Double Counting: The Effect of Wealth on College Admissions

Ethan Hensley

Advisor: Professor Svec

The College of the Holy Cross

Economics Honors Program

Introduction

"I got in!!" These words barrel out of many high school seniors as they receive different acceptance letters from Universities across the country. Growing up, students are told they need to study hard, get good grades, engage in extracurriculars, and do well on standardized tests to gain admission into their dream school, but is that really true? College admissions is like a top-secret government program; few people really know what goes on behind closed doors. Universities across the country proclaim different admissions metrics that entice students to apply; however, they never tell you quite what they are looking for. Recall in the beginning of 2019, news broke of a large, preposterous college admissions scandal involving a plethora of applicants to some of the best collegiate institutions in the United States. This investigation, code named "Operation Varsity Blues", exposed many parents and their children for bribes to gain admission into prestigious universities. According to the New York Times, 53 parents have been charged as a part of this conspiracy, and there are many court cases that are yet to be resolved relating to this matter (Medina et. al. 6). These parents, many of them wealthy and famous, paid for their children's SAT scores to either be inflated or for someone else to take these exams on their behalf. This is cheating in the highest regard, but it does not stop there. These parents also paid many collegiate sports coaches hundreds of thousands of dollars, or in some cases, millions of dollars, to recruit their child for a sports scholarship to these universities. However, the worst part is many of these children that were falsely recruited did not even play the sport they were given a scholarship for and used it as a ploy to gain entrance. More than a year and a half after this news first broke, allegations continue to persist, and this entire scandal likely will not be fully resolved any time soon. I highlight this scandal to show just how much wealth and fame can influence even the "fairest" system in our society, college admissions. For the longest time, I thought the college going process was the most accurate, sacred, and equitable system since these universities claim they want to support the social good in our world; however, how can that be true when so many students were getting admitted into colleges only because their family had the money to buy their way in? “Work hard, get good grades, and do your best in school” does not seem so enticing anymore if wealth plays such a large role in college admissions.

While the scandal I discussed lays bare the benefits of wealth on gaining admission into prestigious universities, there are more subtle ways in which wealth tips the playing field away from being level and towards the wealthy. According to Janet Lorin, a writer for Bloomberg news said, selective colleges have been removing their requirements for SAT and ACT scores. On the contrary, the amount of “Need blind schools” decreases every year (Lorin 2020). Need blind Universities do not take a student’s financial situation or ability to pay into consideration when determining admission. As universities remove these financial safeguards for underprivileged students, they expose this group to even more discrimination in the college admissions process due to the double counting of wealth. Money buys access. It purchases attendance to prestigious high schools, elite teachers, top tier SAT tutors, and extracurriculars like playing the violin or piano. It can even buy admittance into prestigious colleges these days. All of these are factors that almost every elite college institution in the United States considers when determining a student’s admission. However, these universities also examine a student’s ability to pay full tuition as a parameter for acceptance. This leads to a disproportionate weighting of wealth in the admissions process resulting in a larger percentage of affluent students gaining entrance into prestigious universities. Now why does this matter? In a perfect world, colleges would accept students based mainly on their merit and qualification with some regard to wealth to stay operational. Colleges prioritizing tuition income is not inherently a problem since they need money to function, it is that the other admissions metrics are also based on wealth leading to a double counting of wealth in the college admission process. When a college accepts an affluent student, whose collegiate profile is heavily influenced by their familial wealth and income, and not necessarily their own intellectual ability, this causes the college to admit this student based upon admissions metrics that are skewed due to the student's wealth. This leads to a double-counting effect in the college admissions system that gives wealthy students and families an upper hand against poorer applicants. Therefore, whenever the college admits a student based more upon their wealth than ability and could have accepted a different student who was more academically or athletically able, this creates inefficiency, As you can imagine, this compounds with every wealthy, unmerited student that a selective college admits. Over time, this inefficiency grows astronomically, and the rich get richer and the poor continue to stay poor.

In this paper, I aim to understand the different elements of collegiate applications and what factors influence the admissions packets of different students. Throughout this paper, I will detail my own interpretation as well as prominent economic research on college admissions and use these findings to aid me in the development of a robust theoretical model that best represents our current college admissions system. My goal is to use this model to further grasp the areas of inequality and inefficiency in the college system and ideally identify a better, but specifically, more equitable process that colleges can implement to admit students.

Literature Review

This recent college scandal exposes an important question that must be addressed: Why does attending college matter so much? If parents are willing to spend millions of dollars and commit federal crimes just to get their children into college, there must be a reason. A college education improves many areas of a graduate's life, one being financial success. Michal Hout (2012) found that women and men with bachelor's degrees can expect to earn $636,000 and $1.1 million more in their lifetime, respectively, adjusting for the cost of their education, compared to their degreeless counterparts (Hout 2012). Money is not the only thing that matters in life, but this data shows how much a collegiate education matters for long-term financial security. This also indicates the children of these college graduates will have more access to financial resources compared to a non-college educated individual. Anthony Carnevale et al. (2011) estimates the value of a bachelor's degree in 2009 was $2.8 million, meaning they anticipate the present value of a college graduate's earnings, adjusting for the cost of their college attendance, is $2.8 million (Carnevale et al 2011). This helps contextualize just how important a college education is for financial success in life. Now these studies analyzed a broad range of individuals coming from many different colleges, but this college scandal specifically involved the most selective and prestigious universities in the US. Is there a difference in earnings potential graduating from a top tier institution compared to a lower quality school? There is little evidence I found to suggest higher quality colleges lead to more lifetime earnings; however, Hout finds that there are two main distinguishing factors for elite universities: graduation is more certain and investment per student is much higher. Well-endowed, expensive universities spent $15,000 more on average per student each year than they charged in tuition. This means graduates from these institutions were given an equivalent of a $60,000 more expensive education than they paid for resulting in students attending elite colleges having more access to resources to achieve academic, athletic, and financial success.

Despite the recent college admissions scandal and the transition away from need-blind universities, underprivileged students will still have high hopes and aspirations for their future and hopefully one day gaining entrance into their dream school through hard work and dedication. In the introduction, I talked about how colleges are like a secret code that is uncrackable. Although it is impossible to know what goes on behind closed doors, they do give an outline for prospective students to follow to have the best chance of gaining entrance. Websites like PrepScholar detail the rigorous requirements that top colleges in the US demand from their applicants. A great high school GPA, top tier SAT scores, wonderful extracurriculars, and excellent interviews highlight the minimum qualifications. It is a lot for a 17-year-old to process, trust me, but does this transparency really equate to a legitimate chance for students who do not come from extremely wealthy backgrounds? To understand this, it is important to recognize what factors influence all these admissions variables. If a student scores well on their SAT or has a great high school GPA, does that automatically mean they are smart or are these metrics really functions of other variables besides a student's natural, academic ability? Well Nettles, Millett, and Ready (2003) found that students whose families earned over $100,000 per annum scored 0.5 standard deviations higher on their SAT compared to their lower-income counterparts. This finding suggests that whenever a college reviews a student's SAT as part of the admissions process, this is not a complete, accurate representation of the student's academic prowess. Rather, a weighted average of the student's wealth and intellectual ability. Nettles et. al also found that students who come from high-earning families are disproportionately more likely to attend higher quality high schools and engage in more rigorous classes, a parameter that colleges analyze when determining acceptance. Moreover, not only does family income and wealth influence student's scores, but the level of education their parents achieved, specifically undergraduate education or higher, amplified test scores by almost the same amount, 0.4 standard deviations higher (Nettles et al. 2003). This research further suggests that a student's application profile, specifically their SAT, the quality of their high school, and high school GPA, are not completely accurate representations of their academic ability.

Race in college admissions has been a controversial conversation for years. Affirmative Action supporters argue the program removes racial bias and inequity inside the college system. Protesters cite how it is unfair for colleges to use race since it "does not influence a student's academic success". This controversy continues today as bias related lawsuits surrounding college admissions are filed every year. Recently, there was a lawsuit filed against Harvard University for using Affirmative Action to discriminate against Asian American students and classify them differently than other students in the admissions process. Although the court ruled in favor of Harvard, the New York Times stated, "This war on Affirmative Action is far from over" (Hartocollis 2019). Despite the differing viewpoints on this issue, the biggest crux relates to homogeneity. Affirmative Action supporters claim the highest quality universities in our country would consist of only White and Asian students if race was not a parameter that colleges used in admissions. Although racial inequity is a significant factor in determining disadvantage, colleges seem to miss the broader meaning of the term. To fully capture the most disadvantaged students in our society, race should not be the only parameter colleges use to level the playing field. Colleges likely do understand that they are not correctly accounting for the different types of disadvantage in society; however, colleges have the incentive to ignore financial inequity and focus on race related bias. Disregarding wealth equality and accepting higher income students means more tuition dollars that can go towards endowments, new buildings, etc., yet the problem remains the same. As colleges transition away from need-blind admissions policies, the financially underprivileged will continue to suffer from wealth related bias in the college going process.

In addition, there is evidence that class-based preferences encapsulate a different slice of students compared to race-based. Cancian (2008) noted that only factoring in socioeconomic status into admissions policies results in different racial results compared to traditional Affirmative Action. They found that although the number of racially identified minorities accepted into selective universities fell slightly, by only 2%, the number of students around or below the poverty line doubled. This result indicates that colleges miss that disadvantage not only comes from one's racial identity, but also socioeconomic status. Moreover, Card and Krueger (2005) examined what happened in California and Texas when Affirmative Action was eliminated and they found a small, yet still statistically significant, fall in the likelihood that minority students send their SAT scores to elite universities. On the contrary, there was no change for highly qualified minorities. There is much evidence to suggest that race-based preferences, such as Affirmative Action, are important in removing inequality in society, but the positive wealth influence continues to remain unaddressed.

Colleges across the country tout their diversity statistics yet continue to increase the cost of tuition and exclude lower-income students from either applying or attending the school regardless of their admission decision. If you look at almost any college's website, one of the first things you will see in their admission section is the amount of ethnic diversity on campus; however, on the whole, they rarely discuss the inequality of educational opportunities. Specifically, the access that students under financial hardship have to that university. Peter Sacks discusses how colleges have turned a blind eye towards socioeconomic class, which has also diminished the representation of ethnic minorities among our most selective institutions. Sacks finds that the chance of obtaining a bachelor's degree by the age of 24 for an individual has only increased for the upper half of the nation's income distribution since 1979 (Sacks 2007). As this problem persists in our country without any public or institutional reform, student's admission into the most elite colleges in the US will continue to highly depend on their wealth level and not on specific merit.

Many selective colleges have admission boards that individually review candidates to determine their admittance into the university. These colleges claim a more detailed application review process helps eliminate potential areas of bias inside the system, but is that really true? Anna Zimdars performed a study at Oxford University to determine the overall impact gender, ethnic origin, and socioeconomic class have on the probability of gaining admission. She finds that members of the admission board who came from highly educated, higher class families were disproportionately more apt to admit members of their same demographics. Note, Oxford does not consider a student's ability to pay for the institution, meaning they are need-blind. In fact, they bar themselves from gaining access to any financial information regarding the student's family. This makes the finding quite unique. Zimdars explains that a student's background is made very clear in their secondary education, meaning the school they attended, in person interviews, grades, etc. Since Oxford did not have any financial information, Zimdars posits that a student's financial situation is "baked" into their application package (Zimdars 2010). Although this is a study performed at one selective British university, Zimdars findings support the claim that a student's wealth is imbedded in their academic profile.

Many researchers have analyzed the never-ending problem of college admissions, yet very few have proposed any type of solution. There are papers that identify preferences based on lower socioeconomic status; however, researchers fail to find an optimal path forward to create a more equitable admissions system. Of the proposed solutions, they fall mainly into a couple different buckets. The first solution proposes the idea of economic matching, see Arcidiacono and Lovenheim (2015). This idea is like that of a sifter. Students are “matched” or sorted into or out of different universities that would essentially optimize their intellectual output. Moreover, it creates categories of different universities that students would most likely succeed in. This idea claims that some universities are either too difficult or not difficult enough for different students and would result in economic inefficiency. The difficulty in this is identifying which students should and should not belong in each level of college quality.

Conversely, others have developed theoretical models to solve the optimal tuition, applications, admissions, and enrollment joint equilibrium, see Fu (2014) for evidence. This model finds all the optimal levels for what different colleges should charge for tuition and how many students they should admit based upon different parameters. Although this sounds like an exceptional model, it holds constant the race and wealth of students, which is the crux of this whole paper. By maintaining homogeneity among students, it is impossible to determine how much weight should be given to students of different races and wealth levels. I aim to incorporate different student characteristics to understand how these factors influence a student’s success in the college going process.

Theoretical Model

As Colleges across the country continue to remain unaware or disregard the problem of wealth inequality in the admissions process, I aim to show how inefficiency exists under current procedures and how institutions can improve their current admissions system to encapsulate a more robust set of financially and racially underprivileged students without sacrificing operational stability. In this model, there will be one college. I will assume N students apply to this college for admission, but the college will only accept A% of the applicants. As part of their admissions packet, each student must submit their SAT score, the name of their high school, their race, and a measure of their family's wealth (this will be important to identify how much each student can pay for the college). Since this college has been around for a long time, they have formed beliefs as to the quality of each student's high school. Furthermore, the college will require an in-person interview as part of the application process and an admissions officer will assign an interview score to each student based upon the student's performance in that interview. After the college receives all this information, they begin the process of determining which A% of students to admit. To aid in this process, the college develops an admission score formula to assign each student an admission score based upon the information they received from each student. This admissions score is a weighted average of how the college views each student's performance and characteristics along with all the different application materials of the student. The formula I assume is:

$$\mathbf{A_{Score} = W_Q[Q_{Hs}] + W_S[ST] + W_I[IS] + W_w[Wealth] + W_R[|1\text{-}Race|]}$$

I assume that each weight in this formula is non-negative, meaning it can be either 0 or any positive value, where the only restriction is that all the weights equal one. $W_Q + W_S + W_I + W_w + W_R = 1$. This assumption indicates that the college makes its admissions decision based upon some of the student's application material; however, this formula does not take a stance on which information is valued. Specifically, this formula could characterize a college that only values a student's wealth, or it could characterize a college that values some combination of standardized test scores, interview performance, and race. I have left this formula to be very general so that the results contained below apply to many different types of colleges. The college will then admit the top N*A students, meaning the number of applicants multiplied by the percent of students accepted. Also, I assume the college admits their student population by selecting the applicants with the highest A_{Score} until they reach their desired N*A students. Note, I did not incorporate other admissions metrics such as extracurriculars or a student's high school GPA into the model. Although I considered adding these metrics in, the three main factors were sufficient to show circumstance under which admissions policies caused inefficiency; therefore, I chose to leave these terms out to simplify the intuition of the model.

As seen in the admission score formula, I assume that wealth is a potential characteristic that influences a student's admissions score, and you might be asking yourself why. As mentioned earlier, Janet Lorin found that the number of "Need-Blind" institutions continue to decline every year. This means that colleges are considering a student's ability to pay full or mostly full tuition when determining their acceptance. Using this information, the college is potentially not need-blind and could use a student's wealth level to determine their admission score. Finally, I assume that a student's race could also play a role in their admissions score. Many colleges across the country incorporate a student's race into their admissions process to develop a more racially, ethnically, and culturally diverse campus. This model will continue along a similar path and incorporate a student's race into their overall admissions score.

I assume that colleges want to judge students based on their ability and merit, but this level is unknown. Colleges try their best to extrapolate the quality of these students, but this process could be murky. With little information about the actual quality of each student, colleges rely on the metrics in a student's application profile to predict their ability. The trouble is that these metrics are potentially distorted by other characteristics of the students like their wealth and race, leading the college to judge student quality based on flawed observables.

If the SAT score, interview score, and quality of high school were measures entirely of a student's ability, then the college is balancing both its financial necessities with its goal of admitting the most able students. But, the critical feature of this paper is the understanding and recognition that a student's performance on each of these metrics depends on both exogenous student characteristics and other endogenous admissions metrics. For example, look at a student's standardized test score. A student's SAT score will depend on the quality of their high school, meaning the better the high school they attend, the higher their SAT score. However, their SAT score also depends on other characteristics of the student. Particularly, I assume that there are 4 exogenous student factors that will play a role in determining their SAT score, the quality of high school, their performance in the admissions interview, their GPA, etc. These four variables are race, wealth, ability, and luck (which I will call noise in this model). Taking all of this into account, I assume the following functions that determine a student's performance on each of the main admissions metrics where each of the parameters in each equation sum to 1:

$$\mathbf{Q_{Hs} = Q_w(Wealth) + Q_R(Race) + Q_A(Ability) + Q_N(Noise)}$$

$$\mathbf{ST = S_Q(Q_{Hs}) + S_A(Ability) + S_w(Wealth) + Sn(Noise) + Sr(Race)}$$

$$\mathbf{Interview\ (IS) = I_w(Wealth) + I_R(Race) + I_A(Ability) + I_N(Noise)}$$

These formulas specifically describe which factors influence a student's admissions metrics. I also want to mention that in this paper, I take no stance on the individual weights placed on the student characteristics or admissions metrics. While these formulas are meant to represent the true process that generates the values of each student's metrics, colleges do not necessarily know those true formulas and parameters. It is likely, however, that they have beliefs as to the value of each parameter. Those beliefs might or might not match the true process that govern each student's scores. For instance, some colleges will think wealth influences a student's SAT score more or less than the truth, while others will think that ability plays a large role in a student's SAT score. Regardless, these differing beliefs will not impact the intuition and findings of this model.

Before I move on, it is important to understand why the student's admissions metrics can be reduced to these 4 main factors. As I mentioned in the discussion section above, recent research has shown that a student's quality of high school depends on the wealth level of their family, meaning if they can afford to send their children to a private school or live in a good public school district, as well as a student's race. Overall, a "Majority" student is more likely to attend a higher quality high school and perform better on math and science related subjects compared to their "Minority" counterparts (Crosnoe 2009). Furthermore, a student's academic and athletic ability will influence how they perform on entrance exams or whether they receive athletic scholarships to top tier high schools; therefore, the main student characteristics I use in predicting a student's Q_{Hs} are as follows:

$$\mathbf{Q_{Hs} = Q_{w}(Wealth) + Q_{R}(Race) + Q_{A}(Ability) + Q_{N}(Noise)}$$

From this formula, I classify Q_W, Q_R, Q_A and Q_N as the individual weights on each exogenous student characteristic. These parameters, assumed to be non-negative values, shape the importance of the respective factors on the quality of high school attended by each student. Note, I classify a "Majority" student's race as a 1 and a "Minority" student as a zero to help with simplicity; therefore, indicating that the term Q_R(Race) will equal zero for all minority students. As a result, this implies that "Majority" students will always have a positive influence on all their admissions metrics, given the research from above. Moreover, the parameter Q_W is assumed to be non-negative in the model. Although this term could be zero, in the discussion part of this paper, research suggests this parameter is positive, meaning wealth has a positive influence on the quality of a student's high school.

I want to further illustrate how these 4 exogenous student characteristics also influence a student's SAT score. Intuitively, a student's academic ability, wealth, and quality of high school should account for the majority of their performance on these exams; however, I was not certain until finding more economic literature to support this claim. As I mentioned earlier, Nettles et. al (2003) found how wealth influences a student's SAT score as well as the quality of their high school. This study further finds that wealthier students are more likely to enroll in rigorous classes, improving the likelihood they will score well on their SAT. As a result, the following formula indicates how a student's ST score can be broken down to student characteristics and other admissions metrics.

$$\mathbf{ST = S_A(Ability) + S_w(Wealth) + S_Q(Q_{Hs}) + S_N(Noise) + S_R(Race)}$$

Given the above equation, I assigned S_A, S_W, S_Q, S_N, and S_R as the parameters on each respective exogenous student characteristic where the sum of all weights are 1. Since a student's Q_{Hs} is governed by the process described above, I can re-write this equation only in terms of the four main student characteristics.

- ⇨ $\mathbf{ST = S_A(Ability) + S_w(Wealth) + S_Q(Q_w(Wealth) + Q_R(Race) + Q_A(Ability) + Q_N(Noise)) + S_N(Noise) + S_R(Race)}$
- ⇨ $\mathbf{ST = [S_A + S_Q(Q_A)]Ability + [S_w + S_Q(Q_w)]Wealth + [S_R + S_Q(Q_R)]Race + [S_N + S_Q(Q_N)]Noise}$

This formula implies that wealth is an important factor in determining a student's SAT score. Indeed, wealth has two impacts on a student's SAT. The first impact is that wealth allows families to pay for test prep classes, special tutors, and curriculum to help improve a student's SAT score. The second impact comes because greater wealth is associated with attending better quality high schools, which is something that colleges value. This is the beginning stages in the model of illustrating how wealth influences which students a college admits over-and-above the student's ability to pay for the college's tuition.

This equation also implies that a student's race will influence not only their Q_{Hs}, but also the success they achieve on their SAT. Race has two impacts on a student's SAT. The first is indirectly through the quality of a student's high school. As mentioned above, research shows that minority students are more likely to attend lower quality high schools and perform worse on math and science related topics. This suggests these students are less academically prepared for the SAT. I posit that this is due to the difference in the quality of teachers and access to educational resources compared to higher quality high schools. The second impact comes from financial disparities among minority students. According to the U.S. Department of Education, ethnic minorities make up a disproportionately large segment of the economically poor population in the United States (Gore 1998). This financial inequity means these students are unable to purchase the test prep, tutors, and curriculum that other wealthier, potentially majority students can afford. Intuitively, it is shown in the model under current admissions policies how majority and wealthy students are more likely to attend higher quality high schools and perform better on standardized tests. This is only the first of many instances showing how admissions offices are indirectly tilting their admissions policies in favor of wealthy, majority students.

The final admissions metric I want to examine and provide support for is a student's interview score. Most prestigious universities across the country encourage or require an in-person interview as a part of the admissions process; however, what exactly does this accomplish? Well college admissions offices want to determine if a student is a "good fit" for that school. In the model, the college requires each student to have an in-person interview to ensure that every student is assessed equally in their admission score. Specifically, the college has chosen this to determine if the students will assimilate well, succeed academically, and contribute to the student body. As previously discussed, Zimdars (2010) found that admissions board members who come from highly educated, higher class families were more likely to admit students of similar demographics. Although these interviews are likely conducted with good intentions, a student's performance in an interview is potentially just as influenced by wealth, race, and luck as the other metrics used by the college. This creates an additional avenue for bias to seep into the admissions score. Imagine you are an admissions officer at one of the best universities in our country. You are meeting with a handful of students to determine who they are, what they enjoy, and if they will fit into your given university. Each student you meet will likely be different in many categories: wealth, academic/athletic ability, personality, and race to name a few. You will directly hear how they talk, where they went to high school, their life experiences, and see their race. Students that come from similar backgrounds are likely to connect better with you compared to students who come from different life experiences. Interviewers will likely connect more readily, and give higher scores, to students who look, and sound like them. I assume that interviewers are predominantly wealthier and majority, meaning students who match that description will likely perform better in their admissions interviews. Therefore, I factored a student's interview score into the model with the given formula:

$$\textbf{Interview (IS)} = \mathbf{I_w(Wealth) + I_R(Race) + I_A(Ability) + I_N(Noise)}$$

Within this equation, I assign I_w, I_R, I_A, and I_N as the respective weights on the four exogenous student predictors. One thing to mention in this, as well as ST and Q_{Hs}, is these parameter weights can vary to whatever a specific college thinks they should be. Some admissions offices might think I_W is 0.6 and others might believe it is 0.3. Within the context of the model, the college will make assumptions about these parameters to gain valuable intuition;

however, the specific mathematical weight does not impact the logic of the model and I take no stance on what these weights are. This will be important to remember as I investigate the theoretical results and intuition part of this paper.

Given all of the above assumptions, I can re-write the college's admissions score as a function of the exogenous student characteristics. Specifically, the admission score developed can be expressed in terms of the 4 student factors and parameter weights discussed:

$$\mathbf{A_{Score} = W_Q[Q_{Hs}] + W_S[ST] + W_I[IS] + W_w[Wealth] + W_R[|1\text{-}Race|]}$$

$$\mathbf{A_{Score} = [W_Q(Q_W) + W_S(S_W + S_Q Q_W) + W_I(I_W) + W_W]Wealth + [W_Q(Q_R) + W_S(S_Q)(Q_R) + W_I(I_R) + W_S(S_R)]Race + [W_R](|1\text{-}Race|) + [W_S(S_A) + W_I(I_A) + W_Q(Q_A) + W_S(S_Q)(Q_A)]Ability + [W_Q(Q_N) + W_S(S_N) + W_I(I_N) + W_S(S_Q)(Q_N)](Noise)}$$

There is a lot to digest in this more complex A_{Score}. I assign the values of W_Q, W_S, W_I, and W_W as the parameter weights on a student's quality of high school, standardized test score, interview score, and wealth, respectively. Each weight is like that of the ones I placed on Wealth, Race, and Ability in the previous mathematical equations, except now they influence each admissions metric. Note, this A_{Score} includes a "Noise" term which is extremely important in understanding the logic here. Although the model only examines a student's quality of high school, standardized test score, and interview score, this noise term aims to address the variability that cannot be accounted for by wealth, race, and ability. For example, if a student is sick on the day they take their SAT, they might perform worse than otherwise predicted; therefore, there will always be some form of randomness that exists, but my goal is to reduce this value as much as possible and have only the noise or unpredictability in life influence the admissions score, meaning remove the impact that other exogenous student characteristics, specifically wealth and race, have on a student's academic profile. Keep this in mind as we head into the next section of this paper, as it will play a crucial role. Also note, one term I did not add into the model was a student's high school GPA, which many would argue is the most important factor in the admissions process; however, this would also be a function of the same student characteristics outlined above, meaning the college can increase the parameter weights accordingly on the preexisting student factors in the model to account for this. This holds true for all admissions metrics not included in the model.

Inefficiency

Now that there is an understanding of all the exogenous student characteristics and admissions metrics in the model, as well as assumptions that all admissions packets can be broken down further into only exogenous student attributes, it is important to grasp how I measure inefficiency and what parameters play a critical part. Specifically, I aim to detail how inefficiency exists under the current college admissions system and show which student characteristics I use to determine this level of inefficiency. To do this, the college must classify which "ideal" set of students they want to admit in this model. I assume the college wants to accept students with the most ability, meaning the students with the most merit. However, I also assume that every college must have a certain amount of financial income to remain operational, so they choose their population of N*A accepted students subject to some level of financial constraint. This dual incentive of the college leads to my first definition. Let {S*} represent the distribution of students the college would admit if the admissions score were based on the following function:

{S*} = (1-Ww)Ability + Ww(Wealth)

In this equation, W_W represents the necessary weight the college should place on a student's wealth to remain financially well-positioned, and 1- W_W represents the weight the college places on the student's ability. If the college were able observe each student's ability and wealth, then all students would get an admission score, and the college would admit the top N*A students. The resulting distribution of admitted students is {S*}. The trouble with this ideal admissions score, the reason why this is an impractical method of determining admission into the college, is that the college cannot observe a student's ability. In a perfect world, the college would observe each student's ability and wealth, then admit students solely based off these two factors; however, in reality ability is unobservable, and the college must predict the student's ability using the metrics in their admissions profile. Although impractical, the benefit of introducing this definition of {S*} is that we have an easy test of efficiency and inefficiency, at least within this theoretical model: how close does the actual distribution of admitted students under the traditional A_{Score}, which I will classify as {S}, get to {S*}? This is the method I will use to determine efficiency in the model.

Now I want to clarify one important aspect of this model. The college only sees the observable, admissions variables of ST, IS, and Q_{Hs} and the student characteristics of race and wealth that each student submitted in their application package. A student's ability and the degree to which luck has impacted their endogenous admissions metrics are unknown to the college. I point this out to show how although the college wants to admit students solely off ability and to some degree their ability to pay tuition, they are unable to do so since they cannot directly observe these values. Instead, they are making an educated guess about a student's ability through their admissions variables. However, when the college uses these admissions metrics in the student's application, they do not just see ability. Rather, as seen in the Nettles et. al (2003) paper, they see a weighted average of all the student's characteristics on their endogenous admissions variables and make admissions decisions based off this race, wealth, and noise related bias A_{Score} shown in the previous section. Therefore, whenever the college accepts a student with a high A_{Score}, but low level of ability, then inefficiency is created.

In this model, I assume each student has some level of ability, is assigned some level of wealth and race, and each student is also influenced by some amount of randomness in their admissions metrics. Using the A_{Score} I developed in the previous section, I record which N*A students the college admits then compare that to the ideal admissions score. Specifically, does the college accept the students with the highest ability and partial tuition payment preference using their admission score? For every "misplaced" student, meaning a student that was either admitted based upon their A_{Score} but should not have been based off their ideal admissions score, or an applicant that was not accepted under their A_{Score} but should have been according to their {S*}. Every time a student is "misplaced" using the A_{Score}, I record this value and classify it as inefficiency. The sum of all "misplaced" students in the model is the value I use for inefficiency. For more detail, inefficiency exists when:

$\{S\} \neq \{S^*\}$, for each individual student

Theorems

Understanding inefficiency, how it is measured, and the importance of it in the context of the model is the crux of this paper; however, I want to show how inefficiency changes when different parameter weights are placed on the four student characteristics. What happens to inefficiency when the college decides to weight wealth more in the model? What about race?

Theorem #1: If any Wealth parameter other than W_W is greater than 0, inefficiency exists.

⇨ $$\frac{\partial A_{Score}}{\partial Wealth} = [W_Q(Q_W) + W_S(S_W + S_Q Q_W) + W_I(I_W)]$$

⇨ $\{S\} \neq \{S^*\}$, therefore, inefficiency exists, and students are misplaced

This shows the wealth inefficiency that exists in the admissions process. Specifically, any positive parameter weight that is placed on the exogenous variable wealth other than W_W will result in some level of unnecessary misplacement in the model leading to inefficiency. The higher these weights, the more and more inefficiency is created. What does this mean for the college? Like I previously stated, I take no stance on the actual parameter weights; however, if the college believes wealth should be valued more or less, they can adjust this wealth coefficient in the admission score to do so. On the other hand, colleges that decide to have higher wealth coefficients will also increase the number of misplaced students in their admissions process. This means any increase on one individual wealth parameter will result in the same misplacement impact. For example, whenever the college increases any parameter on wealth, the more inefficiency is created in the model under the current admissions score. One point to mention here is that it is impossible for this entire wealth coefficient to equal zero in the A_{Score} since the college operates under a financial budget constraint and must weight wealth to some degree in order to remain operational. Therefore, the college should want to reduce the unnecessary wealth impact as much as possible in their admissions process; however, they cannot completely eliminate this effect in the context of the A_{Score}. Keep this in mind as we head into the next section of the paper.

Theorem #2: If any Race parameter in the A_{Score} other than W_R is greater than 0, inefficiency exists.

⇨ $\frac{\partial A_{Score}}{\partial Race} = [W_Q(Q_R) + W_S(S_Q)(Q_R) + W_I(I_R) + W_S(S_R)]$

⇨ $\{S\} \neq \{S^*\}$, so inefficiency is > 0

This equation shows the race related inefficiency in the model. Similar to wealth, the intuition is the same here just looking at a different student characteristic. Whenever race and racial bias are more important in determining a student's admissions metrics, inefficiency is created. Meaning, each individual increase on any race related parameter other than W_R will result in unnecessary student misplacement. I assume the college wants to minimize the influence that race has on the A_{Score}, specifically, how it is imbedded inside the admissions metrics and the parameter W_R cannot completely account for this racial bias. The importance of this theorem is mainly to mathematically express how inefficiency is created whenever colleges positively weight any race parameter other than W_R (remember "Majority students are coded as a 1") in the model and should focus on minimizing the race related bias for "Majority" students.

True Admission Score

Now that there is an understanding of the student characteristics, admissions metrics, and the method I use to measure inefficiency, I turn to discuss a potential way the college can more efficiently admit students. Specifically, I aim create an admissions system that can more accurately predict a student's ability with the same admissions metrics used in the traditional A_{Score} discussed above. As I have mentioned throughout this paper, the college is unaware of each student's ability and noise value. They only know what a student submits in their admissions packet: Their SAT, name of their high school, admissions interview, race, and wealth. Is there a way to reevaluate these metrics in the student's admissions score to decrease the level of inefficiency and admit more students based upon their {S*}?

To do this, I assume the college has the same information they used to predict the A_{Score} for each student. I assume every college has different, but can be similar, beliefs about the level each student characteristic influences their individual admissions metrics. For example, one college might believe wealth influences a student's SAT score more or less than others. These beliefs, although different, can be used to contextualize each student's admissions metrics in a way the college can remove the race and wealth related bias discussed above. Particularly, the college can adjust each student's admissions score to account for the positive or negative wealth and race related influence on each of the student's admissions metrics. To clarify, no matter the level of wealth or race of a given student, the college can use its beliefs about the individual impact both wealth and race have on the student's admissions metrics to gain a better understanding of the student's actual ability. There are two methods I use to adjust each student's admissions score. First, given the assumptions above, I developed the following formula, which I classify as T_W, to remove the wealth impact on each student's admissions score:

⇨ $\mathbf{T_W = [W_Q(Q_W) + W_S[S_W + S_Q(Q_W)] + W_I(I_W)]}$

This equation might look slightly similar and that is because it is. Recall Theorem 1 discussed above and you will find these formulas are identical. The theorem shows the influence that wealth has on each student's admissions score through their endogenous admissions metrics. Specifically, this encapsulates the entire wealth effect in the model, besides the necessary budget constraint W_W. As a result, the college can reduce a student's admissions score by T_W and eliminate the unnecessary wealth bias from each student's admissions profile. Let me pause here for a moment. This means the college, based upon their beliefs about wealth in the student's admissions profile, can more accurately contextualize each student's admissions packet. Now why does this matter for the model? Recall the four student characteristics I use to predict each student's admissions metrics. Reducing the admissions score by T_W means that wealth has no impact on a student's probability of being admitted to the college besides the necessary financial constraint W_W. As a result, the college uses their own beliefs about wealth to obtain a clearer perspective of a student's ability since there is no unnecessary wealth influence anymore. The resulting change means that {S} and {S*} grow closer since the college can better predict a student's ability, and thus admit students more accurately based upon their ability. Therefore, inefficiency falls.

The second component I use to reduce inefficiency in a student's admissions score is race. Specifically, I aim to eliminate the positive or negative influence a student's race has on their admissions metrics and therefore their admissions score. Note, the college already uses the parameter W_R to help reduce some of the racial bias in each student's admissions score, meaning they positively weight a minority student's race; however, inside the model they fail to completely account for the race related influence on a student's admissions packet. Given the assumptions above, I developed the following formula, which I classify as T_R, to remove the racial influence on each student's admissions score:

$$\mathbf{T_R = [W_Q(Q_R) + W_S(S_Q)(Q_R) + W_I(I_R) + W_S(S_R)]}$$

Similar to T_W this equation should also be familiar. Recall theorem 2 above and you will find these two formulas are identical. Unlike T_W, the college has no racial budget constraint, meaning, in theory, they can admit any subset of racially diverse students. I assume the college wants to accept the most merited students with some respect to ethnic diversity on campus. This is purpose of W_R inside the admissions score. However, there remains race related bias imbedded in each student's admissions metrics that is unaccounted for in the parameter W_R. As a result, the college can use its beliefs about racial influence on a student's admissions metrics to reduce each majority student's admissions score by T_R to eliminate the race related bias majority students receive in society. This allows the college to contextualize each student's admissions score without the impact of a student's race. As a result, they gain an even clearer view of a student's actual ability after removing both the wealth and race related influences on each student's admissions score. Similar to T_W, the resulting change means {S} and {S*} grow closer and the college is now able to admit students even more accurately based upon their ability. Note, T_R only applies to a majority student's admissions score. This is the result of how I classify race in the model and does not represent my own beliefs about how a majority or minority student is impacted in the admissions process, rather this was done for simplicity of the model.

These two equations I use to contextualize each student's admissions score allow me to take this process one step further. So far, these formulas remove as much racial and financial inequity in the admissions score as possible. However, my goal from the beginning is to eliminate all inefficiency that is either unnecessary or unaccountable in the model. Is there a way to create a new admission score that the college can use to admit students more efficiently and bring {S} and {S*} as close as possible? Since we already understand the components of a student's admissions score, how I measure inefficiency, and the two methods to eliminate wealth and racial inequality, I can combine this logic and intuition to create a new admission score that more accurately admits students based upon their ability and some level of financial constraint. Given the above assumptions, I created the following equation, which I classify as TA_{Score} or true admissions score, to aid the college in its admissions process:

$$\mathbf{TA_{Score} = \frac{A_{Score} - T_W(Wealth) - T_R(Race)}{W_S(S_A) + W_I(I_A) + W_Q(Q_A) + W_S(S_Q)(Q_A)}}$$

This true admissions score is the culmination of all the findings in this paper. This is the method I propose as a solution for the college to use in place of its current A_{Score}. The process of determining this true admission score only involves two simple steps the college must take to more efficiently admit students and create less misplacement inside the system. First, the college must establish its beliefs about how the four exogenous student characteristics influence each student's admissions metrics as well as how they choose to prioritize these admissions metrics inside the admissions score. That is, they must assign values for all parameter weights inside the model. The second step involves assigning each student an admission score the same way as before using the original A_{Score}. After the college has performed these two steps, they can use the above true admission score equation and reassign each student a new admission score. The resulting true admission score brings {S} and {S*} as close as possible inside the context of what the college believes each parameter is. To clarify, the level of inefficiency will vary depending on the college's beliefs about each individual parameter inside the model. However, the true admission score will minimize this level of inefficiency regardless of the college's beliefs.

Note, this true admissions score cannot completely predict ability. There remains some level of outside influence associated with the randomness or luck in life and the necessary financial constraint. The college cannot accurately predict how much noise exists for each student and will therefore make admissions decisions where $\{S\} \neq \{S^*\}$ even using the true admission score. However, for any positive parameter weight inside the model, the true admission score reduces inefficiency. Let me pause here for a moment to explain what this entails. The true admission score is really only useful whenever the college has beliefs about the individual parameters. This was one of the steps discussed above that the college must take to determine a student's true admission score. In the context of the model, for any possible positive value of any parameter, the true admission score reduces inefficiency. This means the college can assign whatever positive parameter values they believe on any of the student characteristics or admissions metrics and this model will still reduce inefficiency. How cool is that? No matter what the college believes these parameter values are, the true admission score still reduces inefficiency compared to the original admission score. This indicates that colleges can indeed reduce the amount of student misplacement in their admissions systems given the same admissions packets as before. Therefore, the college can reweight the students' admissions profiles subject to the true admission score and use their beliefs about the different parameter values to make a more efficient admissions system.

True Admission Score Theorem

The crux of this paper focuses on understanding how colleges inefficiently admit students using the admissions metrics in each student's packet. As seen previously, I discussed how colleges can never eliminate inefficiency since there exists some amount of luck or unpredictability in life which will influence student's admissions metrics. However, the true admission score can perfectly predict a student's ability when certain parameters equal zero. This leads to my first definition:

Theorem 3: If W_W, W_R, and the coefficient on noise = 0, then {S} = {S*} and TA_{Score} = Ability

- ⇨ $A_{Score} = [W_Q(Q_W) + W_S(S_W + S_Q Q_W) + W_I(I_W) + W_W]\text{Wealth} + [W_Q(Q_R) + W_S(S_Q)(Q_R) + W_I(I_R) + W_S(S_R)]\text{Race} + [W_R](|1\text{-Race}|) + [W_S(S_A) + W_I(I_A) + W_Q(Q_A) + W_S(S_Q)(Q_A)]\text{Ability} + [W_Q(Q_N) + W_S(S_N) + W_I(I_N) + W_S(S_Q)(Q_N)](\text{Noise})$
- ⇨ $A_{Score} = [W_Q(Q_W) + W_S(S_W + S_Q Q_W) + W_I(I_W) + 0]\text{Wealth} + [W_Q(Q_R) + W_S(S_Q)(Q_R) + W_I(I_R) + W_S(S_R)]\text{Race} + 0(|1\text{-Race}|) + [W_S(S_A) + W_I(I_A) + W_Q(Q_A) + W_S(S_Q)(Q_A)]\text{Ability} + 0(\text{Noise})$
- ⇨ $TA_{Score} = \dfrac{A_{Score} - T_W(\text{Wealth}) - T_R(\text{Race})}{W_S(S_A) + W_I(I_A) + W_Q(Q_A) + W_S(S_Q)(Q_A)} = \text{Ability}$
- ⇨ Therefore, {S} = {S*} and inefficiency = 0

This theorem expresses how the inefficiency in the new admission score now only depends on the noise coefficient, the race coefficient W_R, and the necessary budget constraint the college uses to remain operational. Note, this theorem is implausible since the college can never assign W_W a value of zero without going bankrupt. However, the lower they reduce this parameter, the more accurately they will be able to predict a student's ability and admit students closer to their {S*}. This holds true for every parameter discussed in the theorem. Notice, W_R does indeed generate some level of inefficiency when this parameter is positive. Recall, this is the method the college uses to positively weight minority students in their admissions score. Since T_R already adjusts student's admissions scores based upon the racial privilege or inequality they have experienced in life, the weight of W_R generates inefficiency in the true admission score since the college can predict a student's ability more closely without either the positive or negative influence of race on a student's admissions score. Let me pause here for a moment. I assume the college wants to admit the most able students; however, they must value wealth slightly to cover their expenses. The college must also choose how much to prioritize ethnic diversity in the admissions process using the parameter W_R. When the college decides to increase its budget, meaning W_W goes up, the more inefficiency is created since the college must substitute students with the most merit for students with more financial resources. The logic is similar with W_R. If the college decides to accept more minority students, meaning W_R increases, the more inefficiency is created since they must reduce the number of academically qualified students to accept more minority students. Note, prior to the introduction of the true admission score, the college was creating less inefficiency when they positively weight W_R since this acted as a replacement for T_R. However, inside the true admission score when race is accounted for with T_R, this parameter W_R now encapsulates a different meaning. Before, the college used W_R to account for the racial inequality in society. Now that T_R does this, W_R acts as a constraint upon which the college can choose to admit more minority students than the true admission score would otherwise suggest. If the college chooses to admit more minority students than the true admission score suggests, then inefficiency is created since the college is sacrificing the most able students for more ethnic diversity.

Excel Results/Example

Now that there is an understanding of the model, inefficiency, the true admission score, and the different theorems associated with this model, I want to turn to my final section and discuss potential ways colleges can implement this into their admissions process. As a part of this paper and model, I have also coded an Excel sheet that colleges can incorporate into their admissions system that will show the level of inefficiency given their beliefs about the different parameter values. In doing this, I will provide an example of how to use this model in practice and show how different parameter weights impact the level of inefficiency we see in the model.

I must first assume a few characteristics about the college. This college will receive 10,000 applications for admission and only accept 10% of those students, meaning 1,000 students will be admitted into the college. Also, for each of the 10,000 students, I assume values for the four exogenous student characteristics. The first value of Wealth is normally distributed with a mean of 5 and a standard deviation of 1, meaning there are equal amounts of individuals with the highest-level wealth as there are for the lowest level. This allows the model to capture the broad range of socioeconomic classes in society and how they will influence a student's admission and true admission scores and ultimately their acceptance. Although unlikely that a university would receive an equal number of students from each socioeconomic quartile, I want the model to have broad representation of different wealth levels that exist in the United States. Specifically, how students coming from both complete poverty and immense wealth, as well as everything in between impact their college admissions process. Second, I assign each student a race with 1 being a “Majority’ student and 0 being a “Minority” student. This grouping is done to classify individuals that receive some level of positive or negative bias in their admissions metrics. Note, this bias refers to the racial bias we see in society. Furthermore, I do not take a stance on which ethnicities fall into “Majority” or “Minority”; the college can decide this for themselves. So, a race value of 1 just means a student that has experienced positive bias in society and their admissions metrics, whereas a 0 is the opposite. Thirdly, I assign each student an ability value that cannot be viewed by the college, but this is important to measure inefficiency. This is similar to wealth and is coded as a normal distribution with a mean of 5 and standard deviation of 1, allowing the college to have a wide variety of ability levels. Finally, I assume each student has some level of positive or negative noise/luck. This value was coded with a mean of zero and a standard deviation of 1, meaning a student can have either a negative or positive noise influence on their admissions metrics.

Given these assumptions and the formulas developed in the admission score, each student’s admissions metrics are calculated using the values for the four characteristics. This gives each student a numerical value for their SAT, quality of high school, and interview score. Note, these admissions metrics are not expressed in the traditional manner. Specifically, the SAT score is not valued from 0 to 1600, rather it will vary as the weights on each student characteristic inside this formula is changed. This holds true for the three admissions metrics used in the admissions score. Then, I must act similarly to the college and use different beliefs to assign specific values for each parameter inside the model. See the Appendix, Scenario 1 for the detailed parameter weights I assigned in the model. Once again, these values do not represent my beliefs, rather I arbitrarily bestow them with the constraint that they must sum to 1 in each formula to gain intuition inside the model. After assigning these weights, the Excel program automatically calculates each student's A_{Score}, T_R, T_W, and TA_{Score} using the formulas described above. I then assume the college determines which 1,000 students to admit using both the original admission score and true admission score. This is where valuable intuition is gleaned from the model given the different parameter assumptions.

Before delving into the true admission score, let me first discuss the values of T_R and T_W. As previously stated, these are the race and wealth deductions inside the true admission score which removes all unnecessary racial and financial bias from the original admission score. The formula used to calculate these values is quite intriguing. Each parameter mathematically removes and aims to minimize the influence that wealth and race have on the student's true admission score. Graphically, in the Appendix, Figure 1 it is shown the minimum level of inefficiency for values of T_W from 0 to 1 holding constant all other parameters. Using the formula, I calculate T_W to be 0.264. Although this value is not the minimum of the function, which is 0.464, this still results in lower inefficiency compared to when the college was not discounting wealth in the original admission score. Note, I can perfectly calculate T_W as 0.464 if W_W equals zero. Recall, the only inefficiency left in the true admission score are the necessary terms W_W, potentially W_R if the college chooses to admit more minority students than otherwise suggested by the true admission score, and the coefficients on noise. Since I assume a positive value of W_W in this scenario, the formula does not perfectly minimize the level of inefficiency. However, inefficiency still falls compared to the original admission score (this is when T_W is zero).

Looking at Figure 2 in the appendix, this shows all levels of inefficiency for values of T_R from 0 to 1 holding constant all other parameters. Using the formula for T_R and the parameter assumptions, I calculate T_R to be 0.143. This is the minimum value of this function, meaning the parameter T_R accounts for all unnecessary race bias inside the true admission score. Unlike T_W, there is no mandatory racial constraint, rather the college can choose to accept more minority students if they want to, but do not have to. In this scenario, I assume the college places a weight of 0 for W_R meaning T_R accurately accounts for all racial bias in the true admission score. If the college were to positively or negatively weight W_R, then T_R would still capture all the unnecessary racial bias in the student's true admission score; however, it would not minimize this function since the college places a preference on having more or potentially less minority students on campus than otherwise suggested by the true admission score.

Turning to the true admission score calculated for each student in my scenario, the level of inefficiency substantially improves compared to the original admission score. Using the same parameter assumptions, the number of misplaced students according to the original admission score is 1,340. That is, 1,340 students who either gained acceptance but should not have according to their [S*} or did not gain admittance but should have according to their {S*}. On the contrary, only 968 students were misplaced using the true admission score, a difference of 372 students or 18.6%. Given my parameter assumptions, this shows how even with the same admissions packet information, the college can reduce inefficiency by 18.6% through the introduction of the true admission score into the college's admissions process. Moreover, the college is much more likely to admit students with higher levels of ability using this true admission score. See Appendix Figures 3-6. These graphs show the acceptance rates of students in different wealth and ability quartiles. Recall, I assume the college only accepts 10% of the 10,000 applicants. Figures 3 and 4 show the acceptance rates of students among these different wealth and ability distributions according to their original admission score, whereas Figures 5 and 6 show the same metrics but according to the student's true admission score. Comparing these graphs, it is clear that under the original admission score, students with higher wealth levels are disproportionately more apt to gain acceptance than students with lower wealth levels. Specifically, the college did not accept any students who fell in the bottom 2 wealth quartiles, but the top ability quartile. This indicates the wealth inefficiency expressed throughout this paper. Moreover, minority students had lower acceptance rates regardless of the student's ability or wealth showing the impact that racial bias has inside the student's admission score. Looking at Figures 5 and 6, it is clear that students who fall into the top ability quartiles regardless of their wealth have a much higher acceptance rate compared to Figures 3 and 4. Although some students of lower ability, but higher wealth levels are still accepted, this is to be expected since I assume the college has a positive weight on W_W. Also, the students who fall in the top ability, top wealth quartile still have higher acceptance rates than students with similar ability, but lower wealth. This is also because W_W is not zero. However, the acceptance rates for students in the top ability quartile regardless of wealth improves across the board compared to Figures 3 and 4. This further illustrates the influence that wealth and race have on a student's chances of being admitted into this college. Using the original admission score, top ability students coming from lower income families had no chance of being admitted, yet students from the bottom ability quartile but top wealth had a much higher acceptance rate. The introduction of the true admission score gave top tier ability, lower income students a much higher chance of attending this college even when having a positive weight on W_W.

This is just one specific example of how the model can be used to admit students more efficiently. However, since the model is generalized, any college can use this Excel sheet in their own admissions process to determine which students they should and should not admit according to their own preferences and beliefs. As I stated earlier, the true admission score improves efficiency for every possible positive parameter value, meaning the college can express their beliefs about these dependent and independent terms differently, and the intuition, logic, and results still hold. Furthermore, the model allows the college to view the acceptance rates of students coming from different wealth, race, and ability backgrounds, enabling the college to see how the model improves the distribution of accepted students based upon these characteristics. As a result, this model is applicable to any college willing to incorporate a new admissions process.

Conclusion

The college admissions system remains a mystery to many. As students across the country continue to apply to college coming from different backgrounds, the more difficult it is for colleges to make admissions decisions without bias seeping into this process. As colleges continue to unknowingly, or potentially knowingly, tilt the admissions system more in favor of wealthy, majority students, as seen in the recent college scandal, the most vulnerable in our society will continue to suffer. If these institutions abide by many of their own beliefs about creating an equitable campus, it is incumbent upon them to remove as much inequality from their admissions decisions as possible. In this paper, using assumptions throughout economic literature, I propose a potential solution for colleges to admit students more efficiently and justly. I detail how colleges miss the broader meaning of disadvantage in our society and ought to incorporate financial inequality inside their admissions systems. If our collegiate process continues to encapsulate only the wealthiest and majority students in our country, the rich are likely to stay rich and the poor still poor. I aim to aid colleges in creating the most equitable admissions process to ensure students with the most merit and academic/athletic ability are admitted and can use their talents to make this world a better place. Although idealistic, I believe

I outline a robust, realistic solution to the problems in our collegiate admissions system. As our country and our world continue along the path towards equality in all regards, this paper outlines an avenue forward to safeguard the financially and racially disadvantaged in society.

After completing this theoretical model, it is clear that there are numerous ways to expand upon this research. First, colleges were unwilling to give me access to data within their admissions systems due to confidentiality. However, if a researcher were to obtain this clearance, they could test this theoretical model on actual admissions and see if the logic, intuition, and assumptions still hold. This would allow the model to take another important step to becoming applicable to colleges in the real-world environment. Second, I analyzed four specific student characteristics that the literature identifies as crucial to each student's admissions metrics. Although they account for most of the variability inside each student's admissions packets, I did not add any interaction terms to the model that could also influence how colleges make their admissions decisions. It is likely that wealth and race are correlated with one another and adding this interaction term could help account for more of the variability inside the model. Finally, I assume colleges want to accept the most academically and athletically abled students subject to a budget and ethnic diversity constraint. It could indeed be true that colleges make their admissions decisions subject to other constraints this model did not address. A potential expansion of this model could be communicating with colleges about how they make their actual admissions decisions and if they are truly trying to obtain the most merited students subject to the two financial and racial constraints or if there are more factors they consider. I hope we all continue doing our part, as small as it might be, to make this world a better place one admissions decision at a time.

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Appendix

Definitions of Parameter Terms

S_A	Weight of Ability on SAT
S_W	Weight of Wealth on SAT
S_R	Weight of Race on SAT
S_N	Weight of Noise/Luck on SAT
Q_A	Weight of Ability on Q_{Hs}
Q_W	Weight of Wealth on Q_{Hs}
Q_R	Weight of Race on Q_{Hs}
Q_N	Weight of Noise/Luck on Q_{Hs}
I_A	Weight of Ability on IS
I_W	Weight of Wealth on IS
I_R	Weight of Race on IS
I_N	Weight of Noise/Luck on IS
W_Q	Weight of Q_{Hs} on A_{Score}
W_S	Weight of SAT on A_{Score}
W_I	Weight of IS on A_{Score}
W_W	Weight of Wealth on A_{Score}
W_R	Weight of Minority Race on A_{Score}

Definitions of Each Calculated Parameter Term

T_R	The race deduction for Majority students in the TA_{Score}
T_W	The wealth deduction for all students in the TA_{Score}

Scenario 1:

S_A	0.5
S_W	0.2
S_R	0.1
S_N	0.2
Q_A	0.1
Q_W	0.4
Q_R	0.3
Q_N	0.2
I_A	0.4
I_W	0.2
I_R	0.2
I_N	0.2
W_Q	0.25
W_S	0.3

W_I	0.25
W_W	0.2
W_R	0

Figure 1

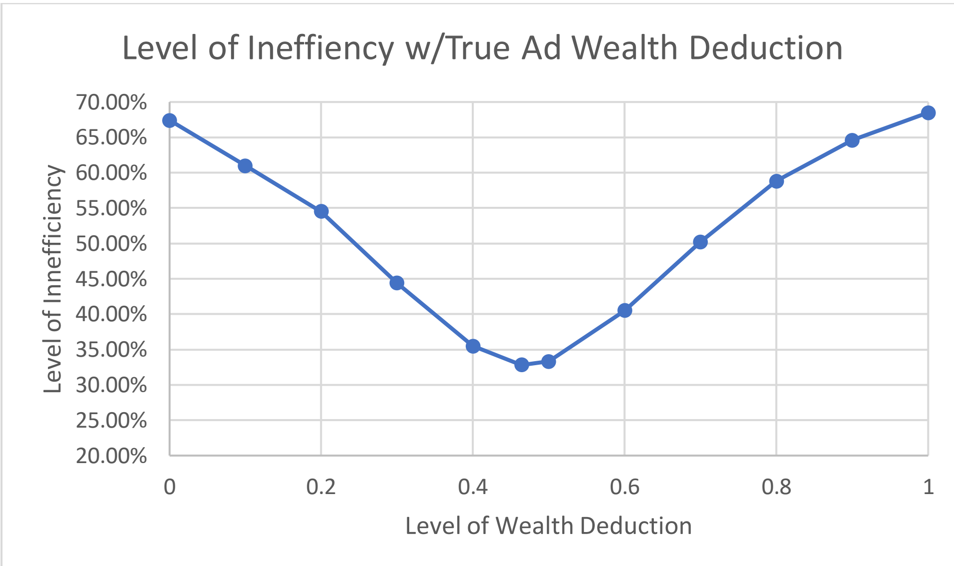

Figure 2

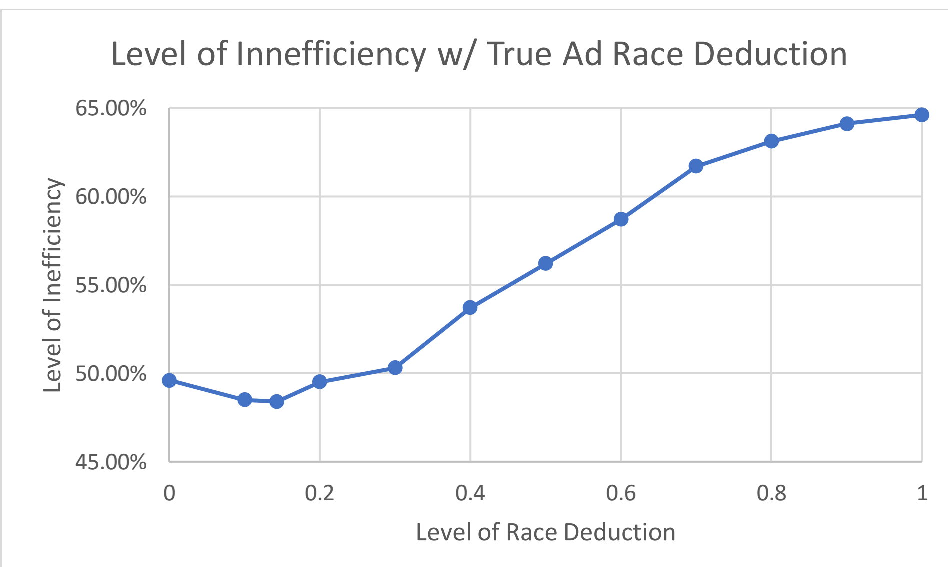

Figure 3: The acceptance rate of students in different wealth and ability quartiles with a race equal to 1 according to the original admission score

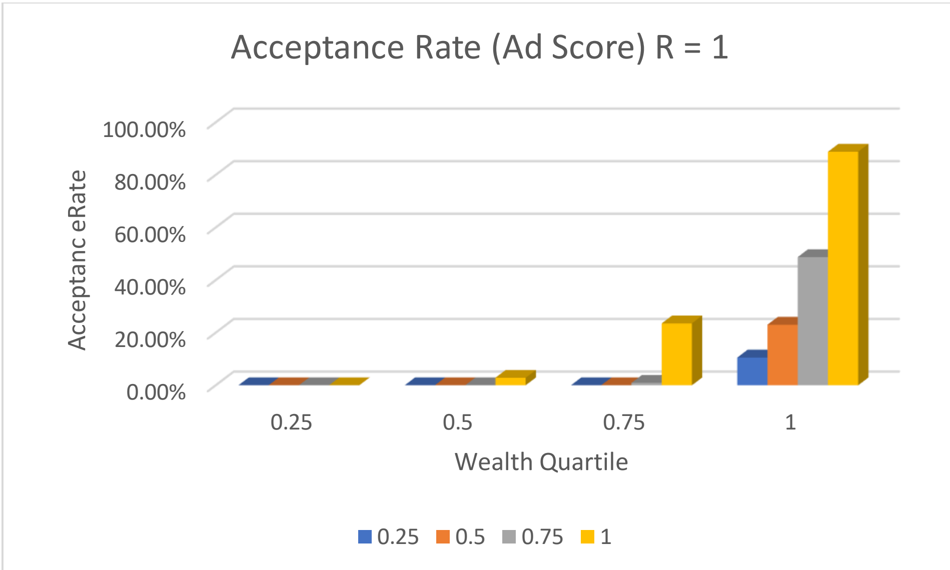

Figure 4: The acceptance rate of students in different wealth and ability quartiles with a race equal to 0 according to the original admission score

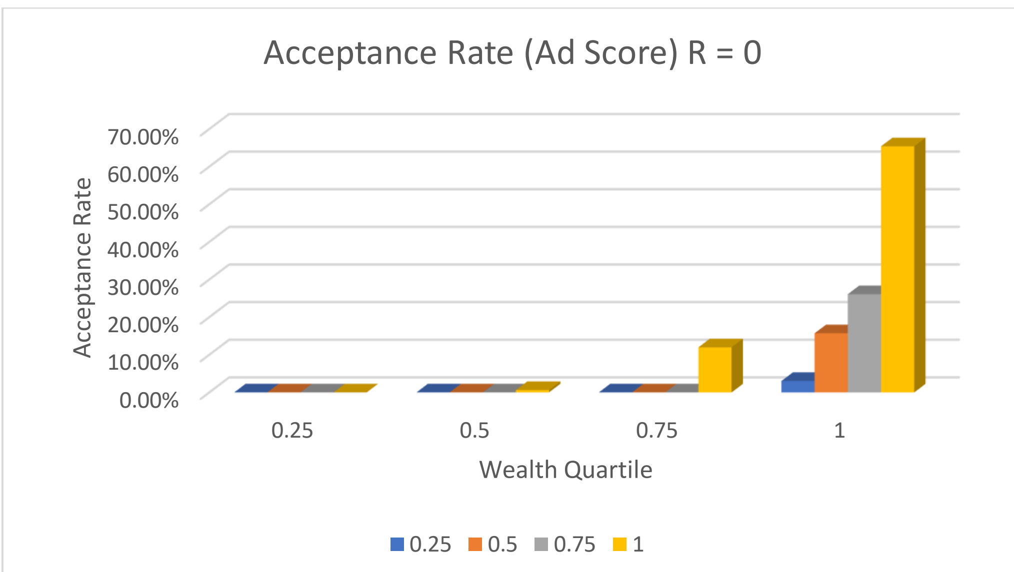

Figure 5: The acceptance rate of students in different wealth and ability quartiles with a race equal to 1 according to the true admission score

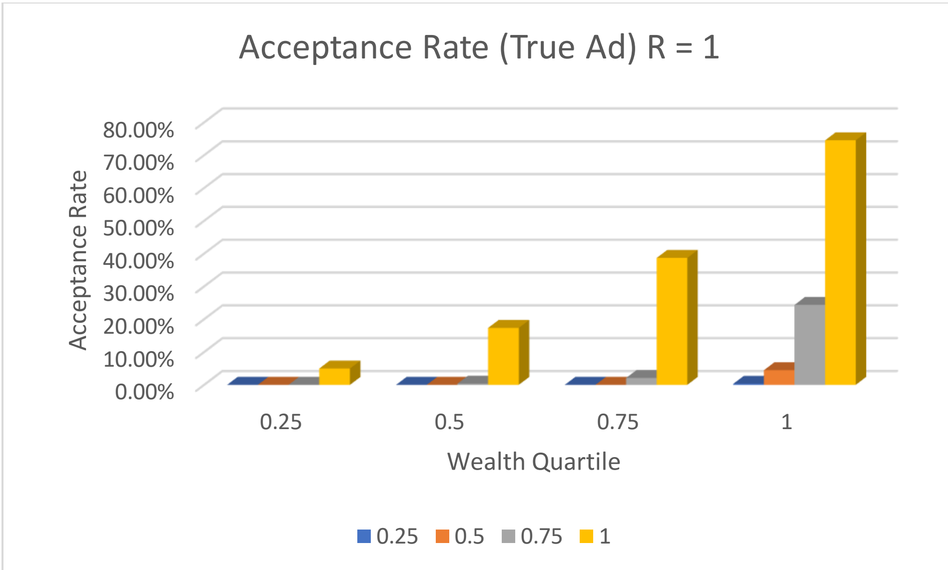

Figure 6: The acceptance rate of students in different wealth and ability quartiles with a race equal to 0 according to the true admission score