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Financial Fit and Academic Match for Chicago Public Schools'
College-Bound Seniors

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Abstract

Academic match is a well-documented phenomenon shown to be closely tied to postsecondary outcomes such as college graduation rates and earned income. This study explores the association between college net cost and academic match using student-level data of Chicago Public Schools seniors from the 2020-2021 school year. I find significant evidence of unique financial pressures placed on academically competitive, low-income students who are likely to receive relatively poor financial aid packages that could disincentivize them from attending a match college. This represents a new factor for consideration in studying patterns of academic match, and I argue how certain strategies in postsecondary advising and targeted funding could improve graduation rates among low-income competitive students.

Financial Fit and Academic Match for Chicago Public Schools’ College-Bound Seniors

The Chicago Public Schools (CPS) system has made great strides in improving educational outcomes for its high schoolers over the past 15 years. When researchers at the UChicago Consortium on School Research found evidence that meeting a “Freshman OnTrack” benchmark of earning certain class credits and no more than one failing grade significantly increased the likelihood of high school graduation, CPS turned the benchmark into a key performance indicator and saw high school graduation rates increase from 60% to 82% over 11 years (Allensworth & Easton, 2005). Recent policy changes have looked beyond high school graduation towards college enrollment. Starting with the 2019-2020 school year, CPS seniors were required to submit post-graduation plans for approval, 83% of which indicated an intent to pursue higher education (Chicago Public Schools, 2020). The following school year, the Illinois legislature implemented a law requiring high school seniors to complete a financial aid application for college before they could graduate high school (Act of June 01 2020). These mandates seek to build on the success that CPS has already had in getting more of its graduates into higher education, as the proportion of high school graduates immediately enrolling in some sort of college rose from 49% to 63% between 2007 and 2018 (Nagaoka et al., 2020).

While the school district has built an infrastructure for encouraging college enrollment, the colleges that students apply to and ultimately attend also matter a great deal for student outcomes. Research indicates that many CPS seniors “undermatch” in their college choice, meaning their student access level—as determined by their GPA and standardized test scores—are higher than the college selectivity level of their chosen institution (Roderick et al., 2011). Undermatching is associated with a significantly decreased probability of college graduation

(Alon & Tienda, 2005) and, even among college graduates, thousands of dollars' worth of lost annual wages (Ovink et al., 2018). The proportion of undermatched CPS students grew from 42.7% to 57.7% between 2003 and 2013 (Roderick et al., 2016), mirroring the much-lauded growth of high school graduation and college enrollment rates. This concerning trend can perhaps help account for the fact that, despite all of CPS' successes in increasing postsecondary enrollment, college graduation rates have remained relatively stagnant since 2012, hovering at around 47% for four-year enrollees (Nagaoka et al., 2020). Although the higher enrollment numbers mean that there are a greater number of CPS students going on to earn a college degree, there are also more students enrolling and not graduating, a particularly scary prospect given that dropping out of school is the strongest predictor of defaulting on student loans (Gross et al., 2009). Taking these high financial stakes into account, it's imperative that educators and policymakers are doing what they can to give CPS students the best shot at postsecondary persistence and success.

This research is concerned with the potential links between academic match and college net cost. Using college application data from the 2020-2021 school year, I argue that the nearly 20% of CPS students whose academic credentials are considered "Competitive" are financially disincentivized from enrolling into match institutions. This paper is divided into 4 sections. Section 1 is a dedicated literature review for examining the state of college completion and its relation to both financial aid and academic match. Section 2 provides a methodological overview of my data collection and analysis, while section 3 presents the findings of that analysis. Section 4 discusses the implications of these findings: how are they limited by this design's methodology, how could they be improved upon in further research, and what implications might they have for CPS' postsecondary efforts?

MOTIVATIONS AND CONTEXT

Of the many factors contributing to college enrollment, there's one that seems most important in America: cost. One Pew Research poll found that three-quarters of respondents feel that postsecondary education is unaffordable for the majority of Americans, and respondents who did not pursue higher education cited financial concerns as their main barrier to enrollment (Taylor et al., 2011). These financial concerns about college are commensurate with the overall trajectory of college costs and its associated burdens. Adjusted for inflation, tuition increased an average of 50% between 1980 and 2010 (Greenstone & Looney, 2012), which coincided with an average student debt increase of \$10,381 over roughly the same timeline (Ratcliffe & McKernan, 2016). Today, the average amount of undergraduate student debt is nearly \$37,000 (Hanson, 2021) and the number of borrowers is so great that student loans are second only to mortgages as the largest source of household debt in America (Dynarski, 2021). With such significant shifts in financing higher education placing further responsibility on students and their families, it's little wonder that so many are skeptical about whether a college education is worth the costs.

However, for those hoping to achieve upward—or simply trying to avoid downward—socioeconomic mobility, there are few quality alternative options. Economic inequality in the United States is on the rise. The top 10% of earners receive nearly 50% of aggregate income, while the bottom 50% only receive 11.3% of total earnings (Blanchet et al., 2022). Traditional notions of an attainable American success story are increasingly outdated. American children born in the 1980s were half as likely to achieve economic mobility than those born in the 1940s, a trend especially pronounced in midwestern states like Illinois (Chetty et al., 2016). One reliable difference-maker in these increasingly difficult economic times is higher education. Only 42% of those whose highest level of education is twelfth grade earn at least

\$35,000 a year, compared with 80% of those whose terminal degree is a bachelor's (Carnevale et al., 2022). This discrepancy has only grown over time. For U.S. males with full-time employment, the average difference in annual earnings rose from \$17,411 to \$34,969 between 1979 and 2012, (Autor, 2014). It's also important to note that these gains aren't stratified along class lines. Graduates who come from the bottom quintile of earnings have remarkably similar economic outcomes to their peers at the same college whose families come from the top quintile (Chetty et al., 2017a). These economic benefits, in addition to the significantly higher levels of physical health and marital satisfaction (Oreopoulos & Salvanes, 2009), suggest that college degrees, despite their costs, provide an effective buffer against certain adverse outcomes.

Of course, gaining the benefits conferred by a bachelor's degree requires actually obtaining said degree, but this outcome is far from guaranteed for those who chase it. Nationally, 40% of four-year college enrollees and 65% of two-year enrollees end up dropping out of school (Dunlop Velez, 2014). The distribution of enrollees who do not reach graduation is unbalanced. Dropout rates have decreased for the wealthiest 20% of Americans while they have remained constant for the 20% least wealthy (Pfeffer, 2018). Within CPS specifically, about 13.3% of Black students and 18.8% of Latinx students go on to earn a four-year college degree, compared to 39.8% of white students (Nagaoka et al., 2020). Without the degree necessary to obtain higher-paying employment, many students who drop out of college struggle to pay off their student loans, as evidenced by the \$15,000 average balance of federal loan defaulters (Huelsman, 2015)—a relatively small amount compared to the average \$35,000 debt of federal borrowers, but nonetheless unaffordable for those stuck with minimum wage work (Dynarski, 1994). The lopsided nature of college persistence and postsecondary earnings results in a situation where

those who stand to benefit the most from college are the least likely to obtain a degree (Brand and Xie 2010). For too many, American higher education only exacerbates existing inequities.

What means are there to avoid the potentially ruinous outcome of enrollment without graduation? One promising method is encouraging enrollment at match and overmatch schools, which are institutions whose college selectivity levels are commensurate or exceed that of a student's access level, respectively. Generally speaking, the higher a college's selectivity level, the higher its graduation levels are (Alon & Tienda, 2005), meaning that students who attend match schools rather than undermatch schools are significantly likelier to graduate from college within 6 years (Ovink et al., 2018; Kang & Torres, 2018). Some may be concerned about the possibility that overmatching leads to students being academically overwhelmed in college and dropping out due to unmanageable course load. However, research indicates that attending overmatch institutions also has positive associations with likelihood of graduation (Alon & Tienda, 2005).

The same cannot be said about students who undermatch. Rather than breezing through coursework that admissions criteria suggests should be easy, undermatched students often drop out of higher education completely (Byndloss et al., 2015), with some undermatched student groups graduating at rates up to 28 percentage points less than their matched counterparts (Kang and Torres 2018). Reasons for why undermatched students have poorer outcomes stem from a lack of resources at less selective institutions, leading to poorer academic advising, larger class sizes, and fewer opportunities for on-campus housing (Rodriguez, 2013).

Although a 41% national estimate for student undermatching among four-year enrollees points to an overall issue (Smith et al., 2013), the likelihood of undermatching is particularly high among certain demographic groups. Students in the bottom half of household earnings

undermatch at rates nearing 50% whereas those in the top half undermatch at rates of 34% (Smith et al., 2013). Black students are also particularly likely to undermatch (Dillon & Smith, 2017). Causes for these discrepancies in enrollment patterns are unclear, but there are positive associations between proximity to match colleges, higher enrollment rates by high school, and the number of degree-holding adults in a student's neighborhood with the likelihood of attending a match school (Dillon & Smith, 2017).

Thankfully, the Chicago Public Schools system has made improvements in enrolling its graduates into match colleges. According to Roderick et al.'s (2016) analysis, following a previous decline, match rates have steadily increased since 2013. However, those rates still hover below 50% depending on student access level, leaving a lot of potential for utilizing match as a strategy for increasing graduation rates. Within CPS, students with similar GPA and SAT scores that attend different high schools have dramatically different postsecondary outcomes, and an estimated half of this gap is accounted for by college choice. This is particularly true of higher-achieving students: as GPA increases, so does the importance of attending a match college in order to maximize chances of graduation. CPS' higher-achieving students would be an estimated 13 percentage points likelier to graduate from college if none undermatched in their college choice (Roderick et al., 2016).

With CPS students both undermatching and dropping out of college at high rates, preventing the former seems like it could be an effective way of preventing the latter. Much of the research focusing on boosting match rates has focused on filling financial (Bettinger et al., 2012) and application (Roderick et al., 2011; Byndloss et al., 2015) information gaps, especially as they pertain to high-achieving high school students who potentially have many college options (Hoxby & Avery, 2012). Relatively little research has looked into how financial aid might be

contributing to the rates of undermatching. We know that state appropriations for Illinois public universities have fallen by nearly one billion dollars since 2005, causing state school tuition and fees to climb and CPS students to take out larger loans (Westbrook & Swanson, 2019). While college graduation rates typically increase significantly alongside college selectivity levels (Appendix F), the financial costs could outweigh the benefits of increased college selectivity, and this burden might not be shared equally among different types of students. The relatively low tuition and fees at the least selective colleges and relatively generous financial aid provided by the most selective colleges would indicate that matching into either of these school groups is less financially prohibitive. Students in the middle though, with the academic credentials to gain access to colleges in the middle of the selectivity spectrum, might not be able to afford a match college. This reasoning is what led Bastedo and Flaster (2014) to posit that “colleges in the middle of the prestige hierarchy may confer worse outcomes than those at the bottom when student loan burden is considered.” This study seeks to investigate the extent to which CPS students are grappling with this tension between match and affordability.

DATA AND METHODS

This study was conducted in collaboration with the University of Chicago Inclusive Economy Lab (IEL), a public policy research organization that, in part, handles a portfolio of work related to education equity in Chicago. In its “Best-Fit” study, IEL seeks to understand the academic, social, and financial aspects of enrollment and persistence patterns for CPS students. My involvement with the study pertained to the academic and financial aspects of college enrollment.

Conducting analysis on net cost and academic match requires two general components: application and college data. For the former, IEL has a data-sharing agreement with CPS, which

includes college application data from Naviance, the college and career organizational service used by CPS students to fulfill high school graduation requirements and manage college application materials. Students add college applications to their Naviance profiles, letting administrators at their schools know when to send documentation such as transcripts. Data in this analysis included 102,486 college applications submitted by 11,981 students from 104 different high schools (Table 1). All 11,981 students applied to at least one college through the Naviance system in the 2020-21 school year. Additional student data included GPA and SAT scores, the two components used by CPS to determine a student's likelihood of acceptance to a given college (Appendix A), and whether a student qualified for free or reduced-price lunch, which provided a financial indicator for making more granular financial aid estimates in some cases.

After assessing student access levels for each individual who added a college application to their Naviance profile, I was able to determine academic match by comparing student access levels to college selectivity levels. CPS uses its own publicly-available college selectivity list, with selectivity designations determined by its own admissions data and the Barron's selectivity index—a widely-used standard for assessing college selectivity. Additionally, I needed a way of imputing the net cost for each student and every submitted application. In order to create these estimates, I pulled three types of higher education institution data from the Integrated Postsecondary Education Data System (IPEDS): cost of attendance broken down by state residency status, average aid in the form of grants and scholarships by income level, and 6-year graduation rates by racial group. The first two data types were used to impute financial aid information for each application listed in the CPS Naviance database. Analysis involving graduation rates matched the racial identity of a given student to the corresponding graduation rate at the schools they applied to.

Lastly, I used postsecondary outcome data from the U.S. Department of Education for purposes of comparing net cost differentials to debt and earnings figures (Table 4). These data were limited to students with demonstrated financial need who received federal financial aid, in the form of Pell Grants, federal student loans, and/or PLUS loans provided to parents to help cover the costs of their student's education.

Analytic Strategy

The main analysis of this study looked into whether net cost substantially differed by match level for students with different academic profiles. It began with the approximately 100,000 applications that CPS seniors submitted in the 2020-2021 academic year. Knowing the true net cost associated with each of these applications was not possible because they were only application data and not acceptance data. Even among accepted students, there is a lot of variation in exact net cost of college because of differences in charges between colleges and aid between students (Burd et al., 2018). In order to estimate net cost, I used a simplified standard that took the difference between average tuition and fees from an institution and average gift aid, such as scholarship and grant funding, that students at that institution received in the 2019-2020 school year. Cases where gift aid was greater than tuition and fees resulted in a negative net cost. The specific gift aid amount was imputed based on the lunch-status financial indicator: if a student qualified for free lunch they were assigned the average aid for the \$0 to \$30,000 income band, reduced lunch to the \$30,000 to \$48,000 income band, and all other students to the average aid amount for \$48,000 and up. Specific lunch-status and income band pairings were made based on the U.S. Department of Agriculture's income guidelines for lunch status (*Fiscal Year 2019 Income Eligibility Guidelines*, 2019).

Since this study's sample came from Chicago Public Schools, in-state tuition and fees were issued for colleges within Illinois, and out-of-state costs were issued to non-Illinois schools. These net costs calculations were assessed at the application level, and then aggregated at the student level after match was determined. While this net cost estimation left out important considerations such as room and board, it's important to note that the goal of calculating net cost in this study was standardization for purposes of comparison. Although the estimated net costs used in this study were likely different from what they were in reality for each student, they provide useful comparison points nonetheless.

Calculating match level for each college application was a process of assessing student access against college selectivity. Student academic credentials were assigned a number value based on the match grid criteria in Appendix A. "Near Open Admission," "Slightly Competitive," "Moderately Competitive," "Competitive," and "Highly Competitive" were 1, 2, 3, 4, and 5, respectively. The same was done for college selectivity, with the addition of the "Highly Competitive Plus" category receiving a value of 6, which is reserved for the most selective schools. This category is not included in the CPS student match grid because no GPA and SAT score combination is high enough to ensure likely admission into "Highly Competitive Plus" colleges (Espenshade & Chung, 2005). After assigning these values, I calculated academic match by subtracting the college selectivity number from the student access number. Any score higher than 0 was considered a "Safety," scores equal to 0 were considered a "Match," scores equal to -1 were considered a "Reach," and any scores less than -1 were considered a "Far Reach." For example, if a competitive student with a 3.2 GPA and 1050 SAT score applied to the highly competitive Illinois Institute of Technology (IIT), the match calculation would be $4 - 5 = -1$, so IIT would be considered a reach school for that student. I was primarily concerned with

the difference in net costs between safety, match, and reach schools, since they are institutions that students are more likely to be accepted into, whereas students are highly unlikely to be admitted to far reach schools.

After estimating a net cost and calculating a match level for each application, I conducted tests of significance. I used a one-way analysis of variance (ANOVA) at each student access level to determine whether mean net cost significantly varied by academic match designation. The null hypothesis for each of these tests was that mean net cost across match levels was the same, while the alternative hypothesis was that mean net cost across match levels was not the same. In cases where I rejected the null hypothesis in favor of the alternative, I used a Tukey's Honestly Significant Difference (HSD) test in order to determine which sample means were significantly different.

RESULTS

Table 1 provides a general overview of demographics from students who submitted applications. It's interesting to note that female students submitted a disproportionately high number of applications, which is in keeping with Nagaoka et al's (2020) finding that young men were less likely to matriculate into college than young women across all racial groups within CPS. There's also a disproportionately high number of applications submitted by highly competitive students, who averaged 11.3 applications, whereas near open admission and slightly competitive students submitted less than 7 applications on average, a trend likely due to higher-achieving students seeking more college options and vice-versa. Over 70% of application-submitting students were eligible for free or reduced lunch, speaking to the high levels of financial need many CPS students have as they begin making efforts to pursue postsecondary education.

Table 1*Demographic Characteristics of Students at Both Student and Application Level*

	By Student		By Application	
	Count (n = 11,981)	Proportion	Count (n = 102,486)	Average Apps
Race				
Asian	820	6.84	7,862	9.59
Black	3,455	28.80	33,099	9.58
Hispanic	5,854	48.90	43,744	7.47
White	1,583	13.20	15,081	9.53
Other	269	2.25	2,700	10.00
Gender				
Female	6,566	54.80	63,038	9.60
Male	5,415	45.20	39,448	7.28
Lunch Status				
Free	7,982	66.60	63,681	7.98
Reduced	922	7.70	7,811	8.47
N/A	3,077	25.70	30,994	10.10
Student Access Level				
Near Open Admission	768	6.41	3,006	3.91
Slightly Competitive	3,471	29.00	21,652	6.24
Moderately Competitive	2,301	19.20	19,559	8.50
Competitive	1,964	16.40	18,967	9.66
Highly Competitive	3,477	29.00	39,302	11.30

Note. This table provides counts and proportions of demographics associated with application data used in this study. The “By Student” column spanner represents student counts, while the “By Application” aggregates college applications by the associated demographic characteristics. The “Average Apps” column lists the average number of applications submitted by a particular demographic.

Appendices B through D provide a big-picture overview of net cost information by match level. The counts in type of application may seem like cause for concern, given that there are nearly 8,000 less match applications than safety, potentially indicating a greater propensity for undermatching among the CPS student body. However, it's important to consider that, especially for more competitive students, there are simply more safety schools than match schools. The relative bounty of safety applications may therefore just be a function of available options. What is more concerning is the finding that match schools for CPS students, on average, are significantly more expensive than safety and reach schools (Appendix C). This is clearly not always the case, given the overlapping ranges within a standard deviation of the mean net cost for differing match levels (Appendix B). Still, the fact that there's a financial disincentive to attend postsecondary institutions deemed most appropriate to the academic qualifications of CPS students seems counterproductive to the goal of getting more students into match colleges.

Net costs of match colleges are not uniformly expensive, however. They are only the most expensive colleges for competitive and highly competitive students. At a mean net cost of \$11,281.84 and \$12,832.43 respectively (Table 2), match schools for competitive and highly competitive students are significantly more expensive than their safety and reach counterparts (Table 3). It's important to pay particular attention to the difference in cost between match and safety schools, as the two demarcate the boundary at which undermatching occurs. Match schools are also significantly more expensive than safety schools for slightly and moderately competitive students, but those differences are small in comparison to the same calculation for competitive and highly competitive students who are faced with an average match premium of \$5,212.93 and \$2,256.08, respectively. Table 3 shows that there is no greater financial incentive to undermatch within CPS than for the highest academically-performing students.

Table 2*Descriptive Statistics of Applications and Net Cost by Student Access and Match Levels*

Access Level	Mean	SD	Min	Max	Count	Average Apps
Near Open Admission	\$4,086.36					
Match	\$3,643.50	\$1,874.62	\$-3,640	\$18,215	1,319	1.76
Reach	\$3,127.35	\$3,967.36	\$-3,044	\$21,833.00	597	0.78
Far Reach	\$4,954.78	\$7,755.46	-\$21,718	\$35,602.67	1,019	1.33
Slightly Competitive	\$4,679.30					
Safety	\$3,645.55	\$2,001.21	\$-3,685	\$24,381	4,562	1.35
Match	\$4,329.77	\$4,836.60	\$-6,906	\$21,833	4,010	1.16
Reach	\$3,953.32	\$5,734.58	\$-6,100	\$34,902	7,768	2.24
Far Reach	\$6,487.66	\$10,669.84	\$-21,718	\$38,333.67	4,958	1.43
Moderately Competitive	\$6,021.25					
Safety	\$4,875.28	\$4,377.58	\$-7,092	\$23,093.67	4,604	2.02
Match	\$5,151.01	\$6,209.12	\$-6,100	\$31,128.33	7,175	3.12
Reach	\$9,967.45	\$7,754.15	\$-3,896	\$35,602.67	4,873	2.12
Far Reach	\$2,079.40	\$14,729.81	\$-22,593	\$39,984.33	2,637	1.15
Competitive	\$7,281.25					
Safety	\$6,049.54	\$6,163.86	\$-5,635	\$31,128.33	8,321	4.24
Match	\$11,262.47	\$8,458.80	\$-6,918	\$35,602.67	5,802	2.95
Reach	\$8,967.87	\$12,021.13	\$-13,642	\$31,744.67	2,569	1.31
Far Reach	\$-1,977.42	\$16,371.09	\$-22,593	\$39,984.33	2,090	1.06
Highly Competitive	\$8,730.63					
Safety	\$10,610.37	\$8,876.75	\$-6,918	\$35,602.67	16,797	4.83
Match	\$12,866.45	\$12,671.45	\$-13,651	\$31,744.67	8,166	2.35
Reach	\$3,814.47	\$16,255.11	\$-22,593	\$39,984.33	14,048	4.04

Note. SD = Standard Deviation. All net costs are in U.S. dollars.

Table 3
One-Way ANOVA Test of Mean Net Costs by Access and Match Levels

Access Level	Difference in Mean Net Costs					
	Match - Safety	Match - Reach	Match - Far Reach	Safety - Reach	Safety - Far Reach	Reach - Far Reach
Near Open Admission	NA	\$516.16*	\$-1,311.28***	NA	NA	\$-1,827.43***
Slightly Competitive	\$684.22***	\$376.45*	\$-2,157.89***	\$-307.77***	\$-2,842.11***	\$-2,534.34***
Moderately Competitive	\$275.74	\$-4,816.44***	\$3,071.61***	\$-5,092.17***	\$2,795.88***	\$7,888.05***
Competitive	\$5,212.93***	\$2,294.60***	\$13,239.89***	\$-2,918.33***	\$8,026.96***	\$10,945.29***
Highly Competitive	\$2,256.08***	\$9,051.98***	NA	\$6,795.90***	NA	NA

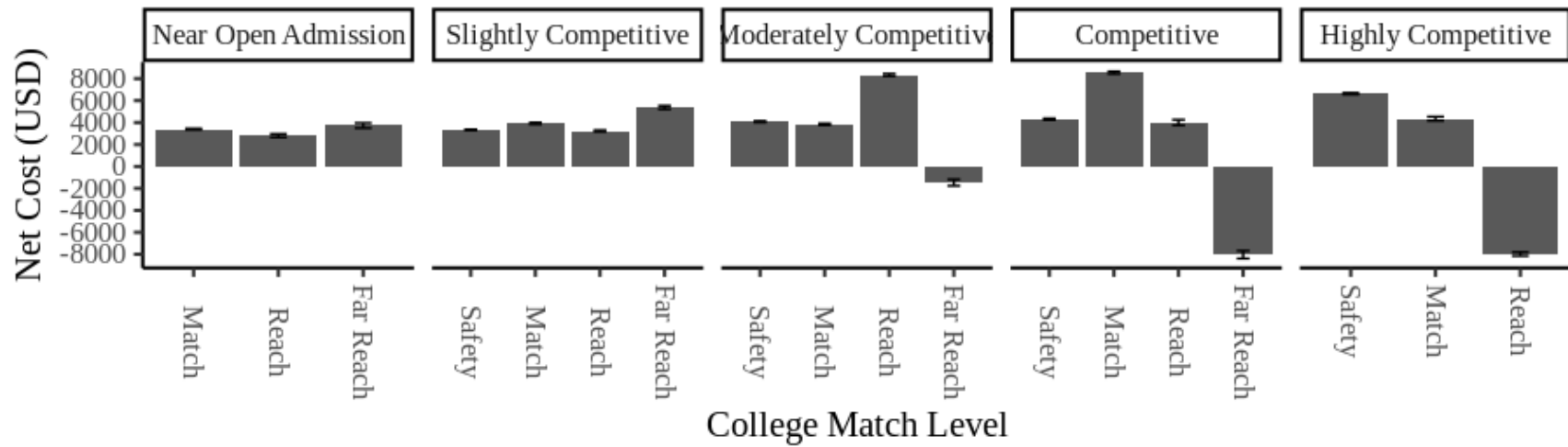
Note. This table shows the differences in mean net costs between different match levels by student access level. *** $p < .001$, * $p < .10$

Given that competitive and highly competitive schools appear to pose a significantly higher financial barrier to entry for CPS students, it's worth examining if there's a particular type of competitive school driving these higher costs. For example, public schools often charge differential tuition rates depending on student residency status. Could it be that out-of-state public competitive schools are inflating the overall average cost of public schools? Appendix H provides a breakdown of the different types of competitive and highly competitive schools that were considered matches for CPS students. Out-of-state schools have the largest mean costs for both groups, and when public out-of-state schools are excluded from the sample applications, estimated net costs at match schools drop significantly for highly competitive students, but remain high for competitive students (Appendix I). The higher proportion of applications to the expensive out-of-state public schools among students with high access levels can likely be explained by the relative affluence of these students compared to other groups (Appendix J).

The heterogeneity in student wealth between access groups raises another complication: perhaps wealthier high-achieving students applied to relatively expensive match schools or receiving less need-based financial aid, such that there's less of a practical disincentive for them to attend a match school. Again, this seems to be the case for highly competitive students but not for competitive students. Figure 1 shows that limiting comparisons to just low-income students changes the relative unaffordability of match schools for highly competitive students, but not so for competitive ones. In fact, at \$8,567.06, match schools for competitive, low-income students had the highest mean net cost out of all college match levels for low-income students. For the CPS students who have the least means of paying for postsecondary education, those among them considered academically competitive appear to face the greatest financial barriers to enrolling in a college deemed appropriate for their skillset.

Figure 1

Distribution of Net Costs by Student Access and College Match Levels for Low-Income Students Only



Note. This figure provides net cost aggregations with an exclusive focus on low-income students, as determined by CPS free and reduced-lunch indicators.

DISCUSSIONS AND CONCLUSIONS

While many studies have expounded on the potential benefits of enrolling into match colleges, few have investigated the financial considerations necessary for acting on such a plan. This study provides suggestive evidence that low-income students with the GPA and SAT scores to be considered “Competitive” are uniquely troubled by the proposition of attending a match college, as these match schools are the most expensive of any other academic grouping of schools available to them. Given that attending match schools increases in importance as student access increases (Roderick et al., 2016), the abnormally expensive nature of match schools for low-income competitive students poses a significant threat to maximizing the benefits that college choice could have for CPS students.

Other research provides some insight into why competitive colleges are unique in their high net costs. Hoxby (2009) looked at historical trends in student enrollment and per-student spending by institutions and found that as students grew increasingly willing to travel further from home to attend college, selective colleges felt increased pressure to spend resources on attracting students from afar. The more selective a college was, the more likely it had the means to increase its per-student spending, and the less likely it was to depend on tuition dollars to cover those costs—using alumni donations and endowment funds instead. However, less-selective institutions did not increase their per-student spending as much, continuing to attract primarily local students and to depend on tuition dollars to cover expenses. It seems possible that schools deemed “Competitive” are in a particularly bad position to attract low-income students, because they are selective enough to want to compete for non-local students by increasing per-student spending, but have not reached high-enough levels of prestige to collect the donation money and grow their respective endowments to the point where they can provide the generous financial aid

packages that “Highly Competitive” and “Highly Competitive Plus” schools can provide to the admitted students that need them.

Study Limitations

There are many imperfections with the execution of this study. To start, the net costs associated with each application are estimates and not true values. These estimates are likely to differ from true values due to variations in need-based and merit-based aid. For example, students applying to undermatch schools are likely to be offered merit-based institutional aid because of the relative strength of their academic credentials compared to other applicants, which is a difference not accounted for in these estimates. Additionally, it’s common for colleges to charge different amounts of tuition and fees depending on the program of study (Wolniak et al, 2018). Ideally, net costs would be taken directly from student financial aid award letters, which are tailored to the specific socioeconomic and academic situations of each student.

Considering that I analyzed application data from the 2020-21 school year, it’s important to note the potential impacts of COVID-19 on these findings. The number of schools using a test-optional admissions policy—in which standardized test scores were not necessary for admission—nearly doubled to over a thousand schools from 2020 to 2021 (Lovell & Mallinson, 2021). This was a particularly popular policy among more selective institutions, and coincided with record-high numbers of applications submitted to many of them (Adler, 2021). Test-optional admissions complicates the method for determining student access levels used by CPS and this study, as students with relatively low test scores might have gained admission to normally inaccessible schools based on the strength of other aspects in their applications. While findings on net cost with a basis in college selectivity were likely not affected by test-optional, the assignment of student access levels could have been.

This study was largely concerned with academic match, which is the act of comparing a student's access level to the selectivity levels of the colleges they have been accepted to. However, the data used in this study do not indicate the admission status of these applications. GPA and SAT scores are used as a proxy for estimating the relative likelihood of admission into the colleges listed in Naviance, but these are not the sole considerations in determining admissibility, especially at more selective college levels (Bastedo & Flaster, 2014). Holistic admissions processes often involve factors such as essays, strength of academic schedule, student demographics, and extracurricular activities (Killgore 2009), meaning that the reductive nature for determining match in this study likely contributed to inaccuracies. There are almost certainly CPS students in the class of 2021 who were denied admission to safety schools, and others who gained admission to far reach schools.

Another unknown factor is the enrollment status of these students. The notion that relative differences in net cost may lead to differences in enrollment is a presupposition until shown otherwise. Although financial concerns are a primary consideration (Taylor et al., 2011), there are plenty of other factors students consider in choosing a college, including proximity (Ovink et al., 2018), social fit (Dillon & Smith, 2017), and familial input (Elliott et al., 2018). These considerations, in addition to student affluence, can all contribute to mitigating the influence that net cost might have on enrollment.

Lastly, it's important to note that match isn't always associated with better postsecondary outcomes for students. There can be extensive overlap in the range of graduation rates between college selectivity levels (Roderick et al., 2016; Appendix E), meaning that some students may have a better chance of graduating from an undermatch institution than a match or even a reach institution. The significantly different levels of net cost and graduation rate shown in this study

are aggregations. While the implications of this study's findings are likely true in general, there are certainly plenty of specific cases in which they do not apply.

Implications

Future research on net cost and match can build on this analysis in a number of important ways. Collecting actual financial aid award letters would help ensure that students were accepted to a given institution and have the necessary information to compare net costs. Award letters would also give researchers as accurate measures of net cost as possible. Pairing those award letter data with enrollment data would allow for better assessment of whether the financial incentives laid out in this study are actually associated with certain match patterns in enrollment. These future findings could then be put into conversation with research on other factors contributing to enrollment decisions, which would help develop sensible and sensitive ways of advising students on choosing the college options that are best for their individual needs.

Even before future investigation takes place, the significant findings from this study may be cause for certain changes. With net costs at competitive schools so high, there's a natural question about whether attending such a school is even worth the additional cost, especially for low-income students who are likely to have to cover those costs with loans. While the answer to this question varies greatly depending on individual situations, the answer in the aggregate seems to be that it makes economic sense for more students to attend competitive than moderately competitive schools. Table 4 provides average student outcomes by college selectivity level. Graduation rates are nearly 20 percentage points higher, and median annual earnings over \$10,000 greater, for federal financial-aid recipients at competitive schools compared to moderately competitive schools. However, it's important to note that while average federal student debt is nearly the same at both types of schools, parental debt taken on to fund student

education is much higher at competitive schools, with average PLUS loans totaling among recipients as high as \$44,812.62 compared to \$27,526.92 at moderately competitive schools. Although student outcomes are generally improved by attending a competitive school over a moderately competitive school, these outcomes are contingent on students actually reaching graduation, and often both students and parents take on a heavy financial burden to get them there.

Table 4
Outcome Indicators for Low-Income Students across College Selectivity Levels

Selectivity Level	Financial Indicator					
	Earnings	Graduation Rate	Federal Student Debt	Student Monthly Payment	Parent PLUS Debt	Parent Monthly Payment
Near Open Admission	\$34,444.93	32.43	\$23,721.44	\$237.14	\$18,388.21	\$206.74
Slightly Competitive	\$44,451.74	25.68	\$21,935.61	\$219.28	\$18,049.27	\$202.93
Moderately Competitive	\$50,576.27	45.66	\$23,577.19	\$235.69	\$27,526.92	\$309.49
Competitive	\$61,036.76	64.16	\$22,796.82	\$227.89	\$44,812.62	\$503.84
Highly Competitive	\$69,124.09	75.66	\$22,659.42	\$226.52	\$44,375.16	\$498.92
Highly Competitive Plus	\$79,972.37	91.34	\$17,133.70	\$171.28	\$51,429.13	\$578.23

Note. All values except graduation rates are in U.S. dollars. All values are means except for “Earnings”, which represents median annual income 10 years out from graduation. Debt amounts are totals at the time of graduation. Graduation rates are race-specific. Analysis does not include out-of-state public schools.

With these findings in mind, high-achieving, low-income CPS students should be encouraged to apply to postsecondary institutions that will maximize their likelihood of graduation and lifetime success. This could entail applications to highly competitive and highly competitive plus schools, which often offer higher graduation rates (Appendix G) at lower net costs to students with demonstrated financial need. Since these “Reach” schools are less likely to admit competitive students, postsecondary advisers within CPS can also consider promoting match schools with relatively low net costs and competitive graduation rates. Appendices K and L offer non-exhaustive lists of moderately competitive and competitive schools that show promise in producing relatively good outcomes for CPS students with demonstrated financial need. The unique expense found in match schools for low-income competitive students, in addition to these students being among those who stand to benefit the most from attending a match school, could also help provide a criteria for funneling limited philanthropic funds for organizations looking to improve postsecondary outcomes for CPS students.

Such policies could help meaningfully increase the number of CPS students who go on to graduate from college. However, it’s worth considering the larger role that postsecondary institutions play in shaping social mobility. The findings from this study bring particular attention to competitive students, implying that these are individuals who can *compete* for a limited number of spots at certain schools. There’s considerable evidence that higher-SES students often employ their resources for the purpose of increasing SAT scores (Alon, 2009) and accessing higher quality schools (Bastedo & Jaquette, 2011), which maintains their hold over a disproportionate share of selective college admissions spots even as lower-SES students also increase their GPA and test scores. As a result, Lucas (2001) suggests that even if everyone were

perfectly matched to colleges based on academic credentials, the number of low-SES students at more selective schools would not change because of the influence that high family income has on maintaining a competitive edge relative to the overall college application pool. This state of low supply and high demand is what led Melissa Roderick (2016) to conclude that:

“College choice is a viable solution for immediately increasing college completion rates, but without an equal increase of quality performing colleges to meet the demand of students, the payoffs for increasing college choice are short-lived. The problem of college completion falls equally on the shoulders of high schools and higher education institutions. The demand for quality college slots far exceeds the supply, and low-income students—lacking the buying power of their more affluent counterparts—are often at a distinct disadvantage on the road to college completion” (p. 39).

Although college continues to be a space of great potential for socioeconomic mobility, a systematic reorganization of the American higher education system is likely necessary before that potential can be fully realized.

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Appendix A

CPS Match Grid

College Match Grid 2021-2022

CPS and the To&Through Project are piloting this grid during the 2021-22 school year. Your feedback on the grid's accuracy and usability are critical to improvements. Please submit feedback using our form: bit.ly/2X0IBF7



SAT	GPA					
	< 2.0	2.0-2.4	2.5-2.9	3.0-3.4	3.5-4.0	
1250+	MODERATELY COMPETITIVE	MODERATELY COMPETITIVE	COMPETITIVE	HIGHLY COMPETITIVE	HIGHLY COMPETITIVE	HIGHLY COMPETITIVE
1160-1250	MODERATELY COMPETITIVE	MODERATELY COMPETITIVE	COMPETITIVE	HIGHLY COMPETITIVE	HIGHLY COMPETITIVE	COMPETITIVE
1060-1150	MODERATELY COMPETITIVE	MODERATELY COMPETITIVE	COMPETITIVE	COMPETITIVE	HIGHLY COMPETITIVE	MODERATELY COMPETITIVE
960-1050	SLIGHTLY COMPETITIVE	MODERATELY COMPETITIVE	MODERATELY COMPETITIVE	COMPETITIVE	HIGHLY COMPETITIVE	SLIGHTLY COMPETITIVE
860-950	NEAR OPEN ADMISSION	SLIGHTLY COMPETITIVE	MODERATELY COMPETITIVE	MODERATELY COMPETITIVE	COMPETITIVE	NEAR OPEN ADMISSION
< 860	NEAR OPEN ADMISSION	SLIGHTLY COMPETITIVE	SLIGHTLY COMPETITIVE	SLIGHTLY COMPETITIVE	MODERATELY COMPETITIVE	

Note: Certain institutions are categorized as **Highly Competitive Plus**, such as Northwestern University and MIT. Regardless of students' GPA and SAT, Highly Competitive Plus institutions are a "Reach" for all students and are therefore not part of this grid.

The To&Through Project is currently unable to predict admissibility for students who apply test optional. However, a group of CPS practitioners recommends that counselors and coaches use the 960-1050 row for students with greater than a 3.0 GPA and the 850-960 for students with less than a 3.0 GPA.

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Appendix B*Descriptive Statistics of Net Cost by College Match Levels*

Match Level	Mean	SD	Min	Max	Count
Safety	\$7,806.48	\$7,680.44	\$-7,092	\$35,602.67	34,284
Match	\$8,671.01	\$9,682.34	\$-13,651	\$35,602.67	26,472
Reach	\$5,284.61	\$12,718.35	\$-22,593	\$39,984.33	29,855
Far Reach	\$3,602.89	\$13,224.04	\$-22,593	\$39,984.33	10,704

Note. SD = Standard Deviation. Net cost calculated by subtracting total financial aid from cost of attendance (tuition + fees). Discrepancy in application total from Table 1 accounted for by certain schools not having an assigned selectivity level. All costs given in U.S. dollars.

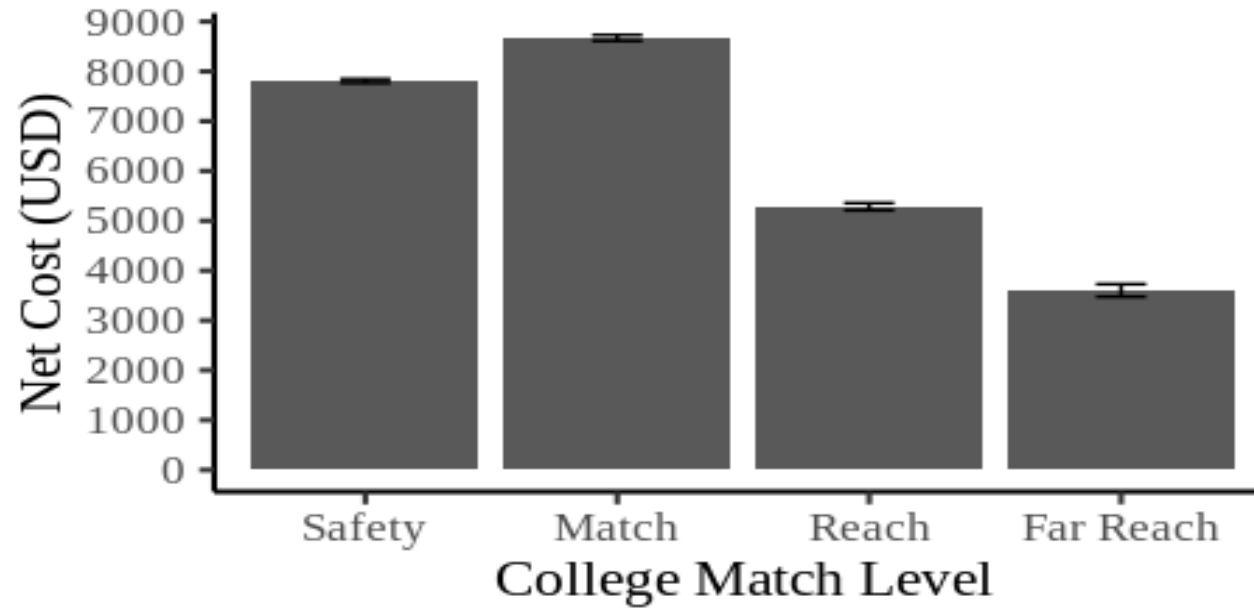
Appendix C

One-Way ANOVA Test of Mean Net Costs by Match Level

	Difference in Mean Net Costs
Match - Safety	\$864.53***
Match - Reach	\$3,386.40***
Match - Far Reach	\$5,068.12***
Safety - Reach	\$2,521.87***
Safety - Far Reach	\$4,203.59***
Reach - Far Reach	\$1,681.72***

Note. This table shows the differences in mean net costs between different match levels. All values given in U.S. dollars. *** $p < .001$

Appendix D

Distribution of Net Costs by College Match Level

Note. This figure shows the mean net cost values from Appendix B with the 95% confidence intervals used to determine the levels of significance noted in Appendix C.

Appendix E*Descriptive Statistics of Race-Specific Graduation Rate by Student Access and Match Levels*

Access Level	Mean	SD	Count
Near Open Admission			
Match	26.71	28.07	79
Reach	23.87	14.33	597
Far Reach	47.58	17.17	1,020
Slightly Competitive			
Safety	31.40	28.88	284
Match	27.11	14.77	4,011
Reach	43.22	12.86	7,768
Far Reach	68.28	12.81	4,958
Moderately Competitive			
Safety	30.01	16.07	2,671
Match	46.37	13.05	7,175
Reach	63.67	9.44	4,873
Far Reach	81.20	11.10	2,637
Competitive			
Safety	45.27	15.45	7,346
Match	65.17	9.31	5,802
Reach	77.42	8.70	2,569
Far Reach	88.90	8.38	2,090
Highly Competitive			
Safety	60.68	15.30	16,117
Match	80.77	8.32	8,166
Reach	91.54	5.87	14,048

Note. SD = Standard Deviation. Discrepancy in counts from Appendix B because not all schools report graduation rates. Graduation rates are percentages.

Appendix F

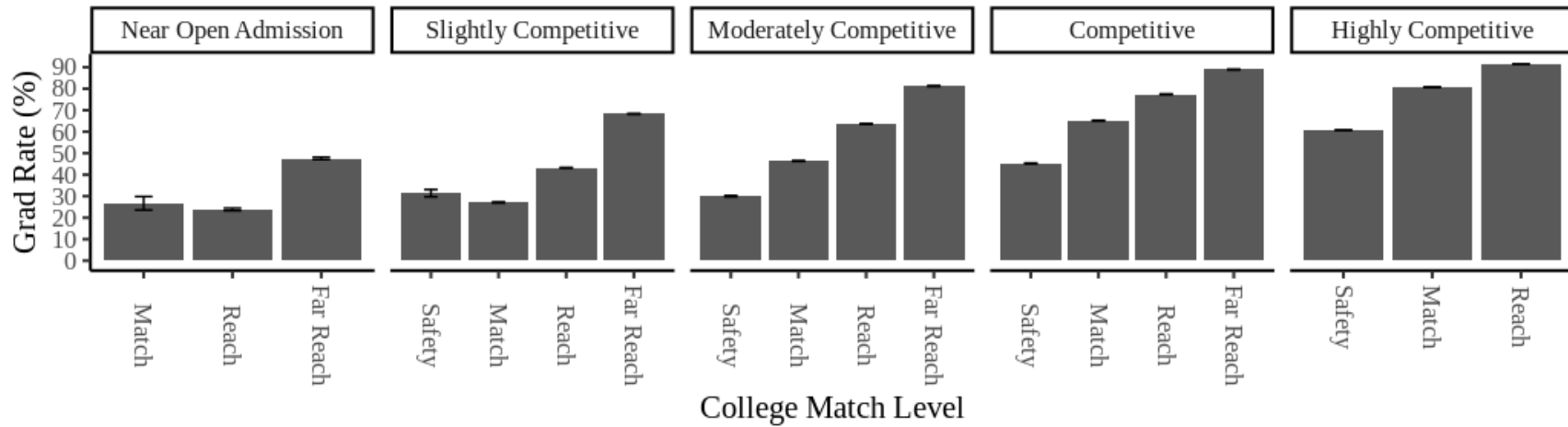
One-Way ANOVA Test of Mean Race-Specific Graduation Rates by Access and Match Levels

Access Level	Difference in Mean Graduation Rate (percentage point)					
	Match - Safety	Match - Reach	Match - Far Reach	Safety - Reach	Safety - Far Reach	Reach - Far Reach
Near Open Admission	NA	2.84	-20.87***	NA	NA	-23.71***
Slightly Competitive	-4.29***	-16.10***	-41.17***	-11.81***	-36.88***	-25.06***
Moderately Competitive	16.36***	-17.30***	-34.84***	-33.66***	-51.19***	-17.54***
Competitive	19.90***	-12.25***	-23.73***	-32.15***	-43.64***	-11.48***
Highly Competitive	20.09***	-10.76***	NA	-30.86***	NA	NA

Note. This table shows the differences in mean net costs between different match levels by student access level. Graduation rates are percentage of students who graduate within 6 years. *** $p < .001$.

Appendix G

Distribution of Race-Specific Graduation Rates by Student Access and College Match Levels



Note. This figure shows the differences in mean graduation rates between different match and student access levels. Graduation rates are percentage of students who graduate within 6 years.

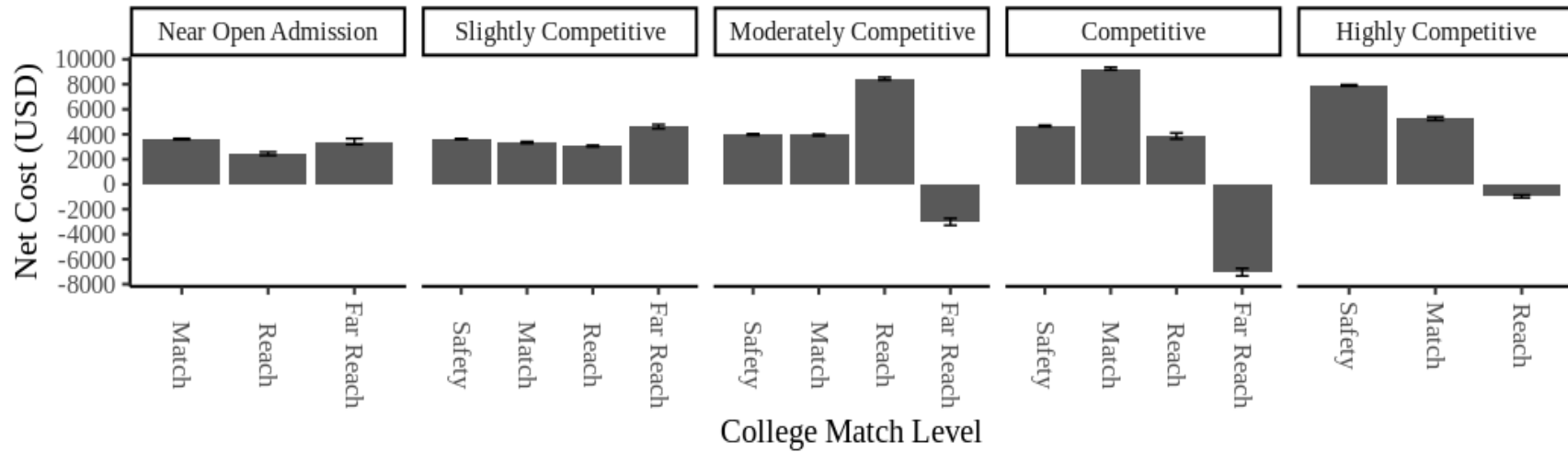
Appendix H*Composition of Match Applications from Competitive and Highly Competitive Students*

School Type	Location	Average Net Cost	Count	Proportion
Competitive				
Public	In-State	\$815	1,154	20.00
Public	Out-of-State	\$18,914	1,203	20.70
Private	In-State	\$12,308	2,675	46.10
Private	Out-of-State	\$11,335	770	13.30
Highly Competitive				
Public	In-State	\$-1,819	1,980	24.20
Public	Out-of-State	\$23,296	3,444	42.20
Private	In-State	\$5,776	663	8.12
Private	Out-of-State	\$11,837	2,079	25.50

Note. This table provides specific information on the types of competitive and highly competitive applications from students with commensurate academic credentials. Net cost given in U.S. dollars. Proportions given in percentages.

Appendix I

Distribution of Net Costs by Student Access and College Match Levels, Out-of-State Public Schools Excluded



Note. This figure provides the same aggregations as those in Figure 1, not including out-of-state public schools.

Appendix J*Composition of Free and Reduced-Price Lunch Students by Student Access Level*

Student Access	Free	Reduced	N/A
Near Open Admission			
Count	668	41	59
Proportion	87.00	5.34	7.68
Slightly Competitive			
Count	2,908	261	302
Proportion	83.80	7.52	8.70
Moderately Competitive			
Count	1,721	183	397
Proportion	74.80	7.95	17.30
Competitive			
Count	1,204	179	581
Proportion	61.30	9.11	29.60
Highly Competitive			
Count	1,481	258	1,738
Proportion	42.60	7.42	50.00

Note. This is a table showing the number and frequencies of students qualifying for free or reduced-price lunch among CPS college applicants. Proportions given as percentages.

Appendix K

Example High-Performing College Options within Illinois for Competitive Students

College Name	School Type	Selectivity	Net Cost	Graduation Rate	Student Debt	Parent PLUS Debt
Illinois State University	Public	Moderately Competitive	\$13,897.77	68	\$20,000	\$28,873
University of Illinois at Chicago	Public	Competitive	\$10,648.88	63	\$17,250	\$25,323
Illinois College	Private	Moderately Competitive	\$12,462.48	68	\$27,000	\$21,779
Lewis University	Private	Moderately Competitive	\$13,561.08	70	\$22,746	\$28,979
Knox College	Private	Competitive	\$15,190.82	71	\$27,000	\$31,933
Bradley University	Private	Competitive	\$16,697.27	74	\$27,000	\$45,548
Augustana College	Private	Competitive	\$17,142.66	77	\$27,000	\$34,000
Illinois Wesleyan University	Private	Competitive	\$19,467.91	82	\$27,000	\$41,578

Note. All values are means except for “Earnings”, which represents median annual income 10 yrs out from graduation. Net cost, student debt, and parent PLUS debt given in U.S. dollars. Graduation rates are race-specific.

Appendix L

Example High-Performing College Options Outside of Illinois for Competitive Students

College Name	State	School Type	Selectivity	Net Cost	Graduation Rate	Student Debt	Parent PLUS Debt
Berea College	KY	Private	Moderately Competitive	\$4,531.00	67	\$3,700	NA
Saint Mary's College	IN	Private	Moderately Competitive	\$12,215.68	81	\$27,000	\$40,000
Beloit College	WI	Private	Competitive	\$8,076.24	78	\$26,000	\$29,127
St. Lawrence University	NY	Private	Competitive	\$10,510.20	80	\$26,890	\$48,266
College of Wooster	OH	Private	Competitive	\$13,307.25	74	\$26,000	\$41,684
Lawrence University	WI	Private	Competitive	\$13,640.53	79	\$25,947	\$43,604

Note. All values are means except for “Earnings”, which represents median annual income 10 yrs out from graduation. Net cost, student debt, and parent PLUS debt given in U.S. dollars. Graduation rates are race-specific.