

LOOKING BEYOND ACCESS: ACADEMIC ABILITY, ABILITY TO PAY, AND DEGREE COMPLETION

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Abstract

Admitting capable students is an important first step toward promoting access – but it represents just a first step. How comparable is the path from admission to degree attainment for similarly qualified students who come from different socioeconomic strata?

Multivariate analysis of data from one university's entering cohort of over 5,000 full-time baccalaureate students shows that ability to pay and academic ability, among other factors, are substantively and significantly related to graduation rates and time to degree. Six-year graduation rates for high-income students are about 10 to 25 percentage points above those of low-income students of similar academic ability.

Affordability, Participation, and Degree Completion

Admitting capable students is an important first step toward promoting access. However, admitting students (even through a need-blind process) represents only a first step in equitably helping students to gain the benefits of higher education. How comparable is the path from admission to degree attainment for similarly qualified students from different socioeconomic strata? This paper examines academic ability, ability to pay, and degree completion, along with numerous other demographic and behavioral variables, for a cohort of over 5,000 baccalaureate degree students admitted to a major research university.

Some prominent reports have suggested that higher education is largely effective in terms of affordability, participation, and degree completion. In the 2005 book *Equity and Excellence in American Higher Education*, Bowen, Kurzweil and Tobin examined whether participation and outcomes differed, for 19 selective colleges and universities, according to students' academic ability and socioeconomic status. They wrote that students from low-income families do appear to be disadvantaged, but only to a small extent. They saw "basic equality" (p. 134) and concluded that a "consistent pattern suggests that socioeconomic status does not affect progression" from application through admission, enrollment, and graduation (p. 100).

Similarly, a 2006 state policy report concluded that higher education in Pennsylvania is expensive but affordable. Again, that message was essentially positive, intended to “give pause to those who believe American higher education has a cost crisis or that the tuitions that colleges and universities charge are thwarting the opportunities of young people in large numbers” (The Education Policy and Leadership Center, 2006, p. 39). Those authors wrote that public higher education in the Commonwealth of Pennsylvania is “largely effective” in terms of participation and degree completion (pp. 6-7).

However, even if one accepts that higher education is affordable and accessible for many students, substantive questions remain. Carnevale and Rose (2003) have provided dramatic evidence on how ability to pay relates to access, especially in selective colleges and universities. Consider the numbers 146, 74, and 3. The figure 146 represents the number of top-tier colleges and universities in the U.S.; this is based on several of the usual metrics, including entering students’ high school grades, SAT scores, and acceptance rates (those 146 institutions include Penn State, the university that we focus on in this paper). Seventy-four percent signifies the proportion of students at these 146 highly selective institutions who came from families in the top socioeconomic quartile. And just 3 percent of students at these colleges and universities came from the bottom socioeconomic quartile.

The Carnevale and Rose analysis includes SAT and high school grades, parental income, admissions preferences, and more, and it delivers a clear and stark message. Socioeconomic background appears to be an extremely important factor in terms of who goes to America’s best colleges and universities. “The reality that many high school students from low-SES families are qualified for college but do not attend or attend but go to colleges that are less selective than their qualifications justify is not widely recognized” (Carnevale & Rose, 2003, p. 41). “The conventional view that academic preparation is a monolithic barrier to access and choice among low-SES students is greatly overstated” (Carnevale & Rose, 2003, p. 38). “There is even less socioeconomic diversity than racial or ethnic diversity at the most selective colleges” (Carnevale & Rose, 2003, p. 11).

Those arguments are buttressed by Thomas Mortensen’s *Postsecondary Education OPPORTUNITY*, which looks across American higher education in total, mostly via comprehensive analyses of datasets compiled by agencies such as the U.S. Census Bureau, the Bureau of Labor Statistics, and the National Center for Education Statistics. Mortensen’s results over many years have repeatedly and convincingly illustrated that at every stage along the track to a bachelor’s degree, “family income plays a strong, positive role” (see, for example, “The Track to a Bachelor’s Degree from College,” 2001, p.1).

Similarly, as reported in *The Chronicle of Higher Education* (Leubsdorf, 2006), many students who enroll at four-year public colleges and universities face a gap between their ability to pay for college and the cost of attending, even with money from financial aid. Sixty-three percent of students do not have enough money – from their family’s

expected contribution plus financial aid – to cover tuition and other expenses of attending college (those figures are based on data from a national 2003-04 survey of colleges and universities by the National Center for Education Statistics). The same report looked at students who do have enough money to pay for college yet receive financial aid. Students from upper-income families, earning an average of \$89,400 a year, had \$3,400 more than necessary to pay for college without loans and \$6,000 with loans. In other words, nationally, many students with real financial need are not receiving enough aid, either in loans or grants, to offset this need. At the same time, many students with no financial need, as defined by the federal government, are receiving aid.

Don Heller is cited perhaps as widely as anyone working at the intersection of policy, affordability, access, and accountability. In testimony to U.S. Congress, he referenced a vast body of research confirming that “lower income students are the most sensitive to rising tuition prices, and they are the first to be priced out” (Heller, 2005, p. 17); that “highest income students have very little price sensitivity” (Heller, 2005, p. 17); that a recent federal report shows “that over 400,000 high school graduates who are academically qualified to attend a four-year college are unable to do so because of cost barriers” (Heller, 2005, p. 19); and that research “has demonstrated that merit aid is awarded disproportionately to students from higher income families, many of whom do not need that assistance to be able to go to college” (Heller, 2005, p. 19).

On that last point, Heller has also noted that “in 2003-04, institutions awarded more than \$2 billion in grant aid to dependent students with family incomes in excess of \$108,000, or approximately twice the median family income of all dependent students in the nation in that year.” He recommended “that these institutions conduct an evaluation of their own financial aid programs to determine whether they are working in consort with the goal of expanding access for underserved populations, or whether they are simply rewarding wealthier students who have had many social, financial, and academic advantages in the years before they went to college” (Heller, 2006, pp. 2-3).

The importance of the issue and the literature’s competing perspectives led us to examine how family income relates to access and degree completion at our institution. Overall, Penn State’s average graduation rates are high; the six-year rate is 84 percent at University Park, the largest campus. But such averages describe students in general, while masking differences among sub-groups. We wanted to see what the evidence could tell us about the academic trajectory of the university’s lower income students, in particular.

Understanding of the interplay between ability to pay and academic ability can be enhanced by incorporating additional variables known to be relevant to student retention. In his oft-cited model, Tinto (1993) attributed attrition to a lack of academic and social fit with the institution. Drawing from anthropological theory, he developed the ideas of community and transition and fit, and concluded that colleges and universities can increase the chances of student persistence by enhancing student/institutional fit and facilitating academic and social integration. Numerous researchers have tested and built upon aspects of Tinto’s model (for example, Braxton, Shaw & Johnson, 1997; Berger & Braxton, 1996;

Janasiewicz, 1987; Levitz & Noel, 1989). Reviewing that research in detail is outside the scope of this paper. However, the literature provides good reason to believe that many factors, such as participation in orientation and advising programs, residence on- or off-campus, and the like, do relate to student success (Pascarella & Terenzini, 2005). Information pertinent to those dimensions is reasonable and relevant to this analysis and is incorporated, as permitted by the availability of data, into this study.

Matters of access and affordability are especially pertinent for public colleges and universities. Penn State, like other public institutions, was founded in part on the premise of making higher education available to the sons and daughters of the working class. The university's mission statement continues to assert that, "As Pennsylvania's land-grant university, we also hold a unique responsibility to provide access." Additionally, the university's strategic plan highlights "the University's commitment to access" (Penn State, 2006).

This is important not just for Penn State, of course, but for the higher education enterprise in general. Colleges and universities may serve individual aspirations imperfectly (in relation to some ethnic minorities, disabled students, and others), but higher education in the United States has long provided a primary avenue to economic well-being and upward social mobility (Blau & Duncan, 2001; Breen & Goldthorpe, 2001; Ehrenberg, 1997; Leslie & Brinkman, 1988). For instance, reviewing the data, Paulsen (1998, p.474) observed that, "The magnitude of earnings differentials between college and high school graduates – which has increased substantially since the mid-1970s – is clearly one of the most striking and straightforward demonstrations of the value of a college education. Another is the substantial difference between the unemployment rates of college and high school graduates." In the face of decades of rising tuition rates, movement away from grants and toward student loans, and an emphasis on merit-based aid rather than need-based aid, maintaining access to higher education for all is increasingly a challenge for our democratic, egalitarian society.

Methodology

In this paper, we emphasize academic ability and ability to pay. Not only does the research literature suggest that these two considerations play an important role in degree attainment, but they also are of great practical interest in how an institution structures its aid (in terms of the mix of loans, grants, need- versus merit-based aid, and so on). We use family income, drawn from FAFSA (the federal government's Free Application for Federal Student Aid) information, as our measure of ability to pay.

We use first-fall semester gpa as our measure of academic ability. In previous presentations on this topic we have fielded questions about this particular measure: "Why didn't you use high school gpa?" (or class rank, or SAT scores, or first-year college gpa). Thus, an explanation of our rationale might be helpful. Our research design calls for a measure of academic ability that is accurate, statistically powerful, and readily available at an early point in students' college careers. The selection of any particular variable involves

compromises among those goals. For example, admissions indicators such as SAT scores have the advantage of being true pre-college measures, but the disadvantage of being fairly weak predictors of academic performance of students at our university. Not surprisingly, every available measure involves some such tradeoffs. On balance, first-semester and/or first-year grades appear to be the most appropriate choice. Numerous retention and degree attainment studies in the past have found that these variables are substantive and significant factors in explaining degree completion (Adelman, 2006a; Desjardins, Kim & Rzonca, 2003; Reason, 2003), so we use first-fall semester grade point average as our measure of academic ability.

The study draws on a variety of internal Penn State electronic databases, such as admission and financial aid files, for demographic information on 5,049 baccalaureate students who began at Penn State's largest campus (University Park) in the fall 1999 semester as full-time students. The cohort was tracked through summer 2005 to determine six-year graduation rates. In addition, we have drawn upon data from the National Student Clearinghouse to shed light on what happens, academically, to students who do not graduate from Penn State.

The study also incorporates information gathered during the freshman orientation and advising program and academic advising sessions during fall 1999. These data allow the model to incorporate indicators such as incoming students' self-ratings of ability and expected college grades as well as their behaviors in terms of whether and to what extent they utilized advising. Finally, the model includes a measure of the number of majors for each student. Although conceptually the idea of changing majors is very simple, accurately measuring this behavior is not. Institutional researchers can empathize with the practical difficulties of dealing with undecided majors, or a science college that enrolls all majors as common-year science majors in the first year (allowing them to become physics or biology majors as sophomores), and so forth. We carefully developed and tested algorithms appropriate for the many such situations possible at our university, to ensure that changes of major were realistically coded and tabulated (Stine, 2007).

This paper focuses on students from a single Penn State campus. We note this because Penn State is one university with 24 locations. Cross-campus perspectives can be informative, but it makes sense to focus here on students at the flagship campus, as this paper does, for two main reasons. First, there are significant differences among student and institutional characteristics at various Penn State locations. Those differences are evident in dissimilar six-year graduation rates: 84 percent at University Park compared to 53 percent graduation rate at other campuses (the missions of which include a two-year role for some location-bound students). Second, a focus on University Park students allows very practical advantages in terms of data availability and consistency.

We have been examining data for the 1999 entering cohort in various ways for approximately two years. We have been sharing the findings (Dooris & Guidos, 2006; Guidos & Dooris, 2007) while simultaneously adding to what is becoming a fairly large and complex dataset. At some point, insights from studying the entering class of 1999 may

become dated. However, we are still learning a lot by continuing to enrich and explore the dataset from that 1999-2005 window. Because of the advantages of building on prior findings and the pragmatic data processing considerations bearing on this type of work, gradually exploring one cohort has been a realistic and productive research strategy. For instance, the analyses of advising participation, student self-perceptions, time-to-degree, and number of majors are all new.

Analysis and Results

Of the 5,049 full-time baccalaureate students who began at Penn State-University Park in summer and fall 1999, 4,243 (84 percent) had graduated by fall 2005. This analysis explores the relationship among ability to pay, academic ability, and graduation for those students, and summarizes the results of regressing nineteen different variables onto graduation. The study also examines whether Penn State non-completers subsequently enrolled elsewhere. Finally, it compares coefficients for the model using six-year and four-year graduation rates and notes some changes in coefficient significance and sign.

Entering Students and Family Income

We have cited several other researchers whose findings have linked participation with socioeconomic status and/or family income. An obvious first-cut question is whether this applies at Penn State, which (as already noted, and like all public universities) traditionally has viewed access as an integral part of its mission.

| | U.S. Family Income Quintile, 1998 dollars¹ | # Students within Income Range | % Students within Income Range |
|---------------|--|---|---|
| Lowest fifth | \$0 - \$21,599 | 275 | 7.5% |
| Second fifth | \$21,600 - \$37,692 | 384 | 10.4% |
| Middle fifth | \$37,693 - \$56,019 | 497 | 13.5% |
| Fourth fifth | \$56,020 - \$83,690 | 892 | 24.2% |
| Highest fifth | \$83,691 and higher | 1,634 | 44.4% |

¹ Source: U.S. Census Bureau (2004)

Table 1. Distribution of Penn State’s 1999 First-time Full-time Baccalaureate Cohort by National Family Income Quintiles

Table 1 relates 1998 family income for the 3,682 entering students who submitted FAFSA applications to the U.S. family income distribution for the same period (income data were not available for 1,367 of the 5,049 students). Table 1 shows that at Penn State, family income does not relate as strongly to the makeup of the entering class as might be expected based on benchmarks (summarized earlier, from Carnevale and Rose) from the nation’s 146 most selective colleges and universities. Still, Table 1 shows that at Penn State, lower-income students are proportionally under-represented and higher-income students are over-represented.

Ability to Pay, Academic Ability, and Graduation Rates

Table 2 summarizes family income data for all 3,682 students in the fall 1999 entering cohort who completed the FAFSA application. As shown (and realizing that many of the students who do not complete the FAFSA are probably from higher-income families), 20 percent of these Penn State freshmen came from families with incomes of \$40,453 or less; 20 percent came from families with incomes of \$116,000 or more.

| | Family Income |
|---------------------------------|-----------------------|
| Lowest Quintile | \$0 - \$40,453 |
| 2 nd Lowest Quintile | \$40,486 - \$66,409 |
| Middle Quintile | \$66,451 - \$88,493 |
| 4 th Quintile | \$88,584 - \$115,800 |
| Highest Quintile | \$116,000 - \$771,170 |

Table 2. Family Income (from FAFSA; N=3,682)

Table 3 shows the distribution of first-fall semester grade point averages.

| | Fall 1999 GPA |
|---------------------------------|----------------------|
| Lowest Quintile | 0.00 – 2.59 |
| 2 nd Lowest Quintile | 2.60 – 2.97 |
| Middle Quintile | 2.98 – 3.26 |
| 4 th Quintile | 3.27 – 3.56 |
| Highest Quintile | 3.57 – 4.00 |

Table 3. Fall 1999 Grade Point Averages (N= 5,049)

Table 4 maps graduation rates onto the high and low income quintiles from Table 2 and the high and low gpa quintiles from Table 3. The resulting contrasts are pronounced. As shown, 95 percent of high-income, high-GPA students graduate within six years. That contrasts with the 84 percent graduation rate for low-income students of similar academic ability, for a difference of 11 percentage points. The absolute graduation rates for low gpa students are much lower, at 72 percent and 45 percent, but the difference between the graduation rates of high income students and low income students is even greater, at 27 percentage points

| | | | |
|-------------------------|------|-----------------------|-----|
| <i>Academic Ability</i> | High | 84% | 95% |
| | Low | 45% | 72% |
| | | <i>Ability to Pay</i> | |

Table 4. Six-Year Graduation Rates by Academic Ability and Ability to Pay

Space does not permit a detailed breakdown of Table 4’s results for Penn State’s various academic units. However, we have examined those data, and strikingly similar patterns occur throughout the university. That is, almost regardless of how we would define groups of students – high ability, low ability, by college, by campus – high income students graduate at rates about 10 to 25 percentage points higher than do low income students of similar academic ability.

Changes of Major

Administrative practices such as the use of common-year categories (discussed earlier) can make accurate analysis of student major changes a difficult task. We found that when these complications were realistically accounted for, students on average had recorded 1.56 majors by the time of graduation. Fifty-seven percent of graduates had only one major during the six years, 33 percent had two majors and 10 percent had three or more majors.

Multivariate Analysis of Factors Relating to Degree Completion

Because a considerable body of research suggests that many factors (high school grade point average, residence on- or off-campus, study skills, and so on) may relate to degree completion, we conducted a multivariate analysis on the dataset of the 3,682 Penn State students with FAFSA data (as already noted, 1,367 of the 5,049 students did not complete a FAFSA application). Since the outcome of interest is dichotomous – either someone graduated or they did not – we use logistic regression for this analysis.

The dependent variable for the regression is graduation within six years. In building models and choosing variables, we ran Pearson correlation analyses and eliminated variables with correlation coefficients of 0.3 or greater to reduce collinearity. (This removed, for instance, Pell recipient status because it was highly collinear with income and with total financial aid, and it removed SAT scores and high school class rank because they were highly collinear with predicted gpa.) A full analysis of the remaining nineteen possible predictors of graduation was modeled, and a stepwise model was also run on these variables. Table 5 summarizes the test results for the full model.

| Variable | Coefficient | Wald χ^2 | Odds Ratio |
|---|----------------------------------|---------------------------------|-------------------|
| Age in Fall 1999 (15-33 years) | -0.0315 | 0.1576 | 0.969 |
| Gender (female=0) | -0.0317 | 0.0784 | 0.969 |
| First generation (no=0) | -0.2578* | 4.6575 | 0.773 |
| On- or off-campus (on-campus=0) | -0.9212*** | 20.6288 | 0.398 |
| Minority (non-minority=0) | -0.0711 | 0.2368 | 0.931 |
| First-fall semester gpa (0.00 - 4.00) ¹ | 1.1377*** | 178.2404 | 3.119 |
| Predicted gpa (0.00 - 3.57) ¹ | 0.8527*** | 16.9824 | 2.346 |
| Residency (Pennsylvania=0) | -0.3893** | 9.2857 | 0.678 |
| 1998 family income (in \$10,000's) | 0.0394** | 8.3614 | 1.040 |
| Total financial aid received in 1999-2000 (in \$1,000's) | -0.0111 | 1.1058 | 0.989 |
| Number of majors, 1999- 2005 (1 – 6) | 0.3092*** | 16.6060 | 1.362 |
| Number of advising interviews by the end of fall 1999 (0-12) | 0.0274 | 0.4684 | 1.028 |
| Student's self-reported expected grade (2.00 – 4.00) | 0.0059 | 0.0011 | 1.006 |
| Student self-rating of note-taking ability -Above Average ² | 0.0315 | 0.0097 | 1.032 |
| Student self-rating of note-taking ability – Average ² | -0.1321 | 0.1804 | 0.876 |
| Student self-rating of test-taking preparation – Above Average ² | 0.6041** | 6.6613 | 1.830 |
| Student self-rating of test-taking preparation – Average ² | 0.4717* | 4.7398 | 1.603 |
| Student self-rating reading comprehension – Above Average ² | -0.0887 | 0.1766 | 0.915 |
| Student self-rating of reading comprehension – Average ² | 0.1836 | 0.8031 | 1.202 |
| Model $\chi^2 = 502.58$ *** Nagelkerke $R^2 = 0.2486$ d.f. = 19 Concordant (predicted to observed) = 77.0% | * p<.05 ** p<.01 ***p<.001 | | |

¹ The gpa increment is a full point – for example, the difference between a 2.50 and 3.50. “Predicted gpa” is a calculation based on SAT scores and high-school grades, used for admissions purposes.

² The reference category for student self-ratings is “below average.” This information is taken from a questionnaire that entering freshmen complete during the pre-enrollment testing and advising program. For these items, incoming freshmen are asked to rate their abilities as either above average, average, or below average.

Table 5. Factors Relating to Six-Year Graduation

Overall Model Fit. As shown in Table 5, the Nagelkerke R^2 was 0.2486 for the full model. This was the highest R^2 of any of our models. This model was able to predict 77 percent of the observed cases. The model χ^2 statistic indicates that the model is significant overall.

Coefficients and Odds Ratios. Logistic regression coefficients estimate the change in the log-odds of the outcome based on a one-unit change in an independent variable. Those estimates are not easily interpreted, except that coefficients may be positive or negative; a positive coefficient indicates an increase in the log odds of the dependent variable while a negative coefficient indicates a decrease. So, for example, in Table 5, the results for “on- or off-campus” show a lower likelihood of graduation for off-campus students since that parameter estimate is negative (-0.9212) and the result is statistically significant.

Although the mathematics behind odds ratios are not intuitive (they represent an exponential log transformation of the coefficients), odds ratios themselves are easy to interpret. The odds ratios for independent variables in this logistic regression represent the difference in the odds of graduating based on a one-unit change in an independent variable. For instance, in Table 5, the odds ratio for on- or off-campus is 0.398. Thus, the odds for an off-campus student graduating are just 0.398 that of the odds of a student who lived on-campus as a freshman. Likewise, the odds ratio for cumulative grade point average in Table 5 of 3.119 suggests that the odds of graduating increase by 3.119 (that is, by 211.9 percent) for a full-point increase in first-fall semester gpa. The relative magnitude of the association between the dependent variable and each dichotomous independent variable can be readily compared. For example, the odds ratios of 0.773 for first generation and 0.398 for residency indicate a greater negative impact associated with living off campus as a freshman than with being a first-generation student. Because continuous variables such as age, aid amounts, and family income have more than two possible outcomes, their odds ratios cannot be compared as easily.

Significant Predictors. The likelihood of graduating in six years appears to be significantly associated with the following student characteristics, as shown in the results for the Wald χ^2 statistics in Table 5:

- | | |
|---|---|
| * first generation (negatively related) | * in-state residence (positively related) |
| * off-campus resident (negatively related) | * changing majors (positively related) |
| * first-fall semester grade point average (positively related) | * positive self-perceptions of test-taking preparation (positively related) |
| * self-report of predicted grade point average (positively related) | |

The logistic regression results confirm that academic ability and income are related to the likelihood of graduation. Increases in first-fall semester gpa and family income both relate significantly to improved odds of graduation. For instance, every \$10,000 increase in family income raises the odds of graduation by four percent.

The following student characteristics appear *not* to be statistically significant: age, gender, minority/non-minority, total financial aid, the number of advising interviews during the first year, students' self-reported expected gpa, students' self-rating of note-taking ability, and students' self-rating of reading comprehension. This means that, for example, that we would *not* expect different graduation outcomes for minority and non-minority Penn State students who are comparable in other respects, such as predicted gpa, family income, and so on.

The findings on the number of freshmen advising sessions are interesting. Researchers have, in some studies, found positive effects of orientation and advising programs on retention, but in general it is fair to say that it has been difficult to consistently demonstrate a direct, positive impact of such programs (Pascarella & Terenzini, 2005). Our findings are positive, but not statistically significant.

The logistic regression results on change of major are also intriguing, and they are in line with other findings. At least two studies (Murphy, 2000; Micceri, 2001) have found that students who change majors have substantially greater graduation probabilities – in Murphy's study, about 40 percent higher, and in Micceri's, about double – compared to students who do not change majors. Our analysis likewise finds that changes of major are positively related to the odds of graduation.

Our results on change of major (like those of Murphy and Micceri) are interesting but not easy to interpret. It may be that students who change majors are doing so because they are getting good advising. Perhaps a wise change of major can in fact help a student to find a program that matches his or her interests and abilities. On the other hand, there may be some interaction involving change of major, graduation, and mediating and/or moderating variables (such as a student's motivation or personality, the unavailability of a desired major at the institution, and so on). In any case – and perhaps contrary to some higher education lore – these findings do not support the argument that students who decide to change majors are harming their chances of earning a degree.

Non-Completers and Subsequent Enrollment at Other Institutions

We cannot determine all the reasons why students enrolled at the university but left before earning a degree. But we have explored whether students who left Penn State continued their education at other institutions, and how income levels and academic ability related to those enrollment patterns. 806 (16 percent) of the 5,049 entering full-time baccalaureate students did not graduate from Penn State within six years.

The data in Table 6 are extracted in part from the National Student Clearinghouse, which is a comprehensive database of students enrolled at over 2,800 colleges and universities. At the time of this study, participating two-year and four-year colleges and

universities, along with other trade and vocational institutions, enrolled 91 percent of the students in higher education in the United States. The Clearinghouse provides information on whether students who left Penn State subsequently attended other institutions of higher education.

| Fall 1999 GPA Quintile | Lowest Income Quintile | | 2nd Lowest Income Quintile | | Mid Income Level Quintile | | 2 nd Highest Income Quintile | | Highest Income Quintile | | Total |
|---------------------------|------------------------------|-------------------------|----------------------------------|-------------------------|---------------------------------|-------------------------|---|-------------------------|-------------------------------|-------------------------|-------|
| | # Non- completers | % Enrolled Elsewhere | # Non- completes | % Enrolled Elsewhere | # Non- completes | % Enrolled Elsewhere | # Non- completes | % Enrolled Elsewhere | # Non- completes | % Enrolled Elsewhere | |
| Lowest GPA | 76 | 41% | 45 | 49% | 40 | 55% | 41 | 54% | 44 | 59% | 246 |
| 2nd Lowest | 31 | 35% | 27 | 37% | 24 | 46% | 13 | 46% | 29 | 69% | 124 |
| Mid-GPA | 26 | 50% | 19 | 53% | 18 | 39% | 19 | 58% | 23 | 78% | 105 |
| 2nd Highest | 19 | 47% | 14 | 50% | 10 | 70% | 16 | 63% | 23 | 57% | 82 |
| Highest GPA | 13 | 85% | 11 | 55% | 5 | 100% | 16 | 81% | 24 | 88% | 69 |
| Total | 165 | 45% | 116 | 47% | 97 | 54% | 105 | 59% | 143 | 69% | 626 |

Table 6. Enrollment Rates at Other Institutions for Penn State Non-Completers

Table 6 presents this transfer information for the 626 students (a subset of the 806 non-completers) for whom we have income data. As shown, 69 percent of the students at the highest income level enrolled at another school compared to 45 percent of those at the lowest income level. In other words, the majority of the university’s non-completers are *not* dropping out of higher education but once again, we see that income matters. Within each level of academic ability, greater proportions of higher income students re-enrolled at other institutions than did lower income students.

Time to Graduation

This paper sidesteps arguments about whether four- or five- or six-year graduation rates should be a preferred metric for colleges and universities. Such policy, measurement, and methodology debates, involving what Clifford Adelman calls the “propaganda of numbers” (Adelman, 2006b, p. B6), are far too important and complex to be casually addressed here. However, the Spellings Commission, among other visible bodies that comment critically on higher education, has noted that four-year graduation is a reasonable expectation. For example, that Commission refers to “four years for a bachelor’s degree” as “the traditional period for the degree” and recommends that incentives to colleges and universities be based in part upon their four-year graduation rates (U.S. Department of Education, 2006, p.20).

| Years to Graduation | Lowest Income Quintile | 2nd Lowest Quintile | Mid Income Quintile | 2nd Highest Quintile | Highest Income Quintile |
|----------------------------|---------------------------------------|---|------------------------------------|--|--|
| Four Years | 55% | 59% | 66% | 70% | 67% |
| Five Years | 39% | 36% | 29% | 27% | 30% |
| Six Years | 5% | 5% | 5% | 3% | 2% |
| <i>Total</i> | 100% | 100% | 100% | 100% | 100% |
| Number of Graduates | 518 | 606 | 643 | 635 | 654 |

Table 7. Years to Graduation (for Students who Graduated in Six Years)

Table 7 shows years to graduation for students who eventually graduated (that is, within six years) for the 1999 cohort of entering full-time baccalaureate students. These data suggest that higher income students are more likely than lower income students to earn a degree within four years.

We are also interested in whether and to what extent logistic regression results differ between the outcome of six-year graduation (shown earlier, in Table 5) and four-year graduation. Table 8 compares those logistic regression results. Gender, minority status, and the number of counseling interviews become significant in relation to the odds of graduation in four years, and in-state residency drops out. Otherwise, the results are fairly similar, whether the dependent variable is four-year graduation or six-year graduation.

The results summarized in Table 8 reinforce the ambiguity, evident both in our own research and in the larger research literature, about the relationships among some of these factors. For example, the number of majors, which is positively related to six-year graduation, has a negative relationship to four-year graduation. Additionally, we have referred already to mixed findings in the scholarly literature (Pascarella & Terenzini, 2005) about the impact of advising and orientation programs, so it is perhaps not surprising that the number of freshman counseling interviews in which students participated is significant for one outcome (four-year graduation) but not the other (six-year graduation).

| Variable | Six-Year Graduation Odds Ratio | Four-Year Graduation Odds Ratio |
|---|---------------------------------------|--|
| Age in Fall 1999 (15-33 years) | 0.969 | 1.055 |
| Gender (female=0) | 0.969 | 0.505*** |
| First generation (no=0) | 0.773* | 0.815* |
| On- or off-campus (on-campus=0) | 0.398*** | 0.300*** |
| Minority (non-minority=0) | 0.931 | 0.778* |
| First-fall semester gpa (0.00 - 4.00) ¹ | 3.119*** | 1.964*** |
| Predicted gpa (0.00 - 3.57) ¹ | 2.346*** | 1.770* |
| Residency (Pennsylvania=0) | 0.678** | 1.056 |
| 1998 family income (in \$10,000's) | 1.040** | 1.020* |
| Total financial aid received in 1999-2000 (in \$1,000's) | 0.989 | 0.990 |
| Number of majors, 1999- 2005 (1 - 6) | 1.362*** | 0.792*** |
| Number of advising interviews by the end of fall 1999 (0 - 12) | 1.028 | 1.174*** |
| Student's self-reported expected grade (2.00 – 4.00) | 1.006 | 0.974 |
| Student self-rating of note-taking ability -Above Average ² | 1.032 | 1.172 |
| Student self-rating of note-taking ability – Average ² | 0.876 | 1.263 |
| Student self-rating of test-taking preparation – Above Average ² | 1.830** | 1.518* |
| Student self-rating of test-taking preparation –Average ² | 1.603* | 1.499* |
| Student self-rating reading comprehension – Above Average ² | 0.915 | 0.940 |
| Student self-rating of reading comprehension – Average ² | 1.202 | 0.925 |
| <i>Six-year model</i> Model $\chi^2 = 502.58$ *** Nagelkerke $R^2 = 0.2486$ d.f. = 19 Concordant (predicted to observed) = 77.0% <i>Four-year model</i> Model $\chi^2 = 486.9056$ *** Nagelkerke $R^2 = 0.1893$ d.f. = 19 Concordant (predicted to observed) = 71.2% | | * p<.05 ** p<.01 ***p<.001 |

¹ The gpa increment is a full point – for example, the difference between a 2.50 and 3.50. “Predicted gpa” is a calculation based on SAT scores and high-school grades, used for admissions purposes.

² The reference category for student self-ratings is “below average.” This information is taken from a questionnaire that entering freshmen complete during the pre-enrollment testing and advising program. For these items, incoming freshmen are asked to rate their abilities as either above average, average, or below average.

Table 8. Factors Relating to Four- and Six-Year Graduation

Related Analyses

As noted, this paper describes one of several related studies. We have also run models (both full and stepwise) for all of the university's undergraduate campuses (Dooris & Guidos, 2006). Those results cannot be presented fully in this paper, for reasons of space. But in brief, all those models were significant based on the χ^2 statistic, and all were able to correctly predict at least 75 percent of the observed cases. In general, those logistic regression results were fairly similar in terms of the direction and significance of many of the variables to those reported in this paper, even though the students' characteristics (especially regarding income, academic ability, and graduation rates) are quite different across campuses. Also, as already noted, gender is not a statistically significant explanatory variable in relation to six-year graduation for students at University Park, but it is for students at other Penn State locations. At non-University Park campuses, females had higher odds of six-year graduation than did males (Dooris & Guidos, 2006).

We were intrigued and a bit surprised by the finding, shown in Table 5 and Table 8, that age does not relate significantly to the likelihood of graduation in either four years or six years. Therefore, we have looked at questions about adult learners in considerable depth. The apparent lack of significance turns out to be contingent on how a population is defined, because in the real world, many returning adults are not first-time full-time students, nor are they necessarily seeking baccalaureate degrees. In a separate study (Guidos & Dooris, 2007), we examined a more broadly defined population which included full-time, part-time, baccalaureate, and associate degree students. That analysis showed that adult learners differ significantly from traditional-age students in the factors relating to degree completion, and that adult students complete their degrees at lower rates than do traditional-age students. Also, even within the adult learner population, we find distinct cohorts. In particular, among adult learners, part-time and full-time students differ greatly on many dimensions. Among returning adults, full-time students are more likely to be male, minority, younger, veteran, and seeking a baccalaureate degree, and they are much more likely to apply for and receive financial aid than are part-time students.

Conclusion and Practical Implications

We believe that America's colleges and universities do a wonderful job for most students. Nonetheless, it appears reasonable to examine closely whether and to what extent a particular segment of students – those from lower-income backgrounds – may be systematically and materially disadvantaged in earning a degree from selective higher education institutions in the United States.

Research on this topic can inform decisions about admissions, student aid, development, programs such as orientation and advising, and more. In fact, at our own institution, we have been invited to share our findings with deans and other staff and administrators as well as with external supporters of the university. The information has become part of conversations about fundraising, about undergraduate advising, and about the allocation of merit- and need-based financial aid.

Our results are clear. When other factors are taken into account, differences in ability to pay relate substantively and significantly to degree completion. Six-year graduation rates for high-income students are about 10 to 25 percentage points above those of low-income students of comparable academic ability. Disparities such as this should be of genuine concern for higher education, and for the students and families that the nation's public universities and colleges serve

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