College Board Advocacy & Policy Center
Research Brief
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The Role of High Schools in Students' Postsecondary Choices

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Summary Notes

- High schools with similar attributes often vary widely in the postsecondary choices made by their graduates.
- Patterns of postsecondary choices by students are persistent across academic years, suggesting that some high schools are more successful than others at guiding students to choose postsecondary alternatives that are well-aligned to their academic credentials.
- Policies and practices to address suboptimal college choice processes at the high school level may be impactful and cost effective.

Postsecondary academic undermatch occurs when a student's academic credentials substantially exceed the academic credentials of the typical enrolled student at the college or university in which he or she has enrolled. Although the term "undermatch" may be a new addition to the American lexicon, it is not a new phenomenon. Seminal work on the college-choice process by Manski and Wise (1983) documents that low-income students are less likely to apply to and enroll in more selective colleges than their higher-income peers. More contemporary research reveals that this phenomenon exists across the socioeconomic spectrum but remains disproportionately prevalent among lower-income students, minorities, and first-generation college-goers (Roderick et al., 2008; Bowen, Chingos, & McPherson, 2009; Smith, Pender, & Howell, 2012).[1]

A study of the 1999 cohort of North Carolina seniors, featured in the book *Crossing the Finish Line* (Bowen et al., 2009), reveals that 40 percent of students who are eligible to enroll in the most selective in-state colleges end up academically misaligned. Across their entire sample, Bowen et al. (2009) find that 59 percent of students in the lowest-income quartile academically undermatched, compared to 27 percent in the top income quartile. A study conducted by the Consortium on Chicago School Research chronicles the 2005 public Chicago high school cohort and finds that 28 percent of students enrolled in a college slightly below this level, and that 34 percent

1. A thorough review of the research literature on undermatch is available in Smith, Pender, Howell, and Hurwitz (2012).

of students enrolled in colleges far below their academic match or did not enroll in college at all (Roderick et al., 2008). In a third study of the academic misalignment between students and their postsecondary choices, Smith et al. (2012) confirm that this problem is not confined to a specific geographic region. Using the nationally representative *Education Longitudinal Survey (ELS)*, Smith et al. (2012) document that, among the 2004 high school cohort, 41 percent of all students and 50 percent of lower-socioeconomic-status (SES) students chose a postsecondary alternative that was not well-aligned with their academic credentials.

These studies expose the extent of student undermatching and identify some student-level characteristics that are associated with such student choices. However, they do not reveal why students choose alternatives that are not well-aligned to their credentials. Dillon and Smith (2009) explore the mechanisms behind undermatch and find that both lack of information and finances play a role in predicting undermatch. The authors suggest that students' surroundings and personal relationships strongly influence their college choices. One prominent source of information for students, for whom personal relationships with peers and mentors might have substantial combined influence, is high school. The new research highlighted in this brief examines the impact of students' high schools on their postsecondary choices.

High schools have the potential to influence how well-aligned students' academic credentials are with their postsecondary choices for several reasons. First, students spend much of their time in high schools, and so the quality and aspirations of their peers may impact whether and where they enroll in college. Second, teachers and school counselors may influence where students apply and enroll based on the amount of information that those professionals share with students, the preferences of students for certain types of colleges, or the students' financial resources and time allocation, all of which vary across high schools. Third, colleges may promote and recruit students at particular high schools based on past performance, geographic location, or personal relationships. For all of these reasons, some high schools may be more likely than others to place their graduates into postsecondary institutions that are academically well-aligned to students' credentials.

Research Questions

1. How much variation in student undermatching exists at the high school level?

2. Is a high school's undermatch rate persistent over time?

3. What are the predictors of high school undermatch rates?

4. How much of the variation in high school undermatch can be explained by observable school attributes, policies, and practices?

Data & Methodology

This study focuses on the postsecondary choices of all SAT® takers in the high school graduation cohort of 2006, who graduated from 3,172 public high schools in 17 states where the preponderance of college-aspiring students take the SAT, rather than the ACT.[2] The data set analyzed is constructed by merging the College Board's student-level SAT data to college enrollment data from the National Student Clearinghouse (NSC). The NSC, which is composed of 3,300 participating colleges enrolling 96 percent of American college students, allows us to document the postsecondary institutions where SAT takers enroll. Public high school demographic characteristics such as urbanicity and total student enrollment come from the National Center for Education Statistics' Common Core of Data (CCD) for the 2005-06 academic year. We restrict the sample to include only the high schools with 50 or more SAT takers.[3]

The unit of analysis in this study is the high school and, at the typical public high school within the sample, 30 percent of the student body is African American, Latino/Hispanic or Native American, and 27 percent are eligible for free or reduced-price lunch.

2. These states include California, Connecticut, the District of Columbia, Delaware, Hawaii, Indiana, Massachusetts, Maryland, North Carolina, New Hampshire, New Jersey, New York, Oregon, Rhode Island, Virginia, Vermont, and Washington. For the 2006 cohort, the number of SAT takers in these states exceeds the number of ACT test-takers by a ratio of 3:1 or greater. Maine is excluded because of the adoption of the mandatory SAT for the high school cohort of 2007. Pennsylvania is excluded due to an inability to distinguish between the Pennsylvania State University branch campuses in the data.

3. High schools with fewer than 50 SAT takers may have extreme undermatch rates due to small sample size.

At the average high school, 58 percent of students take the SAT, and the mean composite (mathematics + critical reading) SAT score is 997.[4] School enrollment ranges from 208 students to 5,336 students, with an average enrollment of 1,432 students. Twenty-three percent of schools are located in census-designated cities, and 21 percent are located in rural areas.

Characteristics of the typical sampled high school:

- 30 percent African American, Latino/ Hispanic, Native American
- 27 percent free/reduced-price lunch eligible students
- 58 percent take the SAT
- Average SAT score of 997
- Average enrollment of 1,432 students

Measuring Academic Alignment of Students' Postsecondary Choices

Throughout this brief, the outcome variable of interest is the percentage of SAT takers in a public high school who academically undermatch in their postsecondary choice. To determine whether a student is academically aligned, we rely on the *Barron's Profiles of American Colleges* Admissions Competitiveness Index.[5] Barron's classifies approximately 1,500 four-year colleges into selectivity categories using incoming students'

4. According to the College Board (2011), the average score on the SAT among students in the 2006 college-bound senior cohort was 1021.

5. Categorizations are featured in *Barron's Profiles of American Colleges* (Barron's Educational Series, 2004). We use the 2004 edition because the National Center for Education Statistics provides the data only every four years. The categorizations across years are relatively stable.

standardized testing information, high school grade point average, class rank, and acceptance-rate data. Due to the small number of institutions in some categories, we combine several Barron's categories to form four selectivity levels for our analyses: *Very Selective*, *Selective*, *Somewhat Selective*, and *Nonselective*.[6]

The Barron's institutional selectivity categories are collapsed into four groups:

- *Very Selective*: 191 institutions
- *Selective*: 277 institutions
- *Somewhat Selective*: 671 institutions
- *Nonselective*: 291 institutions

A student is undermatched if his or her SAT score exceeds the mean SAT score in the selectivity category above the institution in which he or she enrolls. For example, 1240 is the average math plus critical reading SAT score among all students who enrolled in a *Very Selective* college in 2006. A student who scored above a 1240 would be classified as undermatched if he or she enrolled in a *Selective*, *Somewhat Selective*, or *Nonselective* college; a two-year college; or no college at all. The cells marked with an "X" in Table 1 identify students as undermatched based on their SAT scores and the colleges in which they first enrolled, relative to the category of institution to which they very likely had access.

Methodology

These analyses rely on a graphical examination of the data and multivariate regression. We identify immutable high school characteristics (urbanicity, distance to colleges, local educational attainment rate, and the high school's racial/ethnic composition and eligibility for the national free and reduced-price lunch program) as well as mutable high school characteristics (number of students enrolled, SAT participation, SAT performance, pupil-to-teacher ratio, and expenditures per student) that are associated with the percentage of high school graduates who undermatch.[7] The regression models allow us to quantify how much of the total variation in public high-school-level undermatching can be explained by

6. *Very selective* includes Barron's *Most Competitive* and *Highly Competitive* categories, *Selective* is equivalent to Barron's *Very Competitive* category, *Somewhat Selective* is equivalent to Barron's *Competitive* category, and *Noncompetitive* includes Barron's *Less Competitive* and *Noncompetitive* categories.

7. See the technical appendix for the regression specification.

Table 1: Undermatch Designations Based on Student SAT and Selectivity Level of College Enrolled

Student's SAT Score (M +CR)	Very Selective	Selective	Somewhat Selective	Nonselective	Two-Year	No College
>1240		x	x	x	x	x
1130–1240			x	x	x	x
1030–1120				x	x	x
930–1020					x	x
<930						x

Note: The undermatch designation is based only upon the first college in which a student enrolled.

school location and demographics, and those attributes of high schools that are more readily changed through policy and practice (i.e., mutable factors). In statistical parlance, this metric is referred to as an R-squared statistic.

R-squared measures the percentage of the variation in high-school-level undermatching explained by high school characteristics.

Results

How much variation in student undermatching exists at the high school level? Figure 1 shows the distribution of sampled public high schools by the percentage of SAT takers who undermatch in the college-choice process. The highest bar in Figure 1 reveals that more than 1,300 of the 3,172 sampled high schools have 30–40 percent of their SAT-taking students undermatch in the college-choice process. More than 200 of the sampled high schools have undermatching rates between 10–20 percent, and more than 100 have undermatching rates exceeding 50 percent.

The sampled high schools have very different characteristics, in terms of resources and student demographics, and those differences may be related to school-level undermatch rates. Figure 2 investigates this further with a scatterplot of the total expenditures per student at the high school, together with the undermatch rate.[8]

The horizontal axis in Figure 2 measures total expenditure per student, the vertical

8. Total expenditures per student are measured at the district level.

Figure 1: Distribution of High School Undermatch Rates

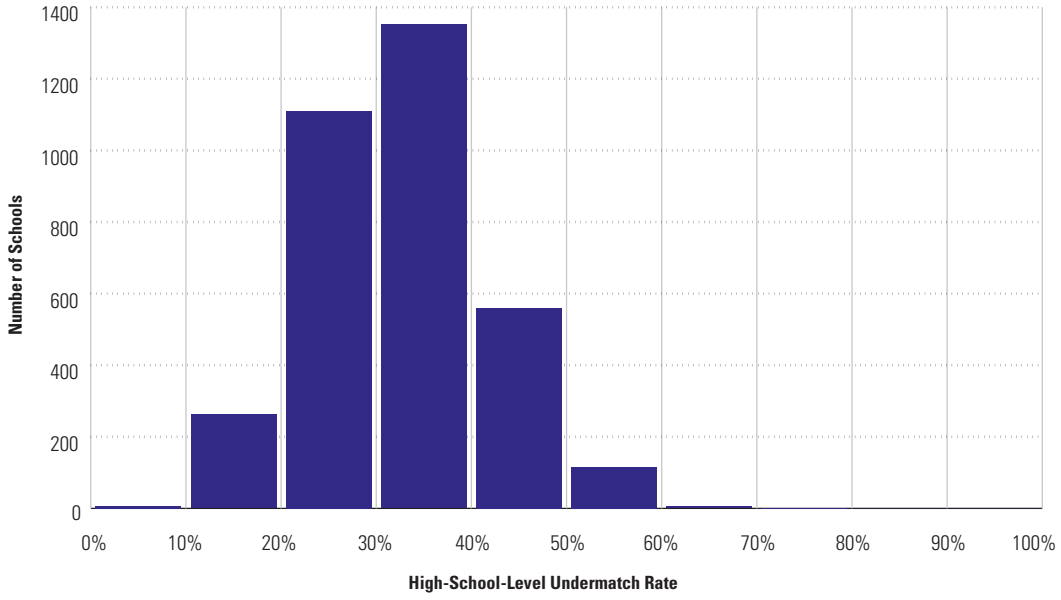


Figure 2: Undermatch Rates by Public High School per Student Total Expenditure

axis measures the percentage of students who undermatch, and each dot represents a high school's values for each of these measures. Figure 2 reveals two features of the data that are important. First, as total high school expenditures per student increase, there is a small decline in the average undermatch rate (i.e., a regression line through these points would be slightly downward sloping). Second, at every per student expenditure level, we observe a wide range of school-level undermatch rates. For example, there are school undermatch rates as low as 15 percent and as high as 60 percent for high schools with total expenditures of $10,000 per student.

High school funding and resources are not the only potential factors that may influence a high school's undermatch rate. Composition of the student body may also have an impact. Figure 3 shows a scatterplot of free and reduced-price lunch program eligibility rates, a proxy for school-level SES, and academic undermatch rates for the sample of public high schools. SES composition does appear to have a very modest negative relationship with a high school's undermatch rate. High schools with more program eligibility have slightly lower undermatch rates on average. However, as observed in Figure 2, there is still a nontrivial amount of vertical dispersion present. This dispersion implies that high schools with similar characteristics (e.g., SES composition of student body) can

High schools with similar attributes can have substantially different rates of postsecondary academic undermatching among graduating students.

Figure 3: Undermatch Rates by Public High School Eligibility for Free and Reduced-Price Lunch Program

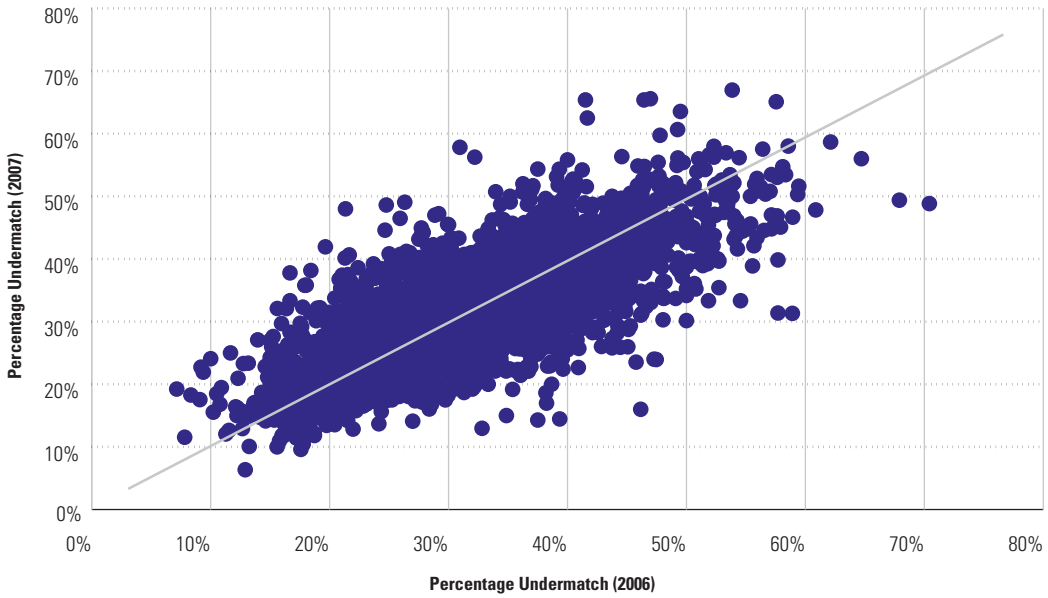
have substantially different undermatch rates. Figures 2 and 3 show that this is true across the distributions of per-student expenditures and free and reduced-price lunch program participation. In other results (not shown), this pattern of variation in undermatch rates also exists in high schools with the same student racial/ethnic composition and average SAT test scores.

Is a high school's undermatch rate persistent over time?

The previous figures suggest that some high schools are more prone to undermatch, or perhaps even have a culture of postsecondary academic undermatch. However, the graphical analyses above use a cross-section of data, so it is possible that a high school has a low undermatch rate some years and a high undermatch rate in other years rather than a systematic pattern of undermatch. Figures 2 and 3 do not disentangle these explanations. In order to dispel this notion of year-to-year random variation in undermatch rates at high schools, we examine the undermatch rates at the public high schools in our sample for both the 2006 and 2007 graduation cohorts. If there truly is a propensity to undermatch (or not undermatch) at particular schools, then a high school should have similar undermatch rates in both years.

Figure 4 displays a scatterplot of school undermatch rates in 2006 and 2007. A clear upward slope pattern along the 45-degree line emerges in Figure 4, which implies that a high school is very likely to have a similar undermatch rate across these two years. Therefore, the vertical

Figure 4: High School Undermatch Rates Across Years



dispersion visible in Figures 2 and 3 is not likely to be random. In fact, high schools that are observably similar on several dimensions can still have vastly different academic undermatch rates.

What are the predictors of high school undermatch rates?

Disentangling the relationships among the numerous predictors of student postsecondary academic undermatch requires the use of a multivariate regression model. This model separates the relationship between each predictor and high-school-level undermatching rate from the correlations that exist between predictors. We classify the comprehensive set of high school predictor variables into two categories: immutable high school characteristics that would be very difficult to change and mutable high school characteristics that may be influenced by policy and practice.

Table 2 summarizes the results of the multivariate regression, indicating whether the relationship between the high school attribute and the school-level undermatch rate is either positive (+), negative (-), or not statistically significant (0).[9] The regression models control for any state-specific differences in the sample.[10] Overall, the results suggest that high schools in cities tend to have higher undermatching rates than high schools in towns and suburbs. Schools located in areas with more postsecondary institutions geographically nearby and

9. Coefficient estimates are provided in the technical appendix (Table A).

10. All estimated relationships are statistically significant with the exception of rural location, percentage eligible for free and reduced-price lunch, and per-student total expenditures.

Table 2: Factors that Determine High School Undermatch Rate

High School Characteristics	Relationship to Undermatch Rate
Immutable Characteristics	
High School Location: City (Relative to Suburban)	+
High School Location: Rural (Relative to Suburban)	0
Number of 4-Year Colleges Within 25-Mile Radius	–
Number of 2-Year Colleges Within 25-Mile Radius	–
Percentage of Adults With Bachelor's Degree or Higher	–
Percentage Underrepresented Minority	–
Percentage Free and Reduced-Price Lunch Eligible Students	0
Mutable Characteristics	
Number of Students	–
Percentage of Seniors Taking SAT	–
Average High School SAT Score	+
Pupil–Teacher Ratio	+
Total Expenditures per Student (District Level)	0

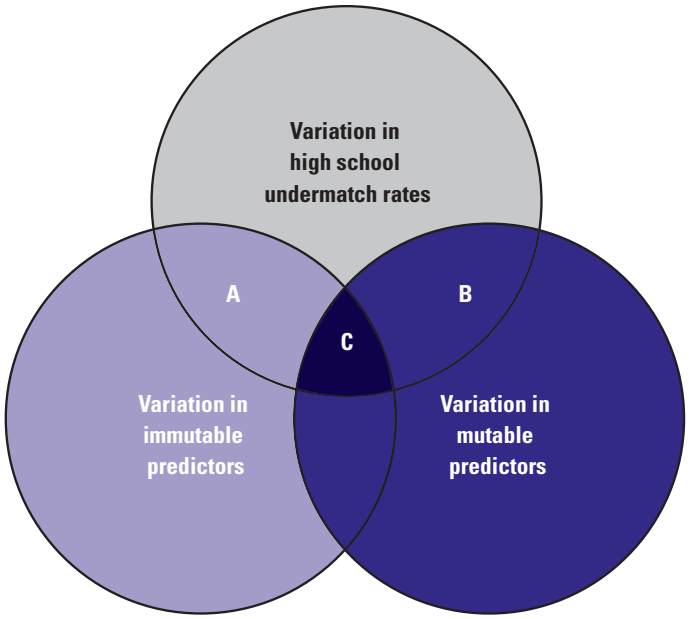
more adults with college degrees tend to experience lower undermatching rates. Also, schools with larger percentages of underrepresented minorities typically have lower undermatch rates. This finding runs counter to that of other studies investigating undermatch, which use the student, rather than the high school, as the unit of analysis.

Among the mutable school characteristics, greater SAT participation is associated with lower undermatch rates. Paradoxically, high schools with higher average SAT scores have higher rates of undermatching, but this occurs because students attending these schools have more opportunity to undermatch.[11] Controlling for all other high school characteristics, higher pupil-to-teacher ratios are associated with higher undermatching rates. This finding points to the idea that school resources may play an important role in shaping a high school's undermatching propensity.

How much of the variation in high school undermatch can be explained?
The above analyses verify that there is a substantial amount of variability in undermatching rates across the sampled schools, as well as in the high-school-level factors that contribute to undermatch rates. In addition to teasing out the relationships between selected predictors and undermatching rates, the multivariate regression analyses reveal how much of the across-school variation in undermatching rates can be explained by each set of predictors. The R-squared statistics indicate how much of this variance in high school undermatch rates can be explained by each set of predictors.

11. A student with a higher composite SAT score is predicted to have access to colleges and universities in all selectivity categories. This greater predicted access comes with more opportunities to undermatch.

Figure 5: Explaining Variation in Undermatch Rates Across Public High Schools



The top circle in Figure 5 represents the variability in high school undermatch rates. The circles representing variability in school-level predictors overlap with the top circle to indicate that these high school attributes explain some of the variation we see in school undermatch rates. Area A+C in Figure 5 indicates that 43 percent of the variability in high school undermatch rates is explained by variability in immutable high school characteristics (i.e., an R-squared statistic of 0.43).[12] When mutable characteristics are added to the model, area B in Figure 5 adds explanatory power and the R-squared statistic increases to 0.46. Thus, in the final model, 46 percent of the variability in high school undermatch rates is explained by school attributes available in the data. This means that 54 percent of the variability in high school undermatch rates remains unaccounted for (represented by the gray area in the top circle). The variation that is unaccounted for reinforces the concept that some high schools are prone to undermatch for reasons that cannot be easily identified.

Policy Implications

After accounting for a comprehensive set of factors related to the fraction of a high school's graduates placed into postsecondary institutions that are well-aligned with the graduates' academic credentials, we are still unable to explain

More than half (54 percent) of the variation in public high school undermatch rates is unexplained by easily observed attributes of schools.

12. The regression analysis also accounts for variability in state-level undermatching cultures.

more than half of the variability in this fraction among sampled high schools. Although the analyses indicate that certain location- and school-specific factors are related to undermatching, this does not mean that schools with high undermatching rates should be resigned to such college-choice behavior among their students. Immutable characteristics do not mean that student choice processes are unavoidable and uncorrectable. A high school's goal should not be to reduce undermatching rates to zero. Such a strategy would ignore the fact that students may have compelling reasons to select colleges at which their academic credentials far exceed those of the typical enrolled student. Although, on average, students who enroll at more selective colleges enjoy better outcomes in terms of completion rates and labor market returns (i.e., higher income), it is not true that every student is best served by attending the most selective college at which he or she is qualified to attend.

Establishing benchmarks for acceptable high-school-level undermatching rates is not sensible policy, and putting undue pressure on high school staff to suppress undermatching is likely to be unfair to both students and staff alike. What does warrant further investigation are the sharply different undermatching rates among high schools in similar locations with similar resources and student demographic characteristics. This finding raises a red flag that students from some high schools may be receiving better information about the importance of engaging in a thoughtful and strategic college search and choice process, compared to similar students at similar high schools.

Further investigation is warranted in light of the evidence that there are sharply different undermatching rates among high schools in similar locations with similar resources and student demographic characteristics.

Opportunities exist to correct excessive undermatching, and many parties, including parents, school staff, and even colleges, can likely play a role in ensuring that students understand the trade-offs associated with attending colleges of differing selectivity levels. At this point, little is known about the most efficient approaches to curb excessive undermatching, and only recently have researchers begun rigorously examining ways of addressing this issue. Caroline Hoxby and Sarah Turner are now completing a large-scale project to identify causal mechanisms through which undermatching can be reduced. MDRC's College Match Program utilizes National College Advising Corps counselors to reduce undermatching in a small number of Chicago public schools (Sherwin, 2012). Both of these initiatives target individual students and show some promising early results.

A propensity for academic misalignment in students' postsecondary placement within high schools suggests that interventions directed toward the entire school, rather than toward specific students within schools, might prove cost effective

and relatively simple to implement. Such a strategy may include proactively targeting school staff most involved in students' college decision making to help these staff members understand some of the negative repercussions associated with undermatching. Alternatively, perhaps colleges can be encouraged to increase their outreach efforts at those schools most prone to undermatching. Given the rich diversity of high schools and students within high schools, a one-size-fits-all approach to undermatching reduction may not be optimal. Identifying multiple approaches would provide high schools with the flexibility to design strategies tailored to the unique needs of their students.

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Technical Appendix

The multivariate regression uses the high school as the unit of observation. The main specification estimated is as follows:

$$\%\ Undermatch_s = \beta_0 + \beta_1 I_s + \beta_2 M_s + State + e_s$$

where % Undermatch$_s$ is the percentage of students who undermatch at high school *s*, and *I* and *M* are vectors of immutable characteristics and mutable characteristics, respectively, of high school *s*. *State* represents a vector of state-fixed effects, and e_s is an i.i.d. error term.

This model is estimated with Ordinary Least Squares (OLS), and the coefficient estimates and standard errors are presented in Appendix Table A.

Appendix Table A: Factors that Determine High School Undermatch Rate

	Model 1	Model 2
High School Location: City	0.009***	0.013***
	(0.003)	(0.003)
High School Location: Rural	0.007*	0.005
	(0.003)	(0.003)
Number of 4-Year Colleges Within 25-Mile Radius	-0.001***	-0.0004***
	(0.0001)	(0.0001)
Number of 2-Year Colleges Within 25-Mile Radius	-0.002***	-0.002***
	(0.001)	(0.001)
Percentage of Adults With Bachelor's Degree or Higher	-0.067***	-0.058***
	(0.010)	(0.013)
Percentage Underrepresented Minority	-0.149***	-0.099***
	(0.008)	(0.010)
Percentage Free and Reduced-Price Lunch Eligible Students	0.025**	0.017
	(0.010)	(0.011)
Number of Students/1000	0.002	-0.006***
	(0.002)	(0.002)
Percentage of Seniors Taking SAT	—	-0.116***
		(0.011)
Average High School SAT Score/100	—	0.023***
		(0.003)
Pupil–Teacher Ratio	—	0.002***
		(0.001)
Total Expenditure per Student (District Level)/1000	—	-0.000
		(0.000)
State Fixed Effects	Yes	Yes
Number of Observations	3,172	3,172
R-Squared	0.425	0.458

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The work in this brief is based on a larger set of projects on postsecondary academic undermatch. The full research papers are available upon request by emailing mhurwitz@collegeboard.org.

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