COLLEGE GRADUATION RATES DEPEND MAINLY ON THE STUDENTS – BUT COLLEGES MATTER TOO. HERE'S HOW MUCH.

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Abstract

College graduation rates are a source of concern; many students fail to complete degree programs and therefore miss out on the socioeconomic benefits accruing to college graduates. Some have proposed that colleges be evaluated based on their graduation rates, with financial aid dollars directed away from poor performers. However, none of these proposals have taken student characteristics into account. Drawing data from the federal government's college scorecard, graduation rates were analyzed in terms of student academic readiness (SAT scores) and financial instability (percentage eligible for Pell grants) for every private four-year college and university in the Northeastern United States, excluding certain highly specialized schools or those (mostly for-profit institutions) that failed to report adequate data. The results were cross-validated on two other populations: colleges situated in the Midwestern United States and those in a selection of Southeastern states. All told, the samples included 558 colleges located in 24 states (plus the District of Columbia) end enrolling slightly over 1,500,000 undergraduates. SAT scores and Pell-eligible population account for 74 – 83% of the variance in graduation rates. Analysis of residuals enables identification of relatively more (or less) successful colleges: those graduating a higher (or lower) proportion of their students than would be expected given the qualities of those students. This leads to a number of interesting findings. For example, historically Black institutions tend to do quite well at guiding students through to graduation, while those focusing on STEM fields tend to have lower graduation rates. The most important conclusion is that any attempt to evaluate colleges based on graduation rates needs to begin with the characteristics of their entering students.

Recent years have seen increasing concern over college graduation rates. A college education is widely (and fairly accurately) perceived as, if not a "ticket" to the middle class, at least a prerequisite. Ambitious individuals, therefore, want to go (or send their children) to college. On a societal level, our information-rich economy also needs ever more educated workers in order to remain globally competitive. Yet when quantitative researchers turned their attention to the matter, they found that a surprisingly large proportion of those who begin college do not actually graduate within a reasonable span of time. This is made even more worrisome by the finding that those with a year or so of college, but no degree, seem not to share much in the benefits accruing to those who complete their degree programs.

In a New York Times Upshot article, Quoctrung Bui discussed two aspects of this problem, though they were not always differentiated clearly. One side of the issue concerns individual students. Those who are not well prepared academically and/or lack adequate financial resources are far less likely to graduate. Yet their failed attempts at negotiating the challenges of university may involve them in considerable debt. The second side of the issue concerns the universities themselves. Graduation rates vary considerably across types of institution, and also from school to school within any given category. Government data indicate, for example, that private, non-profit colleges have an average 6-year completion rate[1] of 65%; public colleges, 58%, and for-profit institutions, 32%. Graduation rates from community colleges are even lower, at 20%. (Incidentally, this raises doubts about the wisdom of the current "push" to make community college even more affordable. By offering incentives that induce more students to select this option, would we cause still fewer to complete the degrees to which they aspire?)

Might we, as a nation, want to do something about one or the other of these problems? Are there prospective students with so little chance of succeeding that they ought not to be allowed to try? Or at least, not awarded federally guaranteed loans for the purpose? Are there institutions of so-called higher education that do such a poor job of actually educating students that federal funds ought not to be disbursed to those they enroll?

I will have little to say about the first problem as such. But I would like to observe that one of the accreditation standards all colleges are supposed to meet is to accept only students who have a "reasonable potential for success." The difficulty here is that nobody has ever defined "reasonable." We would all, I am sure, agree that a 90% chance of success is a pretty good bet, and that a 10% chance is a pretty bad one. But where, precisely, will we choose to draw the line? Here, it makes quite a difference whether you look at it from the perspective of an individual student (who aspires to a better life and is ready to make a risky investment) or that of the investor guaranteeing a loan (who looks for a net gain). As a student, I would feel that even a 25% chance was worth pursuing. But as a coldly rational economist, I might think otherwise[2]. We also need to remember that countries providing free college (such as Denmark or Sweden) do not make university available to all; admission is competitive enough that their citizens are no more likely than Americans to obtain bachelor's degrees. This is a conversation worth having, though not one we will enjoy – or one I intend to pursue here.

My main concern is with the second problem: that of institutional performance. However, this is complicated by the fact that *the two problems are entangled with each other*. Students are not randomly assigned to colleges, or anything like it. Rather, colleges and prospective students engage in an excruciating annual ritual akin to the mating season of an unusually competitive species, the end result of which is that aspiring students are sorted into a stratified system of more and less prestigious colleges[3].

What this means is that the graduation rate of a college, all by itself, actually tells us very little. Think about it. "Ashwood University reports a 6-year graduation rate of 75%." Well, if Ashwood is competing with elite schools like the Ivies, then that looks pretty bad. But if its students are mostly drawn from the middle of the national applicant pool, the same figure would look quite good.

The issue is this: *colleges educate the students they have*. This sounds obvious, but it is usually ignored. What we really want to know is how successful a college has been at helping its students to navigate four years of increasingly advanced coursework and complete their bachelor's degrees. But most analyses of graduation rates, such as the Third Way white paper on which Bui's article was largely based, completely ignore the academic readiness of the students themselves. As a result, they fail to identify the schools that are actually making an unusually good (or poor) job of their educational missions.

Now as it happens, we can do a pretty good job of evaluating institutional performance using data that are ready to hand. Most of what we need is posted to the federal government's "college scorecard" web site.

Academic readiness can be approximated by the average SAT score at each college. Arguably limited in its ability to predict individual outcomes, the SAT is nonetheless a very reliable measure that should work well on a group level. SAT scores are presumably compounded of native wit, history of educational/cultural opportunity, and due diligence (i.e., study habits) – though in what proportion, we are not sure.

The extent to which a college serves socioeconomically less advantaged students may be approximated by the percentage of those students who are eligible for federal Pell grants, which implies a family income below $40,000 per annum. (This is just slightly more than 1.5 times the poverty threshold for a family of four.)

I compiled SAT scores[4], Pell percentages, and certain other figures for almost every[5] private four-year college[6] in the northeastern United States[7]. The data set includes 239 schools enrolling just over 775,000 students: nearly 20% of those enrolled in private four-year colleges nationwide. For what it is worth, here is a description of the "typical" private college in the Northeast. It enrolls 2000 – 3000 students; these students have average SAT scores of about 540; 25 – 30% of them are eligible for Pell grants. Given this student body, it achieves a 65% graduation rate, very close to the national average.

How strongly do these variables relate to college graduation rates? *Very* strongly. The correlation between graduation rate and average student SAT score is +.88; that between the percent of students from financially struggling backgrounds and graduation rate is -.82. For those not accustomed to thinking in terms of correlation coefficients, the following table may be helpful. I broke the colleges down into six groups, or levels, based on their students' average test scores, then calculated graduation rates and Pell percentage for each. Here are the results:

Mean SAT Score	# Schools	Graduation Rate	Pell Eligible
≤ 500	72	47.8%	41.5%
500 – 549	62	61.0	30.9
550 – 599	40	71.5	23.8
600 – 649	27	79.9	19.1
650 – 699	22	87.9	15.5
≥ 700	16	94.1	15.2

As others have observed, most of the less advantaged students are found at colleges with relatively low graduation rates. However, these are also the colleges striving to educate the least well prepared students, and the academic limitations of their students is the key predictor of their low graduation rates[8]. In fact, 77.4% of the variation in graduation rates is explained by this one factor. Given such a strong linear relationship, we can use SAT scores to predict graduation rates with a surprising degree of accuracy. Even more interesting, we can compare the *actual* graduation rate for each school with the rate predicted by our formula. In this way, we can identify those schools that are outperforming predictions (i.e., graduating more of their entering students than would be expected) and those that are underperforming (i.e., losing more students than should be the case).

Here, then, are the "Top 10%" of all private colleges and universities in the Northeast according to this metric. All of them graduate at least 10% more of their entering first-year students than would be expected at a "typical" school, assuming the same caliber students. It is important to remember that these numbers are likely to fluctuate from year to year. We won't always see the same group of schools at the top. But these schools are likely to be consistent in graduating more of their students than would the average institution.

Colleges and Universities with Higher Graduation Rates than Predicted by Student SAT Scores

	z score[9]	predicted	actual
1. Elms College (MA)	+2.25	49.5%	68%
2. Westminster College (PA)	+2.18	59.1	77
3. Moravian College (PA)	+2.09	56.8	74
4. University of Scranton (PA)	+1.97	66.8	83
5. Providence College (RI)	+1.95	70.0	86
6. Albertus Magnus College (CT)	+1.89	40.5	56
7. Stonehill College (MA)	+1.86	67.7	83
8. St. Joseph's College (PA)	+1.59	65.9	79
9. Bryant University (RI)	+1.55	68.3	81
10. Gwynedd Mercy University (PA)	+1.54	51.4	64
11. St. Vincent College (PA)	+1.50	58.6	71
12. College of St. Elizabeth (NJ)	+1.49	42.7	55
13. Quinnipiac University (CT)	+1.39	64.5	76
14. Syracuse University (NY)	+1.34	70.0	81
15. Babson College (MA)	+1.32 (tie)	79.2	90
16. Manhattan College (NY)	+1.32 (tie)	63.2	74
17. St. John Fisher College (NY)	+1.32 (tie)	63.2	74
18. St. Francis College (PA)	+1.31	57.3	68
19. Cairn University (PA)	+1.29	56.4	67
20. Marist College (NY)	+1.25	69.7	80
21. Siena College (NY)	+1.24 (tie)	66.8	77
22. Duquesne University (PA)	+1.24 (tie)	66.8	77
23. Cedar Crest College (PA)	+1.23	50.9	61
24. LaSalle University (PA)	+1.22	55.0	65

The first thing most readers will notice is that this is not a list of "famous" schools. Only two research universities appear (Syracuse and Duquesne: both respectable, but neither one near the top of the usual rankings) and none of the most elite liberal arts colleges. This does not mean that the "elite" schools are doing a poor job of educating their students. It means only that they are blessed with extremely capable students who are very likely to complete their degrees no matter what institution they choose to attend. If your average student scores 700 on each subtest of the SAT, your expected graduation rate is over 92% - there just isn't much room for improvement[10]. By the same token, though, perhaps we should not look to those schools as paragons of pedagogy, unless we really believe that 92% of a batch of randomly selected high school students would thrive at (say) Cornell. We know that the elite schools are capable of educating people who are already highly intelligent, accomplished, and hard-working. We know that the schools listed above are capable of educating the students they have been dealt – and in most cases, those students are much closer to the national average[11].

Taking student abilities into account produces a very different list than that provided by the Third Way report, which is dominated by the usual elite schools (in this case, Stanford and Duke head the list). To be fair, the authors of that report also took the cost of attending into account, and the elite schools tend to have deep pockets. In fact, if you need financial aid, Princeton is the least expensive school in the Northeast according to the scorecard data. But it doesn't do the average college-bound high school student much good to advise her (or him) to attend a school that rejects more than 90% of its applicants, most of whom are much better qualified than the average. Most of the colleges listed here are pleased to accept more-or-less typical college-bound seniors.

The increased likelihood of degree completion at these schools is not trivial. For example, average students[12] at Providence College would have about a 70% chance of completing a bachelor's degree program at a typical college. The actual graduation rate of 86% means that 16 out of 30 students who would have failed to finish their degrees at a typical school will succeed at Providence: a greater than 50% reduction in the risk of non-completion.

The next thing one might notice is that about two-thirds of these schools are at least nominally Catholic, while several more (notably Westminster and Moravian) also have clear religious affiliations. I don't want to make too much of this – there actually are an awful lot of Catholic colleges and universities in the Northeast (about 30% of the sample, with another 13% having Protestant[13] affiliations). But the proportion of top performers that are in the Catholic tradition is noteworthy (especially if we add in the Presbyterians and Moravians!); there may be something going on here. To the extent that their mission statements are to be taken seriously, many of them are deeply committed to helping their students succeed as a form of service. *Some* of them also encourage students to be involved in community-building religious activities. However, as far as I can tell, only a few place much emphasis on religion in their web sites or academic programs. They are far more likely to emphasize their commitment to the liberal arts and to cultivating an inclusive community that welcomes people of every race, gender, and faith tradition[14]. The factors associated with their success remain to be explored.

Naturally, SAT scores are not the only student characteristic affecting success in college. Socioeconomic status (SES) also makes a difference. Students from lower-SES backgrounds will often experience greater difficulty financing college. They are often also less well prepared for the academic environment on a cultural level. The collegiate environment has its own norms, and students unfamiliar with those (often unwritten) rules can be at a disadvantage. Of course, they

are often less well prepared academically as well, but this has already been accounted for by the SAT scores used in the first analysis.

Therefore, a new analysis used both the proportion of students eligible for federal Pell grants and the average SAT score, improving the accuracy with which we predict graduation rates. The increment isn't large (we're up to explaining 82.8% of the variation), but it does tighten things up a bit. More important, it also enables us to identify the extent to which schools are succeeding in educating students from less advantaged backgrounds. Even though school characteristics can affect, at most[15], 17.2% of the variation in student success, we continue to find systematic differences between colleges.

Here, then, are the "Top 10%" among private Northeastern colleges with respect to success in graduating their students after accounting for students' academic abilities (SAT scores) and socioeconomic status (Pell percent). Most of these are schools enrolling large numbers of lower-SES students and managing to "buck" the trend for such students not to succeed.

Colleges and Universities with Higher Graduation Rates than Predicted by a Combination of Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants[16]

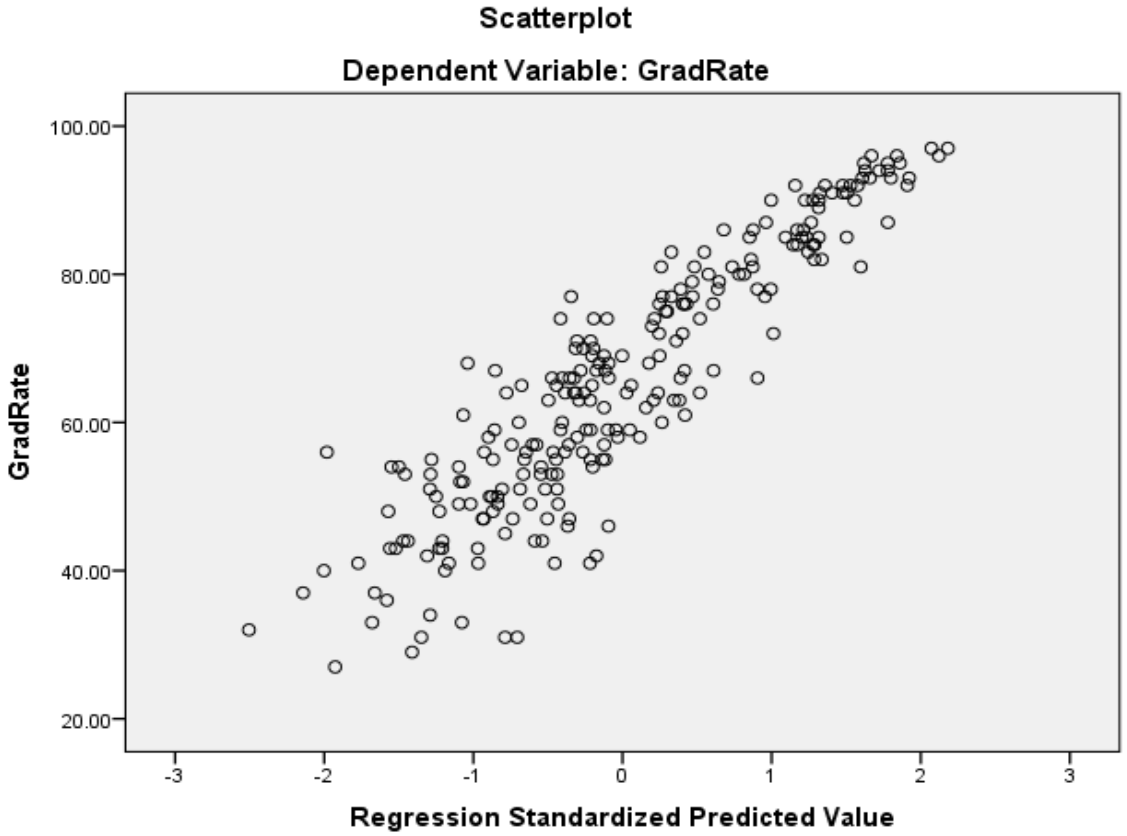
	z score	predicted	actual
1. Albertus Magnus College (6)	+2.98	34.3%	56%
2. Elms College (1)	+2.59	49.2	68
3. Westminster College (2)	+2.32	60.1	77
4. Moravian College (3)	+2.06	59.0	74
5. Cairn University (19)	+2.05	52.1	67
6. Mt. St. Vincent (NY; n/a)	+1.77	41.2	54
7. University of Scranton (4)	+1.69 (tie)	70.8	83
8. Cedar Crest College (23)	+1.69 (tie)	48.7	61
9. Rosemont College (PA; n/a)	+1.66	42.0	54
10. St. John Fisher (17)	+1.58	62.5	74
11. Syracuse University (14)	+1.56	69.7	81
12. Gwynedd Mercy University (10)	+1.47	53.3	64
13. St. Peter's University (NJ; n/a)	+1.44	42.6	53
14. St. Vincent College (11)	+1.41	60.8	71
15. LaSalle University (24)	+1.39	54.9	65
16. Manhattan College (16)	+1.38	64.0	74
17. Providence College (5)	+1.34	76.3	86
18. College of St. Elizabeth (10)	+1.32	45.4	55
19. St. Joseph's College (NY; n/a)	+1.29	60.6	70
20. Stonehill College (7)	+1.21 (tie)	74.2	83
21. LeMoyne College (n/a)	+1.20 (tie)	62.2	71
22. Babson College (15)	+1.20	81.3	90
23. Houghton College (PA; n/a)	+1.18 (tie)	61.5	70
24. Holy Family University (PA; n/a)	+1.18 (tie)	51.4	58

Note: Numbers in parentheses represent each school's rank using SAT alone as a predictor.

The two lists are pretty similar. Most of the schools from the first list also appear on the second. Seven new schools appear; 7 others leave the list. No longer among the "top 10%" are Quinnipiac University, Duquesne University, Bryant University, Siena College, Marist College, St. Joseph's College (PA), and St. Francis College. All of these still fall well in the positive direction, but they lose ground in this analysis because relatively few of their students come from economically challenged backgrounds. Conversely, the 7 added schools educate large numbers of such students. They all fared pretty well in the first analysis, but managed to do so despite hosting large numbers of economically challenged students. For example, only 20% of Quinnipiac's students are eligible for Pell grants, as opposed to 52% of those attending St. Peter's.

I was both pleased and embarrassed to find my own institution heading this particular list. Pleased, because of course one is happy to see evidence that one is contributing to a good cause. Embarrassed, because it makes it inevitable that some readers will (understandably) suspect me of manipulating the data. I can state unequivocally that this is not the case; fortunately, all the data were obtained from public (mainly government-sponsored) sources and are freely available to all. I hasten to add that I do *not* expect my college always to be at or near the "top of the heap;" there are surely many factors in play here, some of which may be structural while others may be transient. In addition, mine is a very small college, which renders our data especially vulnerable to year-by-year fluctuations.

For those who like a visual representation of their data, here is the "scatterplot" showing the relationship between predicted graduation rates and those actually obtained by each school.



What about ethnicity? African-American students graduate at relatively low rates; the same is true of Hispanic students. It is not surprising, then, to find lower graduation rates at colleges enrolling these students in large numbers[17]. This remains true after factoring out SAT scores, a finding consistent with the little-known fact that SAT scores actually *overpredict* college grades for African-American students. However, once you factor out academic readiness *and* economic security (Pell eligibility), ethnicity is irrelevant to the issue of graduation rates. There is nothing about, say, "Black culture" or "Hispanic culture" that interferes with one's ability to succeed in college. Conversely, there is no evidence here that the usual college curriculum is any less appropriate for these student groups. It's all about academic skills and socioeconomic status.

There is an apparent trend for very small institutions to have lower graduation rates, but this is an artifact of the relatively low SAT scores (and large numbers of Pell-eligible students) typical at these schools. Once those factors are removed, size makes no difference.

There does appear to be a positive relationship between graduation rate and religious identity after controlling for the student ability level typical of each college; for whatever reason, Catholic schools (and, to a lesser extent, Protestant ones) outperform their secular peers on this measure. Among schools with student SAT scores in the 550 – 600 range, for example, the mean graduation rates are 67.9% among purely secular schools, 71.2% among Protestant-affiliated ones, and 77.1% among Catholic ones[18].

Of course, we can also learn from the schools that *underperform* – and if we happen to be prospective students (or parents thereof), this too is personal. So, without further ado, here is the bottom 10% of northeastern colleges and universities in terms of graduation rate relative to mean student SAT score.

Colleges and Universities with Lower Graduation Rates than Predicted by Student SAT Scores

	z score	predicted	actual
1. Touro College (NY)*	-4.43	67.4%	31%
2. College of New Rochelle (NY)	-3.27	53.9	27
3. Becker College (MA)	-3.09	56.4	31
4. Polytechnic Inst. Of N.Y.U.	-2.71	82.3	60
5. Thiel College (PA)	-2.40	52.7	33
6. D'Youville University (NY)	-2.31	60.0	41
7. University of Bridgeport (CT)	-2.15	48.6	31
8. Marymount Manhattan C. (NY)	-2.14	59.5	42
9. Long Island U./Brooklyn (NY)	-1.90	48.6	33
10. Lesley University (MA)	-1.89	61.4	36
11. Bennington College (VT)*	-1.85	81.2	66
12. Post University (CT)	-1.73	43.2	29
13. Marlboro College (MA)*	-1.66	76.6	63
14. Unity College (ME)*	-1.57	57.9	45
15. New York Inst. Of Tech. (NY)	-1.53	59.5	47
16. Rochester Inst. Of Tech. (NY)	-1.52	75.5	63
17. Long Island U./Post (NY)	-1.48 (tie)	53.2	41
18. Paul Smith's College (NY)	-1.48 (tie)	53.2	41

19. Dominican of Blauvelt (NY)	-1.45	45.9	34
20. Northeastern University (MA)	-1.26	91.4	81
21. Daemen College (NY)*	-1.24	59.2	49
22. Hofstra University (NY)	-1.21	70.9	61
23. The King's College (NY)	-1.17	68.6	59
24. Sarah Lawrence College (NY)*	-1.16	81.5	72

* SAT data for these schools were obtained from Petersons, not the college scorecard

This is a varied group of schools. We find several Catholic institutions (notably New Rochelle and D'Youville), demonstrating that there is no divine protection afforded thanks to a Church affiliation; one research university (Northeastern); two or three well-respected liberal arts colleges (Sarah Lawrence, Bennington, and Marlboro); several engineering schools (notably R.I.T.), and a mixed batch of small four-year colleges and somewhat larger master's universities. It is likely that the relatively low graduation rates at many engineering-oriented schools[19] reflect the difficult major programs undertaken by many of their students. It is not surprising to see people failing to complete degrees in STEM disciplines – though the colleges might wish to do a better job of redirecting such students into other major fields of study where they might succeed, rather than allowing them to drop out.

Lastly, here are the underperformers when both SAT scores and Pell eligibility are taken into consideration:

Colleges and Universities with Lower Graduation Rates than Predicted by a Combination of Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants

	z score	predicted	actual
1. Becker College (3)	-3.23	54.5	31
2. Touro College (1)*	-3.06	53.2	31
3. Long Island U./Post (17)	-2.92	62.2	41
4. Marymount Manhattan C. (8)	-2.87	62.8	42
5. Lesley University (10)	-2.49	64.1	36
6. D'Youville University (6)	-2.40	58.4	41
7. Thiel College (4)	-2.15	48.6	33
8. Post University (12)	-1.97	43.3	29
9. Bennington College (VT; 11)*	-1.91	79.9	66
10. Fairleigh Dick./Metro U. (NJ; n/a)	-1.90	59.8	46
11. University of Bridgeport (7)	-1.84	44.3	31
12. Husson University (ME; n/a)	-1.81	57.1	44
13. Franklin Pierce College (NH; n/a)	-1.79	60.0	47
14. Curry College (MA; n/a)	-1.70	56.3	44
15. Dominican C. of Blauvelt (19)	-1.58	45.3	34
16. Hofstra University (22)	-1.54	72.2	61
17. New York Inst. Of Tech. (15)	-1.47	57.6	47
18. Northeastern University (20)	-1.35 (tie)	90.8	81
19. Wagner College (NY; n/a)	-1.35 (tie)	73.8	64

20. Daemen College (21)*	-1.35 (tie)	58.8	49
21. Polytechnic Inst. Of N.Y.U. (4)	-1.34	69.8	60
22. Sarah Lawrence Co. (NY; 24)*	-1.31	81.5	72
23. Emmanuel College (MA; n/a)	-1.30	67.4	58
24. Paul Smith's College (18)	-1.29	50.3	41

* SAT data for these schools were obtained from Petersons, not the college scorecard

Once again, although most of these schools also appeared on the list based on SAT scores alone, a sizeable minority has changed. The colleges that disappeared in the second analysis *do* have difficulty retaining and graduating their students, but they get credit for trying to work with many economically disadvantaged students. In the most extreme case, at the College of New Rochelle (which went from the #2 position to off the list entirely), a whopping 76% of the student body comes from households with incomes below $40,000. Their graduation rate is still depressingly low, but they aren't quite the "dropout factory" they've been called. Conversely, those schools that appear only on the second list tend to have much more affluent student bodies – for example, only 23% of Emmanuel's students are eligible for Pell grants.

It is worth noting that 6 of the 30 low-performing schools (20%) had not reported SAT data to the government, forcing us to rely on figures reported to Petersons. This slightly exceeds the proportion of such schools in the data set as a whole (13.8%). It is possible that colleges are more careless about the data they report to college search sites. If a college happened to report higher SAT scores than its students had actually obtained, it would tend to lower their position in these rankings. However, the number of such schools is barely greater than would be expected by chance, 3 Petersons-based schools were among the 31 high performers (9.9% of this group), and the mean standardized residual for all 33 Petersons-based schools was -0.11, very close to zero. So it seems unlikely that there is a systematic pattern of reporting inflated SAT scores to Petersons. Interestingly, if there was any such tendency, this new system for evaluating graduation rates would make it a less attractive option: what a school might gain in spurious evidence of exclusivity it would lost in real evidence of educational success.

Cross-Validation and Generalization

It is, of course, possible that the results reported thus far reflect unique regional qualities. In order to evaluate the extent to which we may generalize from this population to other groups of colleges and universities, we looked at two other regions[20]. These data sets were created using the same methods as the original. An effort was made to include all private four-year colleges and universities within the regions of interest, except for highly specialized institutions such as art schools and schools primarily concerned with training people for religious vocations.

First, let us look at the results for 167 Midwestern schools[21] enrolling 390,797 students. The "average" school in this population has between 2,000 and 2,500 students with average SAT scores of 540; 33% of these students are eligible for Pell grants, and 61% will graduate within 6 years. In short, they are pretty similar to their Northeastern counterparts, though perhaps a bit smaller, enrolling slightly more students from poorer backgrounds, and graduating slightly fewer of their students.

If we apply the predictive equation from the Northeast to these Midwestern schools, we find that SAT scores and Pell eligibility still account for 74% of the variance in graduation rates. A "unique" equation derived using the Midwestern schools barely outperforms this, and the two

equations are practically identical[22]. This suggests that the major predictors of success in college are quite similar in both regions.

Here are the "top 10%" of private Midwestern four-year colleges and universities in terms of their ability to enable students to complete their bachelor's degrees, once student ability and financial resources are taken into account:

Midwestern Colleges and Universities with Higher Graduation Rates than Predicted by Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants

	z score	predicted	actual
1. St. Mary's of the Woods (IN)	+2.74	42.0	61
2. C. of St. Benedict (MN)	+2.29	64.8	81
3. Elmhurst C. (IL)	+2.25	58.3	74
4. Bethel C. (IN)	+2.07	48.8	63
5. C. of St. Scholastica (MN)	+1.90	54.0	67
6. Clarke U. (IA)	+1.72	54.3	66
7. Adrian C. (MI)	+1.70	44.6	56
8. Gustavus Adolphus C. (MN)	+1.44	73.0	83
9. John Carroll U. (OH)	+1.41	65.4	75
10. Dominican U. (IL)	+1.39	55.8	65
11. Hiram C. (OH)	+1.36	55.0	64
12. Baldwin Wallace U. (OH)	+1.26	61.6	70
13. St. John's U. (MN)	+1.25	69.5	78
14. Bradley U. (IL)	+1.24	68.6	77
15. Illinois C. (IL)	+1.23	54.9	63
16. Grand View U. (IA)	+1.20	41.5	49
17. Luther C. (IA)	+1.15	69.2	77

And here are the "bottom 10%" in the Midwest: schools whose students graduate at lower rates than would be expected, given their characteristics upon entry:

Midwestern Colleges and Universities with Lower Graduation Rates than Predicted by Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants

	z score	predicted	actual
1. Madonna U. (MI)	-2.93	63.7	41
2. Lawrence Tech. U. (MI)	-2.89	73.1	51
3. Cleary U. (MI)	-2.67	52.0	31
4. Milwaukee Sch. Of Engineering	-2.20	73.0	56
5. Rochester C. (MI)	-2.08	55.5	39
6. Ohio Dominican C. (OH)	-2.04	57.2	41
7. Holy Cross C. (IN)	-2.04	55.2	39
8. Silver Lake C. (WI)	-1.98	54.8	39
9. Mt. St. Mary U. (WI)	-1.93	53.4	38

10. Roosevelt U. (IL)	-1.88	57.0	42
11. Trine C. (IN)	-1.80	66.2	52
12. Iowa Wesleyan C. (IA)	-1.71	44.0	30
13. Notre Dame C. (OH)	-1.68	50.7	37
14. Cardinal Stritch U. (WI)	-1.55	51.6	39
15. Kettering U. (WI)	-1.49	70.8	59
16. Calumet C. (IN)	-1.46	44.2	32
17. U. of Findlay (OH)	-1.43	66.5	55

As in the Northeast, we find very few institutions on either list one would consider "elite" (though those affiliated with Gustavus Adolphus may be proud of its showing). Nominally Catholic institutions (which make up 25% of all schools in this region[23]) dominate *both* lists (roughly half of the top performers and half of the underachievers). And most importantly: once again we find that colleges heavily invested in STEM fields tend to have relatively low graduation rates (3 of the bottom 17 are largely technical institutes).

Next, let is look at the results for 152 Southeastern[24] schools enrolling 337,988 students. A "typical" school in this region enrolls between 2,000 and 2,500 students with average SAT scores of 515; 41% of these students are eligible for Pell grants, and 52% will graduate within 6 years. The South, then, differs from the other regions we have studied in that more students come from relatively poor backgrounds, the students have slightly weaker academic skills, and they are somewhat less likely to complete college in a timely fashion.

If we apply the predictive equation from the Northeast to these Southeastern schools, we find that it holds up quite well; SAT scores and Pell eligibility still account for 74% of the variance in graduation rates. If we derive a new equation based solely on the Southeastern schools, it does only slightly better and is practically identical to the original in its predictions[25]. This suggests that even though the student bodies differ from region to region, the same factors are the main determinants of success or failure wherever we go.

Here, then, are the "top 10%" among the Southeastern schools: the ones best able to bring entering first-year students through to graduation, given the academic skills and financial status of those students:

Southeastern Colleges and Universities with Higher Graduation Rates than Predicted by Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants

	z score	predicted	actual
1. Berea C. (KY)	+2.74	41.5	64
2. Spelman C. (GA)	+2.65	49.1	70
3. Fisk U. (TN)	+2.23	34.2	53
4. Voorhees C. (SC)	+2.09	11.0	31
5. Claflin U. (SC)	+1.94	27.0	44
6. Johnson C. Smith U. (NC)	+1.64	28.8	43
7. Wofford C. (SC)	+1.57	74.3	83
8. Salem C. (NC)	+1.52	52.3	63
9. Lane C. (TN)	+1.47	19.2	33
10. McDaniel C. (MD)	+1.42	64.4	73

11. Loyola U. (MD)	+1.35	77.5	84
12. Asbury U. (KY)	+1.34	61.9	70
13. Hampton U. (VA)	+1.32	54.3	63
14. Centre C. (KY)	+1.26	79.5	85
15. Davidson C. (NC)	+1.23	87.6	92

It is no surprise to see Berea College at the top. Berea is renowned for providing a tuition-free education, removing one of the main obstacles to college completion for students from needy families. Berea's performance might be taken as an index of what would happen at many liberal arts colleges, were they able to make their students the same offer.

The most striking thing about this list is the fact that 7 of the 15 schools (including 4 of the top 5) are historically Black institutions. Widely admired Spelman heads that list, but most of the others are relatively obscure. These are colleges that work effectively with students who are academically underprepared, financially challenged, and historically oppressed. This underscores the importance of taking student characteristics into account. The actual graduation rates at some of these schools are on the low side (occasionally *very* low), and have been subject to criticism. Others have defended them, citing reasons akin to those addressed here but without quantifying them to demonstrate their truth.

It is impossible to say much about the effect of religious affiliation on graduation rates in the Southeast. Nearly two-thirds of the schools in this region are nominally Protestant, and fewer than 1 in 12 is Catholic. Perhaps a diligent researcher could distinguish carefully between those sponsored by mainstream denominations and those presenting as evangelical, or rate them on the basis of how strongly they express their religious identity in their curricula and social climates[26].

It may be noticed that this list, unlike those for the Northeast and Midwest, includes several elite (Davidson) or near-elite (Wofford, Loyola, Centre) colleges. These schools deserve a moment of self-congratulation. However, it should be noted that the *absolute* differences here are relatively small. There are similar schools elsewhere outperforming to the same degree[27]. But the distribution of our results in the Southeast was different, allowing these relatively modest improvements on expectations to break into the top 10%.

Finally, here are the underperforming schools from the Southeastern United States: those least able to help their students complete degree programs:

Southeastern Colleges and Universities with Lower Graduation Rates than Predicted by Student SAT Scores and the Percentage of Students Eligible for Federal Pell Grants

	z score	predicted	actual
1. Truett-McConnell C. (GA)	-3.30	58.1	26
2. Brewton-Parker C. (GA)	-2.47	44.3	21
3. Reinhardt U. (GA)	-2.31	50.6	28
4. Capitol Technology U. (MD)	-2.08	57.3	36
5. Young Harris C. (GA)	-2.08	52.9	32
6. Shenandoah U. (VA)	-2.05	63.8	42
7. Southern Virginia U. (VA)	-1.79	48.9	31
8. Bluefield C. (VA)	-1.70	56.9	39
9. Cumberland U. (TN)	-1.66	51.0	34

10. Anderson U. (SC)	-1.52	60.8	44
11. Greensboro C. (NC)	-1.42	47.5	33
12. Brescia C. (KY)	-1.27	49.4	36
13. U. of Pikeville (KY)	-1.28	42.8	30
14. St. John's C. (MD)	-1.19	81.1	65
15. Brevard C. (NC)	-1.16	49.4	37

There aren't many engineering schools located in this part of the country, but one of them makes the list. And we see another well-regarded liberal arts college (St. John's). My impression is that the high-ranked liberal arts colleges that have suffered the indignity of appearing on these "worst of" lists all have something in common. They tend to be rather "quirky" schools[28]. My guess is that there isn't anything especially wrong about the educations they offer, but that they naturally fail to appeal to a larger proportion of students. Admissions officers sometimes speak of "pointy" (as opposed to "well-rounded") applicants: those who have some stellar quality that sets them apart, but may lack some other characteristics thought desirable by most schools. One might argue that there is also such a thing as a "pointy" college, and that such institutions as Sarah Lawrence and St. John's College exemplify this.

Conclusions and Recommendations

How might we make use of these findings, especially if they are expanded to encompass all American colleges and universities? I can think of four ways, depending on what we are trying to achieve.

First: If you are a more or less typical prospective student (or the parent of such a one), then you should know that there is a real risk of not completing your degree program, and that it would make sense to look closely at schools that have a track record of success working with students like you (or your child). You can easily identify schools that cater to students at about your level and have decent graduation rates. (The data set available here covers colleges in the Northeast; you'll need to look up schools located elsewhere in the country using the college scorecard). Of course, this should not be your only (or even your primary) criterion for selecting a school. Many other factors also matter. But it ought to be taken into consideration. Life does not come with guarantees, but the odds of ending up with a college degree would be higher than at a randomly selected institution.

Second, if you are an educational researcher, then you should be curious about the factors that set highly successful schools apart from the rest. Some of these may be found in the data already on hand. Some may become evident after perusing college catalogs, web sites, and so forth. However, I suspect that the most important ones will emerge only when close observations are made of the human interactions taking place on those campuses.

Third, if you are a wealthy philanthropist interested in supporting higher education, then you *might* want to redirect some of your largess. Contributions that make little impact on large, well-endowed institutions may have a transformative effect on some of the small, cash-strapped colleges that are actually engaged in the business of educating and uplifting your less advantaged fellow citizens. However, you would be supporting education for regular folks, not enrichment for the gifted, cutting-edge research, or glamorous high-end arts programs.

Fourth, if you are a policy maker, then it is vital that you take student characteristics into account when judging the performance of colleges falling under your jurisdiction. Ranting about

low graduation rates at colleges enrolling less well-prepared students serves no useful purpose. One result of acting on those recommendations would be to shut down exactly the schools that are working most effectively with those students. If we want students to be better prepared for college, then we must improve their pre-college experiences. But if we want colleges to work effectively with the students they serve, then we must evaluate them in a properly informed fashion[29].

In this regard, it is instructive to consider the case of the University of La Verne, officers of which were interviewed by Quoctrung Bui for his article. According to the college scorecard, the average SAT score at La Verne is 515, and 46% of its students are eligible for Pell grants. If we apply our equation to these characteristics, we obtain a predicted graduation rate of 52.6%. In fact, La Verne's graduation rate is reported as 59%. This would place La Verne at about the 85th percentile among our Northeastern schools. That is, La Verne seems to be doing quite an effective job with the students it has. One suspects that this helps to explain why officials there were willing to speak with Mr. Bui, even though there was a risk that the resulting article might cast them in a poor light[30] – they are dedicated higher education professionals who are proud of their good works.

Endnotes

[1] Six years is 1.5 times the "standard" time to completion, but many students who haven't graduated in four years are still making good progress toward their degrees. What is more problematic is the fact that this datum is available only for first-time college students who go on to graduate from their original colleges. In other words, an unknown number of transfer students is lost. This leads to lower graduation rates, because a student who transfers elsewhere counts as a non-completer. In other words, while most non-completers did discontinue their educations, others were merely dissatisfied with some feature of the college they selected as high school seniors. The underestimation problem may be more acute at colleges populated wholly by high-ability students. We also don't know anything about the fate of community college transfers or "returning," "nontraditional" students.

[2] It costs a typical financial aid recipient $25,000 per year to attend the average college. This does not include any federal Pell grants. If we assume $5,000 per year in grants and an average 4.5 years to completion, then the net cost of a complete college education will be $135,000. It has been argued that the average college graduate earns $1,000,000 more over the course of his/her career than someone with a high school education only. If we assume a 50-year career, that translates to an average $20,000 per annum return on that investment (like a 14.8% rate of return on a fixed-term annuity). However, if three other students attended college for an average of two years, but left without degrees and made no financial gain as a result, the net investment would rise to $315,000, and the annual yield would fall to 6.35%. This might or might not seem like a worthwhile investment. And of course the "failed" students would lose out, giving the whole enterprise a kind of "zero sum" quality.

[3] This may be illustrated by the data reported herein. We know that the standard deviation of SAT scores is supposed to be 100 (though in fact it has tended to run a bit higher, often in the 110 – 120 range). If students were assigned to colleges randomly, then the standard deviation of the mean SAT scores across colleges would be close to zero. Conversely, if colleges were perfectly stratified (with no SAT overlap across levels), then the standard deviation of their mean

SAT scores would be closer to 100 (or 120). For the colleges in the present data set, the standard deviation was 84: much closer to the perfectly stratified end of the continuum, especially when we consider that the mean scores ranged from 380 – 750, a more restricted range than that for individual scores.

[4] The college scorecard provides the 25th and 75th percentiles for scores on each SAT subtest. I used the mean of these figures as the midpoint, averaging the scores for the critical reading and mathematics subtests. This figure is not exactly equal to either the mean or the median, but should be very close to both.

[5] Complete data were available on the college scorecard page for 206 schools. The missing data point was usually SAT score. I searched for these on the Petersons web site, a widely used source of college information. This yielded data for an additional 33 schools. The schools for which complete data were still lacking included two eminent women's colleges (Smith and Mt. Holyoke), a few fairly well-known regional institutions (e.g., Merrimack, Hampshire), a few more obscure ones (e.g., Anna Maria, Cazenovia), and two that are in the process of closing (Burlington and Dowling). However, the greater proportion consisted of for-profit institutions, typically part of larger "chains" of colleges (e.g., DeVry, Phoenix). This last group was noteworthy for its very low graduation rates (often around 20%). This finding is difficult to interpret in the absence of evidence regarding student academic skills, but even the weakest student population in the final data set should graduate at a rate of over 30%.

[6] My intention was to include all four-year colleges and universities offering bachelor's degrees in some combination of fine arts, humanities, social sciences, science, engineering, business fields, health-related fields, and so forth. Schools with very specialized missions (such as conservatories and seminaries) were excluded, as were two-year colleges. In some cases, a school's status was ambiguous enough that a judgment call needed to be made.

[7] Defined for present purposes as New England, New York, New Jersey, and Pennsylvania. This is, therefore, a population study of higher education in one region rather than a random national sample. Whether this affects the results much is a subject for future investigation. My hunch is that it does not.

[8] The correlation between average SAT score and Pell-eligible percentage is -.76.

[9] The statistically savvy reader will recognize that what we've done here is to run a regression function and save the standardized "residuals" (i.e., the error) in the form of *z* scores. These scores have a mean of zero and a standard deviation of one. Therefore, a school performing about as expected will have a score near zero. Positive numbers indicate higher than expected graduation rates; negative numbers, the opposite. Scores above +1.00 or below -1.00 are quite noteworthy, as these represent the 84th and 16th percentiles of the distribution.

[10] Indeed, the formula breaks down at the extreme. Four institutions (Harvard, Princeton, Yale, and M.I.T.) are predicted to have graduation rates of 101% – a physical impossibility, at least until one of their exceptionally bright students develops the technology for personal cloning and successfully petitions the Supreme Court to have the duplicate awarded equal privileges.

[11] Although they vary considerably in terms of student characteristics, none has a student body with SAT scores averaging above 600.

[12] We need to be careful about using these findings, which are based on institutional averages, to predict individual cases. A college whose students average 550 on the SAT should have a graduation rate of about 65%. But this does not mean that a student with 550 scores has a 65% chance of graduating. The trouble is that we can't know which students are failing to complete their degree programs, though naturally we suspect that those with lower test scores are at greater

risk. Some evidence suggests that students earning SAT scores above 500 on each subtest have exceeded a critical threshold; nearly 80% of them will obtain first-year GPAs of 2.70 or above, and nearly 85% will still be in college in their third year.

[13] I use the term "Protestant" broadly, to refer to all Christian colleges that are not Catholic. This includes both "mainstream" denominations (e.g., Lutherans and Presbyterians) and more evangelical (often nondenominational) institutions.

[14] A few examples will illustrate the range of religious identification. Marist College, although founded by a monastic order, is now essentially secular. St. John Fisher College emphasizes its Catholic heritage in its mission statement, but also emphasizes its independent nature – and the main page, like most of the site, makes no mention of religion. Similarly, Westminster College asserts its Presbyterian identity, but only on the "history" page; the mission statement merely mentions the "Judeo-Christian heritage." Stonehill College discusses its Catholic identity more prominently, while also stressing its openness to multiple traditions. At the far extreme, Cairn University represents itself as permeated with Christian teachings and would probably be an uncomfortable environment for one who did not share in the beliefs espoused there.

[15] The remaining 17.2% of variance probably includes student characteristics not yet accounted for (such as mental health issues), some measurement error, and some purely random "noise."

[16] Seriously wonky sorts may want to know the regression equation, so here it is: Predicted graduation rate = 0.127(SAT) - .473(Pell%) + 8.946. Remember that the SAT score used is the *average* of the Critical Reading and Mathematics subtests, not their sum. Remember, too, that these B-weights tend to be unstable. When the same analyses are run on different sets of schools, or in different years, the results will vary somewhat. But for now, this provides our best estimate.

[17] The college scorecard includes data on the ethnic breakdown of each college. However, these data can be difficult to work with. A widely varying number of students get listed as "unknown," for example. There also may be substantial numbers identifying as foreign nationals or as being of mixed ethnic heritage, and there is no way of knowing how these cases break down. What I did here was to count only those belonging to the four "main" ethnic groups: White (not of Hispanic origin), Black (not of Hispanic origin), Hispanic (any race), and Asian.

[18] If we create a dichotomous variable (Catholic or otherwise) and calculate the partial correlation between this variable and graduation rates, controlling for mean SAT score, the result is .33 – statistically significant at the .001 level and, more important, accounting for 11% of the variance in graduation rates.

[19] Ten of the 13 schools awarding 25% or more of their degrees in STEM fields (excluding biology) had lower graduation rates than predicted; the mean standardized residual for all 13 schools was -.52, which signifies nearly a loss of nearly 8% of their students.

[20] Empirically derived regression equations capitalize, to some extent, on chance. Cross-validation in new samples is therefore quite important. Some degree of what is called "validity shrinkage" is to be expected. However, if this is too great, it raises doubts about the original findings – and, of course, about our ability to generalize from them.

[21] Defined for present purposes as Ohio, Michigan, Wisconsin, Minnesota, Illinois, Indiana, and Iowa.

[22] Adjusted R^2 using the original equation is .732; that using a new equation based solely on Midwestern schools is .746; the results of the two equations correlate at $r = .99$. Interestingly, the uniquely Midwestern equation places greater emphasis on Pell eligibility than on SAT scores. This seems to reflect two underlying facts. First, there are fewer "elite" schools in the Midwest,

restricting the variability in SAT scores to some extent. Second, there is a higher proportion of students from financially stressed families in the Midwest.

[23] Nominally Protestant institutions make up another 53.9%; only 21.0% of Midwestern four-year colleges and universities lack some sort of religious affiliation.

[24] Defined as Georgia, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, the District of Columbia, Delaware, and Maryland. The inclusion of Washington, Maryland, and neighboring Delaware was in order to enhance the number of elite institutions in the sample – the South is relatively poor in such institutions.

[25] Adjusted R^2 using the original equation is .740; that using a new equation based solely on Southeastern schools is .783; the results of the two equations correlate at $r = .97$.

[26] As one moves into the South, and especially as one tries to move further west (say, into Arkansas), it becomes increasingly difficult to determine which colleges are basically standard, full-service colleges (that happen to have religious identities) and which are mainly in the business of preparing people for religious vocations. This is one reason why the sample for the present study did not extend into the western part of the Deep South.

[27] For example, the graduation rate at College of the Holy Cross in Massachusetts is 6.8% higher than expected, and that for Wheaton College in Illinois is 5.5% greater.

[28] St. John's, for example, is known for its "Great Books" curriculum, eschewing oft-updated (but arguably "predigested") textbooks in favor of influential source documents, however old. Sarah Lawrence subscribes to an Oxford-like educational model emphasizing 1:1 tutorials as opposed to lectures or discussion groups.

[29] There are many possible sets of rules that could be applied, and we should collect data for several years before recommending that they be implemented. One possible arrangement would be to mandate that any school with (a) a graduation rate above 70.0% *or* (b) a graduation rate no more than 0.5 standard deviations below the predicted level, given its students' characteristics, would be considered to be functioning appropriately. Those falling short of these criteria for 3 consecutive years would be "flagged" for further monitoring. This status would be announced on the college scorecard. Those that remained sub-standard for 3 more years would be subjected to an investigation and required to implement a remediation plan (if they had not already done so). If the situation did not improve in the next 3 years, they might lose their eligibility for federal student aid or have their accreditation status threatened. Naturally, there should be room for appeals based on unique institutional challenges, evidence of improvement, etc.

How many schools would be affected? We can't know; that is why several years' worth of data are needed. For the current year's results, 36.4% of the schools (87 in all) exceeded the 70% threshold and are therefore "safe." We would expect 19% of the remainder (about 29, or 12.1% of the total) to fall more than half a standard deviation below the expected level. Many of these, however, are close to the threshold and likely not to remain in the sub-par region year after year. My guess is that about 5% might find themselves "flagged," and that most of these would be able to take effective steps to improve before being threatened with serious sanctions.

[30] It did not; Mr. Bui was quite even-handed. However, he did make one small error. He described La Verne as a "commuter school," when in fact a substantial number of traditional undergraduates live on campus. Like many colleges, though, La Verne also enrolls many commuters, so the sobriquet is not altogether inaccurate.