Higher Education and Social Mobility: Some Results and Some Questions

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I. Introduction

For generations US identity has been shaped by the proposition that talent and hard work would allow anyone to rise above the random circumstances of their birth. The US was not a rigid class-based society, so people could invent or reinvent themselves. Recent data suggest that this idea of the American Dream is more of an American fantasy. A child born to a low-income family in the United States has a smaller chance of upward economic mobility than children born in similar circumstances in many other countries.

Social mobility is commonly measured using the intergenerational elasticity between fathers' and sons' earnings. This elasticity shows how strongly earnings are related across generations.[1] Figure 1 presents Corak's (2013) estimates of the intergenerational elasticity in twenty-two nations. In this broad international comparison, fourteen nations exhibit greater social mobility than the United States.

[Figure 1 Here]

The intergenerational elasticity is quite stable across time in the United States.[2] Chetty et al. (2014, p.1) give a visual analogy: "…envision the income distribution as a ladder with each percentile representing a different rung. The rungs of the ladder have grown further apart (inequality has increased), but children's chances of climbing from lower to higher rungs have not changed (rank-based mobility has remained stable)."[3]

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[1] Ideally, social mobility should be measured in a less gendered way. Data availability has limited many studies to using fathers and sons. When daughters' incomes are available the results are similar.

[2] See Tom Hertz (2007), Chul-In Lee and Gary Solon (2009) and Raj Chetty, Nathaniel Hendren, Patrick Kline, Emmanuel Saez, and Nicholas Turner (2014)

[3] Long and Ferrie (2013) show that intergenerational mobility in the US was indeed greater than in Great Britain in the 19th century, but that advantage was gone by 1950.

A reasonable person might ask, "So what? Why do we need high social mobility?" One answer is that an economy that allows talent to flourish will be more productive. This is an efficiency argument. But to think about the optimal amount of social mobility we need a model of the process that determines social mobility. Gary Solon (2004) models intergenerational mobility by highlighting the heritability of traits (from nature, nurture, or both), the family's human capital investment in their children, and public investment in children's human capital.[4] In Solon's model social mobility is higher if the correlation between parents' income and the traits their children inherit is low, the return to education is low, and public investment in children is more progressive. The heritability of ability and income-raising behavioral traits is largely beyond easy policy intervention, and a nurturing family environment is a good thing. Likewise, a higher return to education isn't a problem, even though it raises earnings inequality ceteris paribus. As a result, the optimal intergenerational income elasticity is not zero. But the capacity of high-income families to invest more in developing their children's human capital decreases intergenerational mobility as it reinforces income inequality. On efficiency grounds alone, a progressive system of public investment in education designed to increase social mobility is likely to be desirable.

Higher education clearly affects social mobility. First, it affects the productivity of private human capital investments. Corak's (2013) data show that there is a strong positive relationship between the college earning premium and the intergenerational earnings elasticity. As Autor (2014) suggests, this may seem odd because education should be "the great equalizer." But in the United States at least, parents' education level is a very good predictor of

[4] Family bequests also affect mobility, and other models include this effect.

a child's educational attainment, so when the return to education is high children from high-income families have two big advantages. They get more education, and that education then pays off with higher earnings over their lifetime.

Progressive public investment in education is needed because the current mechanism that sorts students into universities still places weight on family income and parental levels of education independent of the measures of student ability that largely drive academic success. Some of this weight comes from schools whose need-aware admissions process values family income. Some comes from families and students who have poor information about the costs and benefits of various postsecondary options, or whose financial constraints continue to limit their investment in their children. Social mobility is impeded when high ability students from high-income families are more likely to go to college than high ability students from low-income families. Social mobility also is reduced if the institutions high-income students attend receive more resources. In both cases, income inequality reinforces the effectiveness of private investment in human capital for the well off. Higher education policy plays a significant role in determining the progressivity of public investment in education. Pell grants, for instance, relieve some of the financing constraints on lower-income families. State appropriations for public colleges and universities are much less targeted because they reduce tuition for all students.

A substantial body of evidence suggests that the US higher education system as a whole is not doing the best possible job of enhancing social mobility. Data from the Current Population Survey show that 77% of dependent students coming from families in the top quarter on the income distribution earn a bachelor's degree compared to 9% of students

coming from families in the bottom quarter of the income distribution.[5] Students who come from families in the top income quartile do have stronger correlates with college success, but the correlation between parental income and student academic traits isn't strong enough on its own to support these results. For the overall pool of potential college students the cost of attendance (net tuition plus foregone wages) is high, and financial aid programs are not sufficient to eliminate the disadvantages of low income. Family income remains a very good predictor of college completion.

We recognize that the relationship between higher education and social mobility is complex. In this paper we will highlight two parts of this relationship. First, we will look at the way our higher education system moves students from high school to college. There are two questions here. Do the right students go to college, and do students go to the right colleges? To enhance social mobility we need to get the right students to college and we need to match students and colleges in the way that takes best advantage of what colleges can offer. Second, we will look at the distribution of resources among colleges. In order to enhance social mobility the system of public spending should be progressive. It should funnel funds to colleges that enroll the students with the most need.

II. Do the Right Students Go to College?

Preparing for college requires students and families to take a set of important sequential steps. To have a good chance of success, a student needs to take college preparatory courses in high school, and in many cases this requires making the right curricular choices starting in 8th grade. Good grades are also important. This requires intelligence, and good behavioral traits

[5] These data come from Pell Institute for the Study of Opportunity in Higher Education, (2015).

like the capacity to meet deadlines and to do the dull and often repetitive tasks necessary to achieve longer run goals. Most college-bound students will need to prepare for and take college entrance examinations. The US higher education system is very forgiving, so if the student has not taken the right courses, made the right grades, or taken the college entrance exams, there is still a pathway to a postsecondary credential. Most community colleges and some four-year colleges are essentially open enrollment institutions. They will take almost any student.[6] Despite the fact that there are a large number of open enrollment institutions, the higher education system should and does reserve most of its spaces for students who demonstrate an interest in and an aptitude for learning beyond high school.

As the economic payoff to attending college has grown, the number of students who move directly from high school to college has expanded considerably. In 1980, 49.3% of individuals were enrolled in a degree granting institution of higher education the year after leaving high school.[7] That percentage increased to 69.2% in 2015. With the expansion of the number of students going on to college one might expect some diminishing returns to set in. As the fraction of the high school cohort that goes to college goes up, perhaps the marginal student entering college would be increasingly poorly prepared. If so, the increased enrollment should drag down the average preparedness of college students. And many who are worried about the lack of progress in college completion rates include increased enrollments among the factors depressing completion rates.

[6] In fact most colleges do not even require that students complete high school.
[7] These data come from Table 302.2 in the *2016 Digest of Education Statistics*.

A number of papers have shown that that this concern is largely misplaced.[8] Our study (2015) used two longitudinal data sets (the NLS-72 and ELS:2002) to examine changes in enrollment behavior between the high school classes of 1972 and 2004.[9] Both of these data sets contain nationally representative samples of high school students who were surveyed several times after the original survey during their time in high school. In the NLS-72 data 33.4% of students attended a four-year college during the first three semesters following high school graduation. The comparable figure from the ELS:2002 data is 47%. This is a substantial (40%) increase in four-year college attendance. Yet we did not find any decrease in the average quality of the student body attending 4-year institutions over the thirty-two years between these two samples. This finding is the result of improved sorting of students into a four-year college versus the alternatives (a two-year program or starting work directly after high school). More of the students who were prepared to do well in college in the later sample started college than in the earlier sample. This is evidence that the US has made some progress at getting the right students into college.

Figure 2 shows the improved sorting process using the distribution of high school grade point average (GPA) within each sample.[10] We focus on the GPA results because high school GPA is a better predictor of college success than are the test scores available in the NLS-72 and ELS:2002. We divided the students in each data set into 10 deciles based on where they fell in the sample's GPA distribution and calculated the percentage of students in each decile who attended a four-year college or university within three semesters of finishing high school. We

[8] See Bound, Lovenheim, and Turner (2012) and Archibald, Feldman and McHenry (2015).
[9] The ELS:2002 students were sophomores in high school when they were first surveyed.
[10] We have information on reading and mathematics test scores, and the same sorting improvement is apparent using these measures of student ability.

calculated GPA deciles within each time period (separately for NLS-72 and ELS:2002), so changes in grading standards over time (grade inflation) should not influence our results about college-going behavior. The cross-hatched bars represent the four-year attendance rates for the NLS-72 sample and the solid bars represent the four-year attendance rates for the ELS:2002 sample. In both surveys the college attendance rate is clearly related to GPA percentile. Students in the top (10^{th}) decile have the highest attendance rates, and attendance rates decline as GPA percentile falls.

[Figure 2 Here]

In 1972 there was a lot of room to increase college-going rates of students at the top of the high school class. By 2004 some of that room was filled in. Eighty-one percent of the increase in four-year attendance rates between the two surveys comes from students in the top half of the high school GPA distribution. The top three deciles alone generate half of the increase in four-year college participation, and only 2.2 percent of the rise in participation comes from the bottom three deciles.

This is the good news. Better-prepared students attended four-year universities in much greater numbers in 2004 than in 1972. While the number of students attending four-year colleges increased, the average quality of the students changed very little. Table 1 shows the average percentile rankings of students in the two surveys for three predictors of college success, the average GPA percentile and the average percentiles of math and reading tests given to the two samples. We defined percentiles separately for NLS-72 and ELS:2002 samples, so overall grade inflation does not explain the tendency of our average preparedness measures not to diminish.

[Table 1 Here]

Diminishing returns must eventually set in. Well-prepared students have non-college options, and some will choose the armed services, rock stardom, art school, or one of Peter Thiel's $100,000 grants to forego college and start a business instead. As a result, 90% might be the maximum that can be reached even for the highest deciles. Yet there is still quite a bit of room in the upper deciles, so further increases in the college going rate could still come from the top of the high school class.

These results suggest that the process of sorting high school seniors into college or work has improved. This is consistent with students making sound decisions in response to the rising payoff to a college education. But not all colleges are equal, so there is another kind of match that is important, the match between students and the particular college they attend. We turn to this question next.

III. Students And College Matches I

Non-profit colleges and universities in the United States differ from one another on many dimensions. Public mega-universities with 60,000+ students coexist with small private liberal arts colleges. Highly selective elite colleges accept less than 5% of their applicant pool while other schools will take almost everyone who applies. Some colleges graduate 90% of the students who begin, most within four years. Others struggle to graduate 40% over six years. Some devote a large amount of resources to education and support services while others scrape by with much less spending per full time student. How good a job does this complex system do at promoting social mobility by matching students to the right school?

To address this question, we follow a sample of ELS:2002 high school seniors in 2004 who completed high school or attended college in the sample period. We keep only those who stayed in the sample through the third follow-up (around age 26) so that we can observe college completion outcomes. We also drop observations with missing values for important variables.[11] Throughout our analysis we apply sample weights so that results are representative of the population of US high school seniors in 2004 who completed high school.

Table 2 presents evidence about economic segregation and student performance from the 3rd follow-up of the Education Longitudinal Study of 2002. We break the sample into quartiles of the socioeconomic status (SES) distribution and by the Barron's selectivity category of the college attended for students who start college within two years of completing high school. To avoid small sample sizes in some of the cells of the table, we combined the top two and the bottom two Barron's categories.[12]

[11] Our data set includes restricted-access Barron's selectivity categories, so we round all sample sizes to the nearest 10 for confidentiality. Our sample of high school completers who continued to the 3rd follow-up includes 9,380 respondents. We drop 420 respondents for missing SES quartile. We drop 350 respondents who attended a four-year college whose Barron's selectivity category was missing. We drop 30 respondents whose Barron's selectivity category was "Special." Our final sample size is 8,570.

[12] There are two additional data issues we need to note. First, in column (1) there are different numbers of students in each SES quartile. We are using the ELS:2002 variable BYSES1QU, which categorizes sample members at tenth grade based on father's education, mother's education, family income, father's occupation, and mother's occupation. The original data have roughly equal numbers of respondents in the bottom three SES quartiles and slightly more in the highest. Differential high school dropout will tend to increase our representation of highest-quartile students, since we select only those tenth-graders who were twelfth-graders two years later. Disproportionate attrition from the sample may also lead to smaller numbers of observations in the lower SES quartiles. Our use of sample weights should correct for at least some of that attrition. Second, in column (7), labeled "Did not attend," we list a 2% college graduation rate for the entire sample (northeast most block). Graduation usually requires attendance! We define "did not attend" as not moving into college within the first two years of

[Table 2 Here]

The columns tell a clear story about socio-economic segregation. Column (2) shows us that 940 students (roughly 11% of the sample) attended an institution that was categorized as most or highly competitive by Barron's. Of these 940 students 660 or 70.25% came from families in the highest SES quartile, and only 40 or 4.3% came from families in the lowest SES quartile. In the latest data from the ELS, and in earlier data from other longitudinal data sets, students from the highest SES quartile predominate at the most selective institutions, and the lowest SES quartile students make up a very small fraction of the student body at these schools.[13] The dominance of the highest SES quartile students decreases as the selectivity rating of the college declines, but even at the colleges labeled "competitive" the highest SES students have the largest share of the student body (40.7%).

The rows are revealing as well. For students from the lowest SES families, 69.1% do not attend a four-year college; 38.9% (630/1,620) did not attend any college at all in the first two years after high school and 30.2% (490/1,620) attended a two-year program. For students from the highest SES families only 21.6% did not move into a four-year program; 5.8% (170/2,920) did not attend college at all and 15.8% (460/2,920) attended a two-year college. High SES students are more likely to move directly into a four-year program than low SES students, and they attend more selective institutions.

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finishing high school. Some students in our "did not attend" category did in fact enter college more than two years after completing high school. Some finished a degree.

[13] Bastedo and Jaquette (2011) did a similar calculation for the ELS, and for three other well-used longitudinal data sets (NLS-72, High School and Beyond in 1980 and NELS:88). SES segregation by college selectivity is not a new phenomenon, and our conclusion about SES segregation in enrollment patterns in the ELS data isn't what is new in Table 2.

The ELS data also permit us to examine the relationship between graduation rates and college selectivity. In each cell we list the actual average graduation rate performance of the students in that cell and the average predicted graduation rate for that group of students. The predicted graduation rate is based on a regression that includes the students' GPA percentile and their percentiles on tests of mathematics and reading.[14] Graduation performance is strongly related to selectivity. Students who attend highly selective institutions graduate at higher rates than students who attend less selective institutions. Not surprisingly, much of this correlation is driven by average readiness differences (GPA and test scores) across selectivity categories and income quartiles. But we also see that more selective colleges and universities "produce" graduation rates above predicted values for students in all income quartiles, while non-selective and two-year programs do the opposite.

The first column demonstrates that college graduation and SES are clearly related in the overall sample. As we move down the column, the average actual graduation rate diminishes, from 65.3% for the highest SES category to 19.5% for the lowest SES category. The predicted graduation rate also diminishes but by a much smaller amount, from 54.7% for the highest SES category to 25.9% for the lowest SES category. The highest SES category students outperform the prediction by 10.6% (65.3%-54.7%). This is likely the result of several factors. First, higher SES students are more likely to attend four-year colleges, and they are concentrated in the

[14] The prediction comes from a probit model in which four-year college (bachelor's level) completion is the dependent variable. The independent variables are students' percentiles within the sample-wide distributions of three measures of college preparedness: high school GPA and two aptitude tests taken in the tenth grade (in mathematics and reading). The pseudo R-squared of the probit estimation is 0.2586. The marginal effects (and standard errors) of GPA, math score, and reading score percentiles are 0.006 (0.0002), 0.0026 (0.0003), and 0.001 (0.0003) respectively.

more selective, higher resourced colleges. Second, they are much less likely to drop out of college for economic reasons than are students from low SES families. The reverse is true for students from the lowest SES families. These students underperform the prediction by 6.4% (19.5%-25.9%). The lowest SES students are less likely to attend four-year schools, go to less selective and less well-resourced institutions when they do attend, and are more likely to drop out of college for economic reasons.[15]

In column (2) we see that the disparity in actual graduation rates evident in the full sample is absent for the students who attend colleges in the highest selectivity category. The graduation rate is quite similar across SES categories, as is the predicted graduation rate. Highly selective institutions do not seem to be taking any chances with the lower SES students that they accept. Column (3) demonstrates a similar result. The actual graduation rate is slightly higher for the highest SES students, but it is roughly equal for the remaining three groups. Only in column (4) and thereafter do we see a strong and consistent relationship between SES and the actual graduation rate. Also, except in the highest selectivity category, the colleges appear to give preferences in admission to students from the lowest SES quartile. This follows because their predicted graduation rates are below the predicted graduation rates for students from higher up the SES ladder.

We highlight two main results. Both are variations of the notion that money matters. First, where a student goes to school is quite important. Going to a more selective, better-resourced

[15] Ehrenburg and Webber (2010) have shown that student service expenditures influence graduation and persistence rates and that the largest effects are at schools that have lower current graduation and first-year persistence rates. Students from low SES backgrounds disproportionately attend these under-resourced institutions.

school leads to better outcomes.[16] The actual graduation rates decline as school selectivity rank falls. This is true for the full sample and for every SES group. Second, the resources the family can provide also matter. With only a few exceptions the actual graduation rate declines as the students' SES moves down the ladder. In addition, the highest SES group is the only one for which the actual graduation rate outperforms the predicted graduation rate for all categories, including two-year community colleges.

IV. Students and College Matches II

The data in table 2 are based on the actual matches between colleges and students. These matches reflect how well students navigate the application process and how colleges react to the applications they see. Socio-economic status clearly affects both parts of the process. Higher SES students have many advantages in preparing college applications. They can and do take courses to prepare them for admission tests. They are more likely to attend high schools that send a large number of students to highly selective colleges, so they get good counseling and have teachers who may have attended selective schools and who are used to writing good letters of recommendation. And they can afford to apply to the recommended number of reach, match, and safety schools. Also, higher SES students are very appealing to tuition-dependent colleges. Some high SES applicants are legacies who receive preferences in admission. In the regular admission process at need-aware schools high-income applicants may receive preference at the margin, and the margin may be very wide. And when a college is

[16] Caroline Hoxby (2016) measures the productivity of additional years of schooling across colleges with different average selectivity (SAT) profiles. She shows that productivity, measured as value added by the school relative to the total social investment in its students is roughly constant across schools whose admissions are at least minimally selective. In that case, moving resources toward less selective schools is just as productive as additional spending at more selective schools while improving social mobility.

deciding which students to take from the wait list, a student with a lower financial aid requirement has an advantage. To study the effects of SES on the application and admission process we need to create a hypothetical match between students and colleges that ignores SES status to compare with the actual matches.

We will use a simple example to illustrate our approach. Assume there are two colleges both with a capacity of 10 students. On some objective measures College A ranks above College B. Further assume there are 20 students, and we can rank them from 1 to 20 on some scale of academic promise. Given these assumptions a perfect matching would place students ranked 1 to 10 in College A and students ranked 11 to 20 in College B.[17]

There are two cases to consider. First, assume that College A has a strong desire to have a full French horn brigade, and to do so it has to recruit two good French horn players in this year's class. Also, assume that the best French horn players are students ranked 15 and 16. Giving spots to these two students results in College A admitting students ranked 1 to 8, 15, and 16, and College B having a class of students ranked 9 to 15 and 17 to 20. As a result of College A's desire for French horn players, the two French horn players are over-matched. They are attending a more highly ranked school than they would if admission were solely based on academic promise. Also, students ranked 9 and 10 are under-matched.[18] They are attending a

[17] See Sallee, Resch, and Courant (2008) for a rationale for matching the best students with the best schools.

[18] This kind of under-matching has been the source of much of the legal wrangling about racial preferences in college admission. In some instances students have initiated a legal battle, arguing that a member of a minority group who received a preference in admission took a spot they "deserved." Some examples that reached the Supreme Court include Regents of the University of California v. Bakke, which was decided in 1978, and Gratz v. Bollinger and Grutter v. Bollinger, both of which were decided in 2003.

less highly ranked school than they would if admission were solely based on their academic promise.

The second case flips the causation. Suppose that the students ranked 5th and 6th are unaware that College A would have accepted them, and they only apply to College B. When the students sort out in this case, College A would admit students 1 to 4, and 7 to 12, and College B would admit students 5, 6, and 13 through 20. In this case, students 5 and 6 are under-matched. They are attending a less highly ranked school than they would attend if admission were solely based on academic promise. And students 11 and 12 are over-matched. They gained admission to a more highly ranked school than they would have attended if admission were solely based on academic promise.

The two cases illustrate the adding up constraints inherent in this approach. In the first case, a given amount of over-matching creates an equal amount of under-matching. In the second case, a given amount of under-matching creates an equal amount of over-matching. Given the wide set of admission preferences used by colleges and the idiosyncratic choices made by students when they select where to go, under-matching caused by over-matching and over-matching caused by under-matching is a common occurrence.

Our simple example suggests some additional terminology. We can identify two kinds of mismatching, primary mismatching and secondary mismatching. The over-matching of the French horn players in the first case and the under-matching of the students who did not apply to the best school they could have been admitted to in the second case are examples of primary mismatching. The secondary mismatching is the bumping of students 9 and 10 from College A to College B in the first case and the elevation of students 11 and 12 from College B to

College A in the second case. With more than two selectivity categories, secondary mismatching can only involve a one-level college mismatch. But primary mismatching can involve both one-level college mismatches and multi-level college mismatches. If we observe a two or more level mismatch, that must be a primary mismatch. The student or the university made a choice to do something, or not to do something. A one level mismatch could be primary or secondary.

We can learn about primary mismatching in the third follow-up of the ELS:2002 by creating an academic promise score for each student. The score is a weighted average of the student's high school GPA percentile and the student's percentiles on the math and reading test scores. The weights were the coefficients from our regression predicting college graduation.[19] We then created a hypothetical assignment of students to institutions ranked by Barron's selectivity categories. For example, in the data in Table 2 the colleges rated most or highly selective by Barron's actually enrolled 940 students from our sample. Our hypothetical assignment put the students with the 940 highest academic promise scores in this group of schools. The next group of students, those ranked 941 to 2211, was put into the 1,270 slots in colleges rated very competitive in Barron's, and the other groups of colleges were filled in a similar fashion.

Table 3 presents the results of this exercise. To understand the table compare column (2) in table 2 with column (1) in table 3. Column (2) in table 2 shows that 940 students in the sample attended a college rated most or highly selective by Barron's. This column also gives the

[19] The academic promise score is the prediction of the likelihood of four-year college graduation conditional on high school GPA and math and reading aptitude test scores from the probit model described earlier.

breakdown of these students by SES quartiles. Column (1) in Table 3 shows the result of allocating 940 students to most and highly selective schools based on their academic promise scores. Column (1) in Table 3 shows that this allocation mechanism fills the 940 slots in most and highly selective colleges with 560 students from the highest SES quartile, 220 from the third SES quartile, 110 from the second SES quartile, and 50 from the lowest SES quartile. Column (2) in Table 2 shows that the actual distribution of students to these institutions had 660 students from the highest SES quartile, 170 from the third SES quartile, 70 from the second SES quartile, and 40 from the lowest SES quartile. Reallocating the students takes 100 slots from students in the highest SES quartile in the actual allocation and moves 50 (220-170) of them to students in the third SES quartile, 40 (110-70) to students in the second SES quartile, and 10 to students in the lowest SES quartile.

[Table 3 Here]

Using academic promise scores to reallocate students does not eliminate the relationship between SES and attendance at elite institutions. A large percentage of the students with the top grades and scores do come from the top of the SES ladder. Yet the hypothetical allocation is less heavily weighted toward high SES students. The other entries in the table allow us to investigate more fully the differences between the actual and hypothetical allocation of students.

The entries in columns (2) through (7) allow us to understand mismatching in the ELS data. The cells in each row give the percentage of the total number of students our algorithm has assigned to that particular selectivity level that actually went to each type of school (or into the workforce). For example, the first row of the table tells us that 47.2 percent of the students

in the highest SES quartile who our hypothetical assignment put in the most or highly competitive group of colleges actually attended a college in that group, while 27.7 percent of these students attended a college in the very competitive group. The percentages in each row must add to 100. Compared to the other entries in the table, the 47.2 percent of students actually attending a college consistent with their hypothetical placement is quite high. It represents a "correct" match. The entries down the principle diagonal represent these correct matches, and the percentages are usually high, though seldom as high as 47.2 percent.

The highest percentage of correct matches in the table is the lower right. These are the lowest SES students who are not assigned to any college by our scoring procedure. Almost two thirds of these lowest SES students know that they are not college material, so they do not even try college.[20] This compares with 36.4 percent of similarly under-qualified highest SES quartile students. Unlike their lower SES colleagues, underprepared high SES students are more likely to give college a try than not.

The off diagonal elements represent incorrect matches. These students attended an institution inconsistent with their academic promise scores. As we argued above, a one competitiveness category mismatch will include all of the secondary mismatches as well as some primary mismatches. The two or more category mismatches will all be primary mismatches, and these mismatches will be the focus of our analysis.

The entries above the diagonal represent under-matches, where a student goes to a college ranked below the level predicted by our hypothetical assignment. For example, the first

[20] When we speak of "correct" matches, that term is based on 12th grade preparedness. The mobility gains from progressive higher education policy underestimate the potential gains from interventions that might affect the curricular choices and behavior of lower SES students at a much earlier age.

row of column (5) shows that 2.3 percent of the highest SES quartile students that our hypothetical assignment would have placed in a most or highly competitive college actually attended a college ranked less- or non-competitive. Using the data from table 2, these students attended a college with a graduation rate of 24.1 percent when their academic qualifications suggest they could have been admitted to a school with an over 80 percent graduation rate. These under-matched students are not taking advantage of opportunities that would have been available. Looking at the situations in which students are under-matched by at least two selectivity categories (the last four columns for the students hypothetically assigned to the most and highly selective colleges, the last three columns for students hypothetically assigned to a very selective college, the last two columns for students hypothetically assigned to a competitive college, and the last column for students hypothetically assigned to a less or non-competitive college) the data indicate that primary under-matching is clearly related to SES. For example, consider the students hypothetically matched with a very competitive college who actually attended a two-year college. This group includes 6.7 percent of students in the highest SES quartile, 15.5 percent of students in the third SES quartile, 18.5 percent of students in the second SES quartile, and 23.5 percent of students in the lowest SES quartile. The lower the SES the more prevalent is under-matching.

Students are over-matched in the cells below the diagonal. We find the reverse result for the relationship between SES and mismatching in the case of primary over-matching, which occurs where students are over-matched by two or more college competitiveness groups. For the most or highly competitive category (column 2) this includes the last four rows. For the highly selective category (column 3) this includes the last three rows. For the competitive

category (column 4) this includes the last two rows, and for the less or non-competitive category (column 5) this includes the last row. Primary over-matching is more prevalent among high SES students. For example, consider the students hypothetically placed in a two-year college who actually attended a very competitive college. This group includes 10.9 percent of students in the highest SES quartile, 4.2 percent of students in the third SES quartile, 2.1 percent of the students in the second SES quartile, and 2.6 percent of the students in the lowest SES quartile.[21]

Table 4 presents proportions of various groups who are under-matched and over-matched in the ELS sample.[22] We include entries for two or more category mismatches and three or more category mismatches. In each case we give the base rate, which is the proportion of all students with the possibility of being under- or over-matched by the requisite number of categories. The sample size for the three or more category mismatches is 4,110, and the sample size for the two or more category mismatches is 4,750.[23]

There are some very clear patterns in the results. First consider under-matches. Gender and race do not appear to be strongly related to the likelihood of being under-matched.

[21] Our result is similar to what Dillon and Smith (2013) find using an earlier and smaller data set (the NLSY97). They find that under-matched students are more prevalent in the lower quartiles of the family wealth distribution and over-matched students are more prevalent in the upper quartiles of the family wealth distribution.

[22] Sample weights were used for Table 4. Base rate refers to the average in the sample of respondents who could possibly have been over-matched or under-matched. SES quartiles are calculated based on 10th grade family income, mother's completed education and occupational prestige, and father's completed education and occupational prestige.

[23] The population for base rates of two or more category under-matches includes students who were hypothetically matched to colleges with Barron's ratings of most or highly competitive, very competitive, competitive, and less or non-competitive. This group has a population of 4,750 students. The population for the base rates of three or more category under matches excludes the 640 students at colleges rated by Barron's as less or non-competitive.

Students who are black or Asian are slightly less likely to be under-matched, and Hispanics are slightly more likely to under-match, but the differences with the base rates are small. The results for SES replicate the findings in the previous table. The further up the SES scale is a student's family the less likely he or she is to under-match. The same holds for parents' education. Students from the Northeast are less likely to under-match, and students from the West are more likely to under-match. Students from rural high schools are also more likely to under-match. College athletes are less likely to be under-matched, but this result probably overstates the importance of athletic participation. This happens because all of the athletes were in college, so being under-matched into the "did not attend" category was not possible for them. Finally, our proxy for the quality of the student's high school curriculum (the Advanced Placement class variable) is not associated with under-matching.

Over-matches are more common for students who are male or black, but not more prevalent for Hispanics. Over-matches are also related to family SES. The two lowest SES quartiles are least likely to be over-matched, while the highest SES quartile is more likely to be over-matched. This is the pattern one would expect to see if a significant number of schools practice need-aware admissions. In these cases, institutions admit students without regard to financial need until they have exhausted the funds they have committed to financial aid and fill the rest of their class with students who do not require financial aid. This will cause them to admit some high SES students who are not as well qualified as some lower SES students whom they fail to admit. Parental education shows a similar pattern. The more highly educated are parents the more likely are their children to be over-matched. Both the results for SES and parental education may reflect the use of legacy advantages in admission. If schools give special

consideration to legacies this could lead to some over-matching, though a 3 or more category over-match would suggest a very strong legacy preference. The regional pattern reverses the under-matching results. Students from the Northeast, who were less likely to be under-matched, are more likely to be over-matched, and students from the West, who were more likely to be under-matched, are more likely to be over-matched. The same pattern of results holds for students from rural high schools. Over-matches are very prevalent among college athletes, particularly over-matches involving 3 or more categories. This is not surprising since coaches recruit almost all athletes, even those not receiving scholarships. Also, athletic ability and academic ability are unlikely to be strongly positively correlated. Again, our AP class variable does not have an effect.

Over-matching and under-matching have generated a significant literature, much of which is parallel or non-overlapping. Some of the literature on over-matching explores how colleges try to recruit diverse classes of students. Acting affirmatively could create primary overmatches if institutions enroll students who are not prepared for the rigors of a highly selective institution.[24] In our data we see little evidence of primary over-matching of students from low SES backgrounds. Schools also may admit students on the basis of talents that are not strongly correlated with the measures (GPA and test scores) that we use as predictors of academic success. Athletic and artistic talents are good examples. We have already noted that primary over-matching seems more acute among high SES students, and this could reflect

[24] Much of the over-match literature focuses on affirmative action policies, particularly in law schools. See Richard Sander (2004) and Peter Arcidiacono and Michael Lovenheim (2016).

legacy preferences, need-aware admission practices, and recruiting athletes from higher SES backgrounds.[25]

Much of the concern about under-matching stems from evidence that many high-performing low-income students have very poor information and do not apply to the colleges that are a better fit for them academically, despite the fact that these institutions might well offer enough financial aid to make the higher ranked college less expensive than the institutions the students actually attend.[26] The Expanding College Opportunity (ECO) project (see Hoxby and Turner, 2013) shows how an inexpensive intervention that provides low-income students with important and personalized information about their options can have a dramatic impact. The ECO project gave high-achieving low-income students accurate information about net price at elite schools for which they were qualified and helped them to understand the application process. The treated group applied to more schools, and to better schools that offered more resources. Significantly more students from the treated group were accepted to, and ultimately enrolled at, the schools for which they were better matched academically. These results show that higher education markets are far from frictionless. There are many barriers, real and perceived, that thwart good decision-making, particularly for low SES students and students who are the first in their family to attend college.

V. Progressivity of Funding

[25] Shulman and Bowen (2001) show that affirmative action toward athletes was much more pronounced than affirmative action toward minorities. See Figure 2.3 page 41)

[26] See Hoxby and Avery (2013). Some of the earlier work on under-matching focused on samples from limited areas. For example Bowen, Chingos and McPherson (2009) investigated a sample of North Carolina students, and Roderick, Nagaoka, and Allensworth (2006) studied students from Chicago public schools. More recently nationally representative samples have also been used; see Dillon and Smith (2013) and Smith, Pender, and Howell (2013).

To emphasize a point that should have already come through loud and clear, Table 5 rearranges the data in Table 2 to highlight an important message. College attendance remains highly related to socioeconomic status. These data give the percentage of each SES quartile in the ELS sample that attends college by the Barron's selectivity categories. For example, only 2.5% of students from the lowest SES quartile attend a college in the top Barron's category (most or highly competitive). This compares to 22.5% of students in the highest SES category who attend a college in the top Barron's category. Students from the bottom half of the SES ladder do not attend 4-year colleges as frequently as students from the top half of the SES ladder. They are less likely to attend colleges in the top Barron's selectivity categories than are students from the top of the SES ladder. And they are more likely to move directly into the labor force.

[Table 5 Here]

To enhance social mobility, public funding of higher education needs to be progressive. Funding should increase as socioeconomic status declines. Effective progressive funding programs need to shift resources to where the lowest SES students attend college. Some public funding clearly is progressive. The Pell Grant program is need based. Only relatively low-income students qualify for a Pell Grant, and among low-income students the grant award grows as income decreases. The result is clearly a progressive transfer.

State need-based financial aid programs are also progressive transfers. The shift away from need-based financial aid programs to merit-based ones like Georgia's HOPE scholarship program has reduced the progressivity of state financial aid. The data in Tables 3 and 4 clearly

show that students higher up the SES ladder have higher high school grades and test scores, so basing aid on these criteria will lead to a regressive transfer.[27]

Other funding is not as progressive. The largest single source of support for students comes from the state subsidy given to public institutions. This subsidy allows state supported institutions to provide an education at a discount to state residents. Table 6 presents data from the Department of Education's Integrated Postsecondary Education System (IPEDS). The data are in real dollars (deflated by the Consumer Price Index) and averages are weighted using full-time equivalent attendance weights. The data are for two three-year time periods, 1988-1990 and 2013-2015. The three-year averages smooth out any unusual data for a particular year. The table reports state appropriations, expenditures on instruction, and expenditures on other core activities (student services, academic support, and instructional support) for 2013-2015, for 1988-90, and for the difference between those years.

[Table 6 Here]

The real value of state appropriations per full-time equivalent student is not distributed progressively. State appropriations per student are much higher at the top Barron's selectivity categories where more affluent students are more likely to attend college and lower at the less selective Barron's categories where less affluent students are more likely to go. Real state appropriations per full time student have fallen over this time period, and the evidence in Table 6 suggests that the more selective institutions have experienced larger reductions in state

[27] One argument in favor of programs like the HOPE scholarship is that they are simple to understand. As a result, they may send incentives that get more students to take steps earlier in their schooling to prepare for college.

appropriations than the less selective institutions. In a sense, state cuts have been progressive. This might have been the result of each category of institution taking the same percentage reduction, but it was not. The most elite category (most and highly competitive) experienced a 39.6 % reduction, the very competitive category experienced a 37.9 % reduction, the competitive category experienced a 36.0 % reduction, the non- or less competitive category experienced a 25.3 % reduction, and the 2-year colleges experienced a 20.7 % reduction. In the aggregate, states protected their less competitive institutions from the worst of the cuts. Still, despite this protection, the regressive pattern persists. The most recent data on state appropriations indicate that the more competitive a college is the more it receives in state appropriations per student.

The data on expenditures show a similar pattern. The more competitive the institution is the larger are its expenditures on instruction and other core activities. This follows because the more competitive institutions receive larger state appropriation and also because they are able to generate more non-state funds. The difference in state appropriations between the most and highly competitive colleges and the very competitive colleges is $2,014, while the difference in two spending categories (instructional and other core) combined is $8,287. The only way this is possible is if the most and highly competitive institutions were able to generate much more in tuition, grants and contracts, sales of educational services, and/or private funds. The fact that the most selective public institutions increasingly can generate their own revenue enhances the regressive nature of the public system as a whole. Both state appropriated funds and campus generated funds are larger at the institutions that tend to have the most affluent student bodies.

As states decrease the per-student funding of public institutions the finances of these institutions are increasingly being privatized. Raising funds from all of these non-state sources is easier for more highly rated public institutions than for schools with lower rankings. This problem is more acute in states where demographic change is reducing the size of graduating high school classes, as it is in the Northeast and Midwest.[28] In these states, less selective state universities are likely to lose students (and the associated tuition revenue) to their more highly rated state competitors. These less-selective state institutions are more frequently used as backup choices for students who would prefer to attend a state flagship. Also, less selective institutions are not as effective at generating private giving. The public colleges with lower ratings are typically newer and often smaller than their more highly rated state-supported brethren. This means they have a smaller alumni base and fewer chances to land a really big gift that can make a substantial difference. Finally, most public support for research grants and contracts is given to institutions with large graduate programs. In most cases (though not all), these research universities have fairly competitive undergraduate admissions, so the extra research funding provides benefits that are not readily available to lower ranked public institutions.[29]

To conclude, some public support is given on the basis of need, and increasing this type of public support for higher education will enhance the progressivity of public support and improve social mobility. The vast majority of federal support for students authorized by Title IX of the Higher Education Act is based on need, or at least has income cutoffs for eligibility, so it is

[28] See Prescott and Bransberger (2012).
[29] For a fuller discussion of how changes in the economic and political landscape likely will affect flagships versus non-flagships, see chapter 10 of Archibald and Feldman (2017).

progressive. Need-based financial aid programs at the state level also are progressive. On the other hand, state support for merit-based financial aid programs and federal support for research are not progressively distributed. And most importantly state support for public institutions is distributed regressively. If our objective is to improve social mobility, there is ample room for changes in public policy.

VI. Summary

We have presented mixed results about the role of higher education in promoting social mobility. First, we showed that the process of sorting students into four-year colleges has improved. As a result, the growth in the fraction of high school students moving directly into four-year colleges has not reduced the average quality of college students. Other things equal, this should promote social mobility. Increasing the fraction of the well-prepared students who attend college emphasizes ability over income as a predictor of college attendance. Unless income and ability are perfectly correlated this change should improve social mobility.

On the other hand, income is still a very strong predictor of the quality of the college students attend. Under-matching is overwhelmingly a low SES phenomenon. A large number of high ability low SES students attend colleges that are under-resourced and have very poor graduation rates. Similar low SES students who are more appropriately matched attend colleges with substantially more resources and much higher graduation rates. This prompts the question of how best to improve college matches for low-income students. The barriers are social, informational, and economic. Where can we make the most progress? We can move resources

to the schools that are currently under-resourced, or we can move students to the right schools. Or we can do both.

Bibliography

Archibald, Robert B., and David H. Feldman, (2017). *The Road Ahead for America's Colleges & Universities*, Oxford: Oxford University Press.

Archibald, Robert B., David H. Feldman and Peter McHenry (2015). "A Quality-Preserving Increase in Four-year college Attendance," *Journal of Human Capital*, 9 (Fall): 265-297.

Arcidiacono, Peter and Michael Lovenheim (2016). "Affirmative action and the quality-fit trade-off." *Journal of Economic Literature* 54 (1) 3-51.

Autor, David (2014). "Skills, education, and the rise of earnings inequality among the 'other 99 percent'" *Science*, 344 (May 23): 843-851.

Bowen, Chingos, and McPherson (2009) *Crossing the Finish Line: Completing College at America's Public Universities,* Princeton: Princeton University Press

Bastedo, Michael and Ozan Jaquette (2011). "Running in Place: Low-Income Students and the Dynamics of Higher Education Stratification," *Educational Evaluation and Policy Analysis*, 33 (September): 318-339.

Chetty, Raj, Nathaniel Hendren, Patrick Kline, Emmanuel Saez, and Nicholas Turner (2014). "Is the United States Still a Land of Opportunity: Recent Trends in Intergenerational Mobility," NBER Working Paper 19844, January.

Corak, Miles (2013). "Inequality from Generation to Generation: The United States in Comparison," in R. S. Rycroft. *The Economics of Inequality, Poverty, and Discrimination in the 21st Century* (ABC-CLIO): 107-123.

Hertz, Tom (2007). "Trends in the Intergenerational Elasticity of Family Income in the United States," *Industrial Relations*, 46 (January): 22-50.

Hoxby, Caroline M., (2016). The Dramatic Economics of the U.S. Market for Higher Education. The 2016 Martin Feldstein Lecture. *NBER Reporter*, Number 3.

Hoxby, Caroline M. and Sarah Turner (2013). "Informing Students About Their College Options: A Proposal for Broadening the Expanding College Opportunities Project," The Brookings Institution, http://www.hamiltonproject.org/papers/informing_students_about_their_college_options

Hoxby, Caroline M., and Christopher Avery (2013). "The Missing 'One-Offs'; the Hidden Supply of High-Achieving, Low-Income Students." *Brookings Papers on Economic Activity*, (Spring), 1-65.

Lee, Shul-In and Gary Solon (2009). "Trends in Intergenerational Income Mobility," *Review of Economics and Statistics*, 91 (November): 766-772.

Long, Jason and Joseph Ferrie. (2013). "Intergenerational Occupational Mobility in Great Britain and the United States since 1850." *American Economic Review*, 103(4): 1109-37.

Pell Institute for the Student of Opportunity in Higher Education (2015) "Indicators of Higher Education Equity in the United States," http://www.pellinstitute.org/downloads/publications-Indicators_of_Higher_Education_Equity_in_the_US_45_Year_Trend_Report.pdf

Prescott, Brian and Peace Bransberger (2012). *Knocking on the College Door: Projections of High School Graduates, 8th ed*. Bolder Colorado: Western Interstate Commission for Higher Education.

Roderick, Melissa, Jenny Nagaoka, and Elaine Allensworth (2006). "From High School to the Future," Chicago Postsecondary Transition Project.

Sallee, James M., Alexandra M. Resch, and Paul N. Courant (2008). "On the Optimal Allocation of Students and Resources in a System of Higher Education*," B. E. Journal of Economic Analysis and Policy* 8 (1): 1-24.

Sander, Richard (2004)."A Systematic Analysis of Affirmative action in American Law Schools," *Stanford Law Review* 57 (2): 367-483.

Schulman, James L., and William G. Bowen (2002). The Game of Life: College Sports and Educational Values, Princeton: Princeton University Press.

Solon, Gary (2004). "A model of intergenerational mobility variation over time and place." In Miles Corak (editor). *Generational Income Mobility in North America and Europe*. Cambridge: Cambridge University Press.

Webber, Douglas A., and Ronald G. Ehrenberg (2010). "Do Expenditures other than Instructional Expenditures Affect Graduation and Persistence Rates in American Higher Education." *Economics of Education Review*, 29 (6): 947-958.

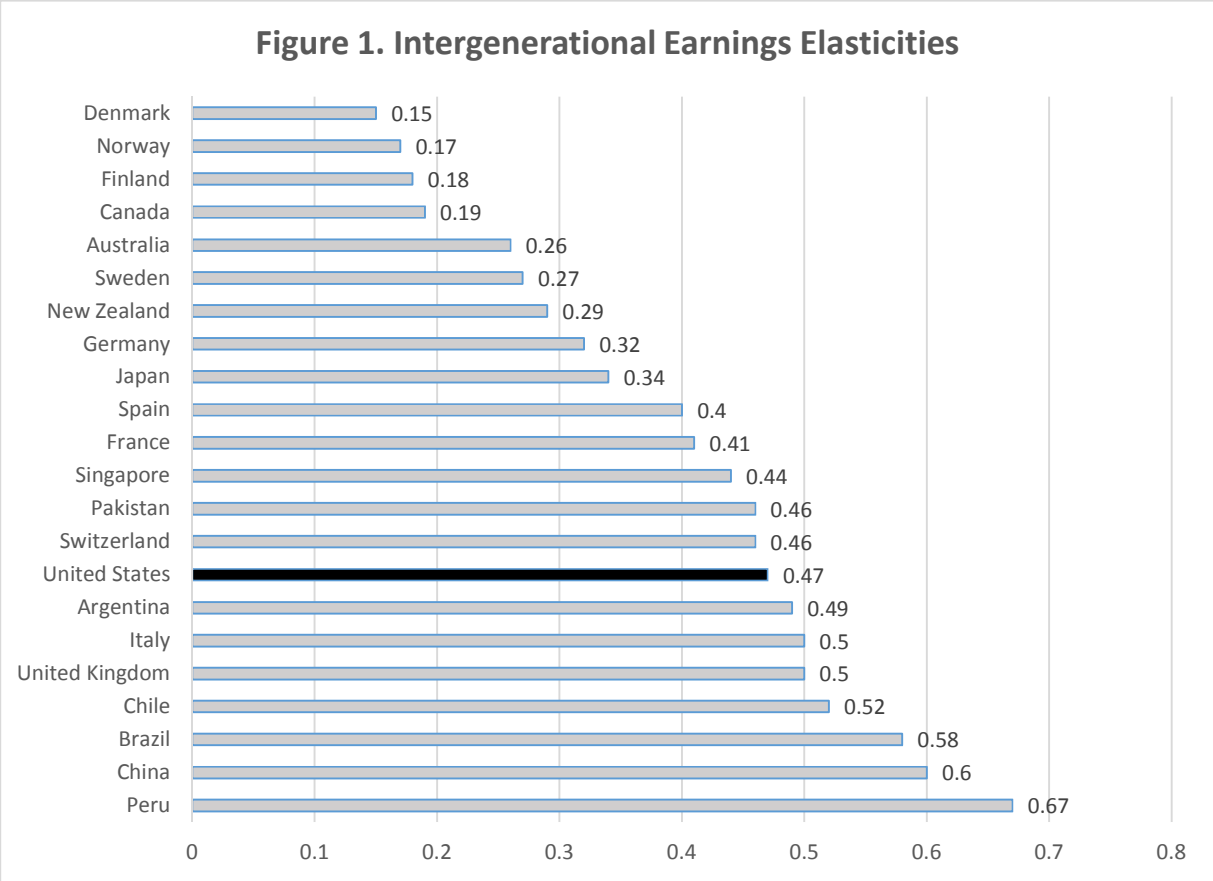
Figure 1. Intergenerational Earnings Elasticities
Denmark 0.15
Norway 0.17
Finland 0.18
Canada 0.19
Australia 0.26
Sweden 0.27
New Zealand 0.29
Germany 0.32
Japan 0.34
Spain 0.4
France 0.41
Singapore 0.44
Pakistan 0.46
Switzerland 0.46
United States 0.47
Argentina 0.49
Italy 0.5
United Kingdom 0.5
Chile 0.52
Brazil 0.58
China 0.6
Peru 0.67
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

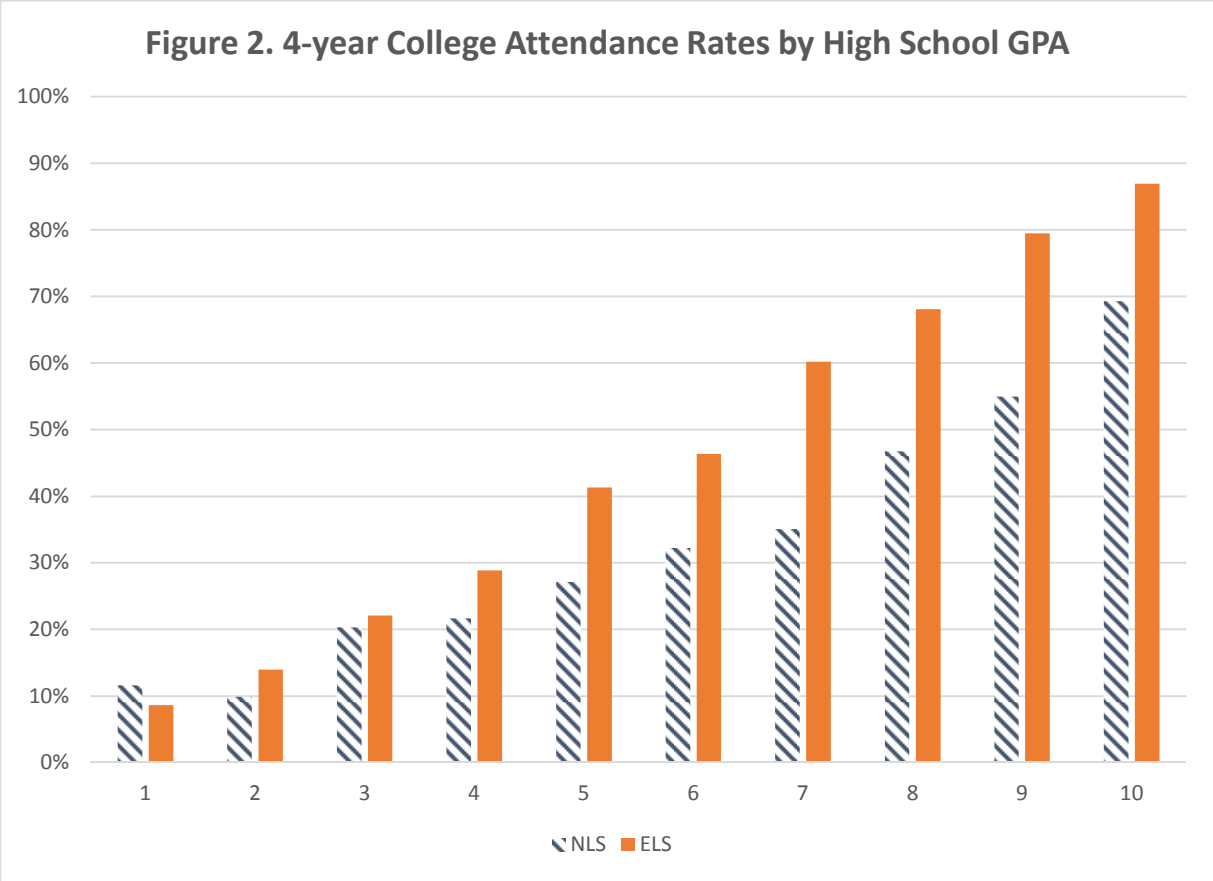
Figure 2. 4-year College Attendance Rates by High School GPA
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5
6
7
8
9
10
NLS
ELS

Table 1. Average Percentiles of Students Attending Four-year Colleges, NLS-72 and ELS:2002

	NLS-72	ELS:2002
GPA percentile	64.6	66.2
Math test percentile	65.9	64.9
Reading test percentile	63.3	63.8

Table 2. Actual and Predicted Graduation Rates by College Attendance (College Type and Selectivity), ELS:2002

Four-year college completion by 3rd follow-up of ELS:2002							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Category of first post-secondary institution attended					
	All	Most or Highly competitive (4-yr)	Very competitive (4-yr)	Competitive (4-yr)	Less- or non-competitive (4-yr)	Two-year college	Did not attend
All SES groups							
Actual rate	40.5	82.9	79.8	63.8	42.6	24.1	2
Predicted rate	40.5	72.9	64.6	51.9	37.4	30.8	18.1
Observations	8,570	940	1,270	1,890	640	2,170	1,670
Highest SES quartile							
Actual rate	65.3	84.5	84.2	72.9	54.8	36.8	8.5
Predicted rate	54.7	73.9	65.9	55.6	45.4	34.6	22.8
Observations	2,920	660	700	770	170	460	170
Third SES quartile							
Actual rate	41.9	83.5	75.2	60	46.1	27.8	2
Predicted rate	42.5	71.3	64.6	51.9	37.7	35.8	18.5
Observations	2,160	170	320	560	170	570	370
Second SES quartile							
Actual rate	27.5	70.7	73.2	59.1	37.6	18.9	1.9
Predicted rate	33.9	70.7	63.8	49.8	36.2	28.4	20.1
Observations	1,870	70	150	350	150	650	500
Lowest SES quartile							
Actual rate	19.5	83.3	76.7	54.4	31.1	17	.5
Predicted rate	25.9	70.6	58.2	44.2	30.3	25.4	15
Observations	1,620	40	100	210	140	490	630
NOTES: Data from ELS:2002. Sample of 2004 seniors. Sample sizes rounded to the nearest 10 for confidentiality. Sample weights used. SES quartiles calculated based on 10th grade family income, mother's completed education and occupational prestige, and father's completed education and occupational prestige. Predicted graduation rate based on a regression of four-year college completion (indicator) on high school GPA percentile, math and reading test score percentiles.							

Table 3. Comparison of Actual and Counterfactual Post-secondary Attendance, ELS:2002

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Actual college attendance					
Merit-based counterfactual	SES quartile	n	Most or Highly competitive (4-yr)	Very competitive (4-yr)	Competitive (4-yr)	Less- or non-competitive (4-yr)	Two-year college	Did not attend
Most or Highly competitive (4-yr)								
	Highest	560	47.2	27.7	19.8	2.3	2.3	.7
	Third	220	26.5	25.5	28.3	4.2	14.7	.7
	Second	110	27.5	30	22.7	7.5	11.1	1.1
	Lowest	50	17.8	32.1	36.1	4.3	9.2	.6
Very competitive (4-yr)								
	Highest	630	27.3	35.8	26.1	3.4	6.7	.8
	Third	330	14.1	27.3	34.4	7.1	15.5	1.6
	Second	200	9.4	15.2	41.9	7.4	18.7	7.4
	Lowest	110	11.4	20.9	22.6	12.8	23.5	8.8
Competitive (4-yr)								
	Highest	790	15.6	25.7	33	6.9	15.4	3.5
	Third	500	6.3	17.7	36.7	6.7	25.8	6.9
	Second	370	2.4	10.1	30.1	8.4	31.8	17.2
	Lowest	240	3.2	14.3	26.3	10	30	16.2
Less- or non-competitive (4-yr)								
	Highest	220	5.1	18	39.3	6.6	23.3	7.7
	Third	180	1.7	8.3	38.7	11.5	30	9.7
	Second	140	2.6	5.3	16.9	11.5	40	23.8
	Lowest	100	0	8.7	25.9	6	38.7	20.6
Two-year college								
	Highest	510	3.5	10.9	28.5	9.1	31.2	16.7
	Third	580	.8	4.2	20.7	10.6	37.2	26.5
	Second	570	1.1	2.1	13.1	8.3	43.7	31.6
	Lowest	510	.3	2.6	9.5	8.6	39	40.1
Did not attend								
	Highest	220	.8	.9	7.3	6.6	47.9	36.4

	Third	350	.9	.3	7.1	8.1	30.4	53.2
	Second	490	0	.4	6.4	6.1	36	51
	Lowest	610	0	.2	3.4	6	25.7	64.7
NOTES: Data from ELS:2002. Sample of 2004 seniors. Sample weights used. SES quartiles calculated based on 10th grade family income, mother's completed education and occupational prestige, and father's completed education and occupational prestige. Predicted graduation rate based on a regression of four-year college completion (indicator) on high school GPA percentile, math and reading test score percentiles.								

Table 4. Characteristics of Respondents by Mismatch Status, ELS:2002

Average Characteristics of Mismatched Students								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Under-matches				Over-matches			
	2 or more categories		3 or more categories		2 or more categories		3 or more categories	
	Base rate	Under-matched	Base rate	Under-matched	Base rate	Over-matched	Base rate	Over-matched
Male	43.1	41.6	41.9	45.7	48.7	53.1	50.5	60.5
Black	4.8	2	3.9	1.3	16.3	24.7	19.8	28.3
Hispanic	7.6	9.9	7.1	11.4	15.5	9.5	17.8	9.9
Asian	5.4	3.2	5.7	3.1	3.7	4.4	3.2	4.6
White	78.7	81.8	80.1	80.9	59.6	54.8	54	49.8
Other race	3.5	3	3.4	3.3	4.9	6.6	5.2	7.5
Lowest SES	11.4	16.8	10.4	18	25	15.6	28.9	15.9
Second SES	18.9	27.2	18.2	31.8	26.3	20	28.4	24
Third SES	28	30.3	28.1	30.6	26.2	27.9	25.1	25.4
Highest SES	41.6	25.7	43.3	19.6	22.5	36.5	17.6	34.6
Parent high school only	14.7	23.2	14	26.6	22.2	15.8	24.1	14.8
Parent some college	29.6	37.3	28.5	38.7	37.2	29.5	38.8	33.3
Parent BA	28.1	21.4	28.6	21.5	21.3	29.8	19.7	26.9
Parent MA or more	25.5	15	27.2	10.9	13.7	21.7	10.7	23.7
Northeast	20.8	12.1	19.8	11.9	19.3	28.1	19.5	23.5
South	30.4	31.5	30.3	30.7	35.4	37	36.1	43
Midwest	28	30.9	28.8	31.6	24	23.4	23.2	22.8
West	20.8	25.6	21.1	25.9	21.4	11.5	21.2	10.6
Rural high school	23.8	29.6	24	28.7	22.2	14.4	21.9	13.9
College athlete	10.1	6.2	10.2	3.8	7.4	17.3	7.1	21.6
AP class	27.9	27.1	29.7	26	15.1	17.6	12.8	11.7

NOTES: Data from ELS:2002. Sample of 2004 seniors. Sample weights used. Colleges divided into Barron's competitiveness categories. Respondents counterfactually sorted into competitiveness category by a college graduation prediction based on high school GPA and test scores. Undermatching is when a student is counterfactually sorted into a higher competitiveness category than the one she attends. Overmatching is when a student is counterfactually sorted into a competitiveness category that is lower than the one she actually attends. Base rate refers to the average in the sample of respondents who could possibly have been overmatched or undermatched. That is, only respondents counterfactually matched into the second-highest or lower competitiveness categories could have overmatched. SES quartiles calculated based on 10th grade family income, mother's completed education and occupational prestige, and father's completed education and occupational prestige.

Table 5. Percentages of Students in SES Quartiles by Type of Initial Higher Education Experience, ELS:2002

	Most or Highly	Very	Competitive	Non- or Less	2-yr	Did not attend
Highest SES	22.5%	23.9%	26.3%	5.8%	15.7%	5.8%
Third SES	7.9%	14.8%	25.9%	7.9%	26.4%	17.1%
Second SES	3.7%	8.0%	18.7%	8.0%	34.8%	26.7%
Lowest SES	2.5%	6.2%	13.0%	8.7%	30.4%	39.1%

Table 6. Revenues and Expenditures at Public Institutions

	Most or Highly	Very	Competitive	Non- or Less	2-yr
Revenues per student					
State Appropriations 13-15	$9,714	$7,700	$6,281	$5,983	$3,651
Difference in State Appropriation 13-15 minus 88-90	-$6,362	-$4,692	-$3,534	-$2,022	-$953
Expenditures per student					
Instruction 13-15	$17,827	$12,783	$9,504	$7,925	$6,271
Difference in Instruction 13-15 minus 88-90	$ 5,682	$ 3,653	$2,365	$2,052	$1,608
Other Core Expenditures 13-15	$11,543	$8,300	$6,992	$6,531	$4,903
Difference in Other Core 13-15 minus 88-90	$ 4,907	$2,991	$2,654	$2,710	$2,750
FTE students 13-15	897,378	1,301,377	2,943672	446,208	3,011,752
Number of Institutions	34	75	272	80	691