabilities of being enrolled in college and having dropped out of college by the fall three years after transfer are .676 and .292, respectively, which means that the ranking of SUNY 4-year institutions on the probability of being still enrolled is similar across the samples, but there is little similarity when ranked according to the probability of having dropped out. The values of these Spearman correlation coefficients are statistically significantly different from zero at at least the .05 level for both having graduated and being still enrolled, which means that we can reject the hypothesis that each of the rankings of the 4-year colleges on these two measures is not similar across the two samples.

When we similarly compute the Spearman rank correlation coefficient for the estimated 2-year institutional coefficients found in tables 4 and 6 for the probability of graduating by the fall three years after transfer, it proves to be .799. The Spearman rank correlation coefficient for the probability of still being enrolled in college three years after transfer is .613. With 36 observations (2-year institutions) each of these correlations is statistically significantly different from zero at the .05 level of significance, which means that we can reject the hypotheses that the ranking of 2-year institutions on these measures is not similar across the two samples. In contrast, the Spearman rank correlation coefficient of the probability of having dropped out of college by the fall three years after transfer is -.359, which is also statistically significantly different from zero at the .05

level. This means the ranking of 2-year institutions in terms of their students' drop out probabilities is not similar between samples.

Interestingly, however, in each of the samples there is a highly negative correlation between a 2-year institution's rank on its transfer students' graduation probability and its rank on their drop out probability and also a highly negative correlation between its rank on their graduation probability and its rank on their probability of still being enrolled in college. Differences across 2-year SUNY institutions in the probability that students from them who have transferred to SUNY 4-year institutions graduate within 3 years reflect both the speed that they are progressing towards a degree and differences in drop out behavior.

V. Controlling for Academic Ability and Preparation

Graduation probabilities vary widely across the 4-year SUNY campuses present in our sample for students who first enroll at each campus as a freshman. For example, the 6-year graduation rates for the class entering as freshman in the fall of 1992 varied across the campuses in our sample from 29.68 to 82.22. Presumably these probabilities vary because of differences in the academic ability and preparation of students admitted to and enrolling at each institution, differences in the financial situations of enrolled students at each institution and differences in the academic support that students receive from faculty and staff at each institution. In fact the correlation across the SUNY 4-year institutions of the 6-year graduation rates for freshman in the fall of 1992 and the estimated institutional dichotomous variables in our probability of completion equations is about .70. So our estimates of the relative impact of the 4-year colleges in graduating

2-year college transfer students to a large extent may reflects their success in graduating students who enter initially as freshman.

Similarly, our model implicitly assumes that transfer students from a given SUNY 2-year institution that enroll in different SUNY 4-year institutions are all roughly comparable in academic ability and preparation. So, for example, if there are two SUNY 4-year campuses that are located near a given SUNY 2-year campus, it assumes that students from the 2-year campus that transfer to each of the 4-year campuses are comparable in academic quality. However, if the admissions standards for freshman students, in terms of students' academic records and test scores, at the first 4-year campus are higher than the admission standards at the second 4-year campus, it is reasonable to assume that the entrance standards for transfer students to the first campus will also be higher than the admission standards for transfer students to the second. If differences in admission standards for transfer students at SUNY 4-year campus mirror differences in standards for freshmen at the SUNY 4-year campuses, the estimated coefficients of the transfer student three year graduation rate, continued enrollment rate and drop out rate probabilities that we report in tables 3 and 5 may simply reflect differences in the academic preparation and ability of the transfer students at different 4-year institutions, not differences in the academic support that students receive from faculty and staff at different 4-year institutions.

Ideally a study such as ours would include in the analyses information on the academic backgrounds of the students who transfer from each 2-year to each 4-year college in terms of things like grade point averages, fraction of credit hours for which transfer credits were granted, number of credits completed prior to transfer and test

scores. In the absence of such data, or because the resource costs of obtaining and analyzing them are too high, a second best approach to measuring the relative effectiveness of a 4-year SUNY institution in graduating transfer students is the extent to which their transfer students' graduation rate exceeds the graduation rate of transfer students at other 4-year SUNY institutions, after one controls for each institution's 6-year freshman graduation rate in the estimation. This approach assumes that the admissions standards for transfer students at each 4-year institution parallel, but are not equal to, the admission standards for freshman students at the institution. That is, it assumes that those institutions that have the highest admission standards for freshman also, in a relative sense, have the highest admission standards for transfer students.[25]

To obtain such estimates, we reestimated our models for the sample of transfer students that received AA or AS degrees before transferring, entering into each equation as an additional explanatory variable the 6 year graduation rate of students who entered as freshman at each 4-year institution. Data for freshman who entered in the fall of 1992 and 1993 were used for the fall 1995 and fall 1996 transfer students, respectively.

The coefficients of the 4-year and 2-year college obtained from this estimation appear in tables 7 and 8 respectively. The ranking of the 4-year institutions that one obtains when this is done is quite different than the ranking that is one obtains from tables 3 and 5. For example, while transfer students who enrolled at CC, CJ and CO all were estimated to have lower probabilities of graduating within 3 years than transfer students who enrolled at CS in tables 3 and 5, in this specification they all have higher

[25] This does not say that the admission standards for transfer students at an institution are the same as the admission standards for first-time freshman. Rather, it says that across institutions, the two sets of standards will be highly correlated. In the fall of 2001 we surveyed deans of admissions to see if we could obtain information about transfer student admission standards but the replies we received were not sufficiently informative to include those responses in our models.

probabilities of graduating within 3 years.[26] Indeed, the Spearman rank correlation coefficient of the 4-year institution graduation probabilities, still enrolled probabilities and drop out probabilities between tables 5 and 7 are .033, .238 and .187, respectively, none of which are statistically significantly different from zero. This suggests that it is important to control for student preparation and background in any attempt to evaluate the relative performance of 4-year institutions within a state system in educating transfer students.

When we compute the Spearman rank correlation coefficients across the 2-year institutions of the graduation probabilities, still enrolled probabilities, and dropped out probabilities found in the two tables, they are .996, .998, and .999 respectively. Each is statistically significantly different from zero, which implies that the ranking of the 2-year institutions on these three measures is similar regardless of whether the controls for the 6-year graduation rates of entering freshman at each 4-year college is included in the model.

Interestingly, once we control for the 6-year graduation rate of freshmen, the ranking of the 4-year institutions on the probability that transfer students to them graduate within 3 years is highly positively correlated with the share of an institution's new students that are transfer students (the data in table 2). Put another way, on average, the more important that transfer students are to a SUNY 4-year institution, the greater the likelihood that they will graduate within 3 years. Four-year institutions that accept large shares of their student bodies via the transfer route appear to become especially adept at assuring that transfer students make normal progress through the behavior.

[26] These comparisons ignore the statistical significance of the results.

VI Concluding Remarks

Our goal in this paper has been to describe a methodology that can be used within state systems of higher education to evaluate how well each 4-year public institution is performing in educating students who transfer to it from each 2-year public institution in the state and how well each 2-year public institution in the state is performing in preparing its students who transfer to 4-year public institutions in the state to complete their programs at the 4-year institutions. While some of the estimates that we obtained using data from the SUNY system are interesting in their own right, for example, our primary goal has been to illustrate the methodology.

Our view is that accountability rankings of this type are best thought of as formative rather than summative. Rather than using them to reward, or penalize, institutions, it would be more productive, at least in the initial years that they are employed, for system administrators and policy makers to focus on outliers to try to learn what the factors are that cause some 4-year and 2-year institutions to "look better" or "look worse" on these measures than do other institutions within the system. Once the factors are discovered, to the extent that they relate to practices of institutions rather than characteristics of the institutions, their students, or the areas in which they are located that are not accounted for in the estimation, dissemination of information about the actions taken by the "better institutions" that led to their success to all institutions in the system would be beneficial.

There are of course a number of ways in which our methodology can be improved. For expository purposes we have used the simplest statistical model, a system of linear probability equations, and estimated it using ordinary least squares. Inasmuch as

the sample sizes vary across the cells of the model (2-year college/4-year college/degree at transfer), more precise estimates could be obtained using the method of weighted regression. In addition, the linear probability model does not take into account that each of the probabilities can vary only between 0 and 1 and that there is an explicit ordering of the probabilities (graduating is better than still being enrolled, which in turn is better than having dropping out). Using a multinomial logit model takes the first into account, while using either an ordered probit or logit model takes the second into account.[27] We have in fact estimated both multinomial logit and ordered logit models and the results we obtained when these models were employed were similar to those that we have reported in the text.

The data that we use follows transfer student for only 3 years. If access to follow-ups that span longer periods of time were available in a state system's information system, it would be possible to gain a better understanding of whether institutions vary in their longer-run graduation and drop out probabilities.

Evaluations of this type would ideally also be conducted using more cohorts (entering classes) of transfer students. The small number of students found in many of the 2-year institution/4-year institution cells makes it difficult for our models to "tease out" statistically significant differences across institutions. The increases in sample sizes permitted by access to multiple cohorts of data would enhance the likelihood of being able to observe differences across institutions. Use of multiple cohorts would also be preferred because an institution's "performance" could be judged on average over a number of cohorts rather than from how the students in only one or two cohorts do.

[27] See Jeffrey M. Woolridge (2002), pages 504 to 508, for a discussion of ordered probit and ordered logit models.

Rather than assuming, as we have done in tables 7 and 8, that the admission standards and preparation of transfer students to each 4-year institution can be controlled for by the 6-year graduation rate of students who initially enroll as freshmen at the institution, it would be by far preferable to try to directly control for these variables. If data on the academic backgrounds and information on each transfer student are not easily available in a state system's information system, information on the minimum grade point average, or the average grade point average, for transfers that each 4-year institution has admitted in each year would be useful.[28]

As in many states, there is no system wide articulation agreement in New York State that specifies the conditions under which students from a 2-year institution can transfer to a 4-year institution. The success of transfer students coming from a SUNY 2-year campus that transfer to a SUNY 4-year campus may depend upon the types of articulation agreements, if any, that exist between the two campuses. Such agreements often specify sets of required courses for transfer students wishing to major in certain fields that must be accomplished before transfer, along with grade point averages that must be maintained in these courses; transfer students may be better prepared for transfer if such agreements are in place. Having detailed data on the nature of articulation agreements between each 2-year campus and each 4-year campus within a state system, whether each agreement is adhered to and the resources that each institutions applies to

[28] As noted above, we tried to obtain such information through a survey of deans of admissions at the SUNY 4-year institutions, but were not successful in getting consistent data. Presumably the system administration offices would have a better chance of obtaining such data.

advising potential transfer students from or to it would improve the analyses and aid in the interpretation of the estimated institutional coefficients.[29]

An important factor that may influence the ability of 2-year college transfers to progress towards 4-year degrees is the financial background of the transfer students. For example, if transfer students from one 2-year institution have greater "financial need" than transfers from a second 2-year institution, it would not be surprising to find that the former have a lower probability of receiving a 4-year degree and a higher probability of dropping out within three years after transfer than do the latter. However, this difference would tell us nothing about the relative performance of the two 2-year institutions. Hence, if data in state system information systems permitted one to control for transfer students' financial backgrounds, this would improve the analyses.

Finally, although our rankings of institutions on the various measures across the different data sets and models (all transfers, transfers with 2-year academic degrees, transfers with two-year academic degrees using a model that attempted to control for differences in admission standards) often were similar, the numbers of differences that we found that were both statistically significant and large enough to be significant in a policy sense varied across models. This suggests that if a system has the resources, staff talent and time to estimate models of the type we have done using individual level data this clearly would be preferable to do. Such analyses would allow the system to more adequately control for individual-level variables that should be expected to influence progression through the system, including gender, race, ethnicity, financial background,

[29] Our fall 2001 survey also attempted to obtain information on the whether there were articulation agreements in place between each 2-year and each 4-year institution, the comprehensiveness of such agreements (for specific majors or for the institution as a whole), and the fraction of transfer students enrolled under such agreements. Again the responses were not complete enough to allow us to use such information in our analyses. System offices are likely to have better luck collecting such data then we did.

credit hours prior to transfer and the like. This type of approach would have take account of the fact that individual-level and institutional-level data (the dichotomous variables) both would be included as explanatory variables. One, but not the only, way to approach such data is to use Hierarchical Linear Models (HLM).[30]

[30] Raudenbush and Bryk (2002)

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Table 1

Share of Freshmen Enrolled in Public Institutions in the Fall of 1996 Who Were Enrolled in 2-Year Colleges

	All	FT	State	All	FT
Alabama	.56	.50	Montana	.11	.09
Alaska	.01	.01	Nebraska	.42	.34
Arizona	.19	.16	Nevada	.57	.26
Arkansas	.64	.49	New Hampshire	.27	.20
California	.78	.60	New Jersey	.62	.55
Colorado	.45	.27	New Mexico	.29	.28
Connecticut	.50	.31	New York	.58	.55
Delaware	.35	.22	North Carolina	.44	.34
Florida	.65	.52	North Dakota	.27	.27
Georgia	.48	.37	Ohio	.36	.26
Hawaii	.74	.60	Oklahoma	.48	.36
Idaho	.36	.34	Oregon	.59	.45
Illinois	.72	.56	Pennsylvania	.55	.43
Indiana	.23	.15	Rhode Island	.49	.37
Iowa	.71	.59	South Carolina	.50	.41
Kansas	.54	.42	South Dakota	.01	.01
Kentucky	.30	.27	Tennessee	.45	.39
Louisiana	.16	.12	Texas	.59	.45
Maine	.27	.25	Utah	.59	.48
Maryland	.59	.44	Vermont	.25	.15
Massachusetts	.56	.45	Virginia	.32	.23
Michigan	.46	.30	Washington	.82	.72
Minnesota	.47	.43	West Virginia	.15	.11
Mississippi	.65	.61	Wisconsin	.48	.36
Missouri	.36	.26	Wyoming	.71	.66
U.S Total	**.55**	**.42**			

Source: Authors' calculations from data contained in the WEBCASPAR System (All- all freshmen, FT- full time freshmen)

Table 2

Transfer Students As A Share of All New Undergraduate Students in the Fall 1999 at SUNY 4-Year University Centers and University Colleges

Albany	.375	Geneseo	. 201
Binghamton	.271	New Paltz	.401
Buffalo Univ.	.339	Old Westbury	.533
Stony Brook	.431	Oneota	.352
Brockport	.479	Oswego	.359
Buffalo Coll.	.484	Plattsburgh	.442
Cortland	.368	Potsdam	.320
Empire State	.743	Purchase	.291
Fredonia	.277		

Source: Authors' computations from data found in *Application and Enrollment Patterns of Transfer Students – Fall 1999*, Report Number 6-00A, Office of Institutional Research and Analysis, State University of New York, December 2000, part VII.

Table 3

Linear Probability Model Coefficients of the Four-Year College Variables: Complete Sample

Receiving institutions (impact relative to CS)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**		**Coefficient**	**T-value**		**Coefficient**	**T-value**
CA	-0.257	-3.328		0.133	1.756		0.120	2.332
CB	0.083	1.753		-0.119	-2.579		0.037	1.176
CC	-0.211	-4.934		0.058	1.373		0.152	5.339
CD	-0.154	-2.118		0.102	1.425		0.052	1.068
CE	0.004	0.108		-0.055	-1.368		0.047	1.740
CF	-0.096	-0.632		0.122	0.819		-0.023	-0.226
CG	0.135	2.995		-0.185	-4.188		0.047	1.578
CI	-0.180	-2.356		0.018	0.244		0.157	3.096
CJ	-0.326	-4.286		0.142	1.901		0.180	3.548
CK	-0.144	-2.309		-0.025	-0.402		0.172	4.144
CL	-0.260	-4.358		0.105	1.790		0.157	3.969
CM	-0.032	-0.270		0.042	0.363		-0.015	-0.190
CN	-0.186	-2.583		0.039	0.556		0.144	3.018
CO	-0.076	-1.842		-0.019	-0.484		0.093	3.415
CP	-0.196	-4.165		0.018	0.394		0.179	5.697
CQ	-0.063	-0.978		0.023	0.365		0.040	0.925
CR	-0.043	-0.926		-0.044	-0.960		0.083	2.701
Average annual wage (3 yr avg.), former inst.	0.165	1.589		-0.053	-0.517		-0.115	-1.674
Average annual wage (3 yr avg.), receiving inst.	-0.236	-2.412		0.145	1.507		0.088	1.355
Distance	-0.016	0.000		0.024	2.222		-0.008	-1.152
AA/AS degree	0.201	0.017		-0.071	-4.182		-0.130	-11.328
AAS/AOS degree	0.153	0.020		-0.041	-2.064		-0.115	-8.619
Certif. of program comp.	0.058	0.044		0.060	1.398		-0.120	-4.143
Year	0.019	0.015		0.006	0.402		-0.025	-2.490
Adj. R2	0.180			0.102			0.086	

n=2107 groups

Summary Statistics	Mean	Standard Dev
Fraction graduated	0.520	0.367
Fraction still enrolled	0.364	0.345
Fraction dropped out	0.117	0.231

Note: Average wage is measured in tens of thousands of dollars, and distance is measured in hundreds of miles

Table 4

Linear Probability Model Coefficients of the Two-Year College Variables: Complete Sample

Sending institutions (impact relative to TAD)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)		(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)		(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**	**Coefficient**	**T-value**	**Coefficient**	**T-value**
TA	0.225	2.190	-0.140	-1.383	-0.090	-1.320
TB	0.165	1.385	-0.097	-0.835	-0.072	-0.914
TC	0.036	0.553	-0.031	-0.482	-0.005	-0.119
TD	0.076	1.068	-0.050	-0.714	-0.029	-0.610
TE	0.087	0.940	-0.023	-0.254	-0.067	-1.098
TF	-0.272	-2.324	0.105	0.916	0.170	2.181
TG	0.156	2.562	-0.163	-2.726	0.005	0.116
TH	0.137	1.021	-0.006	-0.048	-0.137	-1.531
TI	-0.352	-2.110	0.054	0.330	0.301	2.719
TJ	0.100	1.411	-0.112	-1.614	0.010	0.206
TK	-0.049	-0.593	-0.013	-0.158	0.057	1.047
TL	-0.334	-2.113	0.159	1.027	0.180	1.711
TM	0.055	0.671	-0.027	-0.332	-0.029	-0.539
TN	0.219	1.769	-0.148	-1.218	-0.077	-0.936
TO	0.019	0.146	0.079	0.606	-0.104	-1.180
TP	0.041	0.313	0.017	0.133	-0.063	-0.727
TQ	-0.037	-0.547	0.043	0.659	-0.009	-0.206
TR	0.184	1.419	-0.029	-0.229	-0.159	-1.839
TS	0.031	0.347	-0.013	-0.144	-0.021	-0.361
TT	-0.040	-0.573	0.005	0.067	0.035	0.756
TU	0.103	1.186	-0.053	-0.621	-0.044	-0.754
TV	0.137	1.147	-0.036	-0.307	-0.106	-1.338
TW	0.036	0.258	0.054	0.401	-0.097	-1.058
TX	0.005	0.055	0.052	0.615	-0.059	-1.024
TY	0.117	1.563	-0.089	-1.205	-0.027	-0.533
TZ	0.092	0.728	-0.008	-0.067	-0.090	-1.061
TAA	-0.035	-0.278	0.166	1.329	-0.137	-1.617
TAB	0.190	2.086	-0.128	-1.431	-0.066	-1.089
TAC	-0.065	-1.271	-0.006	-0.126	0.070	2.058
TAE	0.124	1.672	-0.104	-1.424	-0.023	-0.457
TAF	-0.083	-1.433	-0.011	-0.192	0.093	2.412
TAG	0.119	0.968	-0.044	-0.364	-0.065	-0.797
TAH	-0.002	-0.019	-0.001	-0.011	-0.002	-0.021
TAI	0.103	0.848	-0.024	-0.200	-0.084	-1.042
TAJ	0.079	0.978	-0.045	-0.565	-0.033	-0.615

n=2107 groups

Table 5

Linear Probability Model Coefficients of the Four-Year College Variables: Two-Year Academic Degree Sample

Receiving institutions (impact relative to CS)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**		**Coefficient**	**T-value**		**Coefficient**	**T-value**
CA	-0.244	-1.999		0.202	1.699		0.041	0.701
CB	0.044	0.488		-0.074	-0.848		0.031	0.707
CC	-0.097	-1.399		0.009	0.134		0.092	2.775
CD	-0.223	-1.599		0.170	1.255		0.051	0.763
CE	0.098	1.451		-0.127	-1.922		0.028	0.850
CF	0.013	0.056		-0.100	-0.439		0.091	0.801
CG	0.175	2.586		-0.195	-2.973		0.020	0.631
CI	-0.163	-1.334		0.129	1.092		0.033	0.564
CJ	-0.190	-1.580		0.178	1.520		0.011	0.192
CK	-0.101	-1.015		0.016	0.162		0.086	1.811
CL	-0.234	-2.453		0.186	2.005		0.064	1.406
CM	-0.343	-1.778		0.367	1.954		-0.023	-0.247
CN	-0.132	-1.143		0.090	0.801		0.046	0.832
CO	-0.014	-0.214		-0.083	-1.291		0.098	3.078
CP	-0.087	-1.262		-0.006	-0.096		0.098	2.969
CQ	-0.038	-0.377		-0.003	-0.031		0.042	0.863
CR	-0.015	-0.207		-0.019	-0.267		0.033	0.948
Average annual wage (3 yr avg.), former inst.	0.128	0.725		-0.199	-1.157		0.062	0.733
Average annual wage (3 yr avg.), receiving inst.	-0.247	-1.592		0.260	1.726		-0.015	-0.195
Distance	-0.043	-2.424		0.047	2.713		-0.005	-0.597
year	-0.010	-0.419		0.009	0.358		-0.001	-0.109
Adj. R^2	0.111			0.104			0.033	

n=762 groups

Summary Statistics	Mean	Standard Dev
Fraction graduated	0.615	0.339
Fraction still enrolled	0.324	0.328
Fraction dropped out	0.063	0.156

Note: Average wage is measured in tens of thousands of dollars, and distance is measured in hundreds of miles

Table 6

Linear Probability Model Coefficients of the Two-Year College Variables: Two-Year Academic Degree Sample

Sending institutions (impact relative to TAD)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**		**Coefficient**	**T-value**		**Coefficient**	**T-value**
TA	0.271	1.577		-0.301	-1.802		0.019	0.225
TB	0.139	0.692		-0.289	-1.476		0.136	1.406
TC	0.003	0.031		-0.028	-0.273		0.024	0.460
TD	0.078	0.656		-0.163	-1.399		0.076	1.321
TE	-0.022	-0.143		-0.026	-0.172		0.038	0.510
TF	-0.102	-0.495		0.172	0.856		-0.061	-0.617
TG	0.198	2.044		-0.207	-2.206		0.005	0.098
TH	0.054	0.242		-0.168	-0.771		0.099	0.917
TI	*	*		*	*		*	*
TJ	0.205	1.843		-0.229	-2.112		0.015	0.273
TK	0.023	0.166		-0.232	-1.748		0.199	3.039
TL	-0.114	-0.427		0.251	0.966		-0.125	-0.977
TM	0.066	0.482		-0.102	-0.761		0.025	0.372
TN	0.291	1.427		-0.357	-1.800		0.052	0.533
TO	0.055	0.253		-0.186	-0.873		0.117	1.112
TP	0.150	0.674		-0.173	-0.796		0.008	0.077
TQ	-0.072	-0.674		0.050	0.484		0.013	0.258
TR	0.136	0.632		-0.183	-0.870		0.033	0.319
TS	0.059	0.404		-0.164	-1.160		0.096	1.383
TT	-0.015	-0.134		0.009	0.082		-0.002	-0.030
TU	0.216	1.536		-0.261	-1.910		0.057	0.852
TV	0.188	0.937		-0.252	-1.288		0.049	0.511
TW	0.108	0.468		-0.187	-0.832		0.063	0.571
TX	-0.206	-1.408		0.100	0.703		0.097	1.382
TY	0.095	0.783		-0.117	-0.990		0.013	0.215
TZ	0.166	0.784		-0.220	-1.073		0.042	0.411
TAA	-0.053	-0.249		0.021	0.103		0.018	0.174
TAB	0.135	0.882		-0.204	-1.369		0.058	0.784
TAC	-0.013	-0.158		-0.036	-0.443		0.046	1.144
TAE	0.082	0.641		-0.122	-0.985		0.031	0.514
TAF	-0.004	-0.041		0.003	0.031		-0.001	-0.016
TAG	0.100	0.483		-0.177	-0.877		0.063	0.630
TAH	0.005	0.029		-0.123	-0.680		0.104	1.162
TAI	0.072	0.346		-0.093	-0.458		0.008	0.080
TAJ	0.046	0.337		-0.109	-0.824		0.067	1.025

n=762 groups

*TI had no transfers with a transfer degree in the 95/98 cohort

Table 7

Linear Probability Model Coefficients of the Four-Year College Variables: Controlling for Admission Standards

Receiving institutions (impact relative to CS)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**		**Coefficient**	**T-value**		**Coefficient**	**T-value**
CA	0.135	0.692		-0.091	-0.481		-0.041	-0.435
CB	-0.062	-0.620		0.007	0.076		0.053	1.116
CC	0.349	1.820		-0.335	-1.796		-0.004	-0.048
CD	0.422	1.436		-0.328	-1.148		-0.088	-0.624
CE	0.222	2.649		-0.222	-2.723		0.001	0.021
CF	0.258	1.015		-0.290	-1.170		0.038	0.306
CG	-0.088	-0.702		0.008	0.064		0.077	1.281
CI	-0.079	-0.630		0.065	0.530		0.015	0.247
CJ	0.092	0.555		-0.040	-0.249		-0.050	-0.627
CK	0.081	0.660		-0.125	-1.044		0.047	0.792
CL	0.002	0.011		0.004	0.029		0.013	0.208
CM	-0.275	-1.413		0.313	1.657		-0.038	-0.403
CN	0.219	1.205		-0.181	-1.025		-0.030	-0.340
CO	0.258	2.020		-0.293	-2.360		0.039	0.633
CP	0.090	0.910		-0.144	-1.488		0.060	1.260
CQ	0.118	0.988		-0.124	-1.066		0.008	0.147
CR	-0.324	-2.256		0.220	1.574		0.100	1.442
Average annual wage (3 yr avg.), former inst.	0.113	0.638		-0.187	-1.088		0.066	0.773
Average annual wage (3 yr avg.), receiving inst.	-0.130	-0.808		0.170	1.083		-0.040	-0.510
distance	-0.042	-2.383		0.046	2.679		-0.005	-0.619
gradrate	1.923	2.489		-1.486	-1.976		-0.416	-1.117
year	-0.029	-1.134		0.023	0.924		0.003	0.225
Adj. R^2	0.118			0.108			0.033	

n=762 groups

Summary Statistics	Mean	Standard Dev
Fraction graduated	0.615	0.339
Fraction still enrolled	0.324	0.328
Fraction dropped out	0.063	0.156

Note: Average wage is measured in tens of thousands of dollars, and distance is measured in hundreds of miles

Table 8

Linear Probability Model Coefficients of the Two- Year College Variables: Controlling for Admission Standards

Sending institutions (impact relative to TAD)	(A) Graduated by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(B) Are still enrolled in the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)			(C) Have dropped out by the fall of 1998 (from '95 cohort) or in fall 1999 (from '96 cohort)	
	Coefficient	**T-value**		**Coefficient**	**T-value**		**Coefficient**	**T-value**
TA	0.254	1.479		-0.287	-1.723		0.022	0.271
TB	0.120	0.599		-0.274	-1.403		0.140	1.448
TC	-0.003	-0.028		-0.024	-0.227		0.025	0.486
TD	0.071	0.593		-0.156	-1.349		0.077	1.351
TE	-0.036	-0.229		-0.016	-0.105		0.041	0.548
TF	-0.084	-0.410		0.158	0.789		-0.065	-0.655
TG	0.193	1.997		-0.203	-2.168		0.006	0.122
TH	0.031	0.140		-0.150	-0.690		0.103	0.962
TI	*	*		*	*		*	*
TJ	0.195	1.755		-0.221	-2.041		0.017	0.315
TK	0.021	0.153		-0.231	-1.741		0.199	3.046
TL	-0.097	-0.365		0.238	0.917		-0.129	-1.005
TM	0.054	0.392		-0.092	-0.690		0.027	0.413
TN	0.272	1.335		-0.342	-1.727		0.056	0.576
TO	0.041	0.188		-0.175	-0.823		0.120	1.141
TP	0.134	0.601		-0.160	-0.737		0.012	0.111
TQ	-0.077	-0.718		0.054	0.518		0.014	0.277
TR	0.119	0.552		-0.169	-0.807		0.037	0.356
TS	0.052	0.361		-0.159	-1.127		0.098	1.403
TT	-0.017	-0.154		0.011	0.097		-0.001	-0.022
TU	0.214	1.527		-0.259	-1.902		0.058	0.859
TV	0.174	0.868		-0.240	-1.233		0.052	0.543
TW	0.094	0.407		-0.176	-0.784		0.066	0.599
TX	-0.217	-1.486		0.108	0.763		0.100	1.415
TY	0.087	0.721		-0.111	-0.940		0.014	0.244
TZ	0.148	0.703		-0.207	-1.008		0.045	0.448
TAA	-0.070	-0.331		0.034	0.168		0.021	0.210
TAB	0.125	0.818		-0.196	-1.318		0.060	0.814
TAC	-0.013	-0.153		-0.036	-0.448		0.046	1.141
TAE	0.074	0.583		-0.116	-0.939		0.033	0.541
TAF	-0.007	-0.080		0.005	0.062		0.000	0.001
TAG	0.085	0.410		-0.165	-0.820		0.066	0.663
TAH	-0.017	-0.091		-0.106	-0.586		0.108	1.215
TAI	0.056	0.272		-0.081	-0.400		0.011	0.114
TAJ	0.034	0.247		-0.099	-0.752		0.070	1.065

n=762 groups

*TI had no transfers with a transfer degree in the 95/98 or 96/99 cohort

Appendix Table

The State University of New York (SUNY) System (Fall 2001)

I. University Centers (4) - Albany, Binghamton, Buffalo, Stony Brook

II. University Colleges (13) - Brockport, Buffalo State, Cortland, Empire State College, Fredonia, Geneseo, New Paltz, Old Westbury, Oneota, Oswego, Plattsburgh, Potsdam, Purchase

III. Specialized Colleges (5) – College of Technology at Farmingdale[b], Maritime College[a], College of Optometry[a], Institute of Technology at Utica-Rome[c], College of Environmental Science and Forestry

IV. Statutory Colleges (5) – College of Ceramics at Alfred and the Colleges of Agriculture and Life Sciences[a], Human Ecology[a], Veterinary Medicine[a] and the School of Industrial and Labor Relations[a] at Cornell

V. Community Colleges (30) – Adirondack, Broome, Cayuga County, Clinton, Columbia-Greene, Corning, Dutchess, Erie, Fashion Institute of Technology, Finger Lakes, Fulton Montgomery, Genessee, Herkimer County, Hudson Valley, Jamestown, Jefferson, Mohawk Valley, Monroe, Nassau, Niagara County, North Country, Onondaga, Orange County, Rockland, Schenectady County, Suffolk County, Sullivan County, Tompkins Cortland, Ulster County, Westchester

VI. Colleges of Technology (5) – Alfred, Canton, Cobleskill, Delhi, Morrisville

VII. Health Science Centers (2) – Brooklyn[a] and Syracuse[a]

[a] Not included in the sample
[b] Became a 4-year institution after 1995 and included as a 2-year college in the sample
[c] Enrolled only upper-division students in 1995 and 1996 and was not included in the sample