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Research Paper

Inference by college admission departments

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ABSTRACT

Theoretical, experimental and empirical research by economists and psychologists suggests biases in how people draw inferences. Eyster and Rabin (2005) review extensive experimental evidence that suggests people do not fully take into account how other people's actions depend on their private information. Using data from two colleges with optional SAT I policies, this paper quantifies the extent to which players underestimate this relationship. This policy provides applicants with a choice of whether to disclose their SATI scores to the college. Our empirical estimates indicate that colleges do underestimate the relationship between an applicant's action (not submitting) and type (SATI score).

1. Introduction

The college admissions process is filled with uncertainty: both students and colleges have private information and are making inferences about the other party's preferences or characteristics. With increasing competition among colleges to attract the best students, the stakes are high for accurate inference – as colleges attempt to identify and attract the students who will give the most value added to their institution. The economics literature typically assumes this inference is based on Bayes Rule.[1] However, Eyster and Rabin (2005) present a psychologically motivated equilibrium concept where players do not accurately map private information to actions and thus make inferences inconsistent with Bayes Rule.[2] The so-called *cursed equilibrium* allows for the possibility that players underestimate the relationship between other players' actions and their private information and is supported by experimental evidence in common value auctions, bilateral trades, and voting games.[3] If players do systematical underestimate the relationship between other players' actions and types, it has implications for all private information games.

This paper uses field data to quantify the degree to which players underestimate the relationship between other players' actions and their private information. This paper is the first to estimate their cursed parameter despite the fact that Eyster and

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[1] Since Harsanyi (1967) first developed the approach of modeling games of incomplete information, game theorists have developed numerous applicable equilibrium concepts. See Fudenberg and Tirole (1991), Kreps and Wilson (1982), Cho and Kreps (1987), and Banks and Sobel (1987) for details associated with the equilibrium refinements.

[2] See Camerer et al. (2004), Jehiel (2005), Jehiel and Koessler (2008), and Ross (1977) for other models where uninformed players make inferences that differ from Bayes Rule.

[3] Eyster and Rabin use the term cursed equilibrium because of its ability to explain the prevalence of the "winner's curse".

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Rabin's "primary motivation for defining cursed equilibrium is not based on learning or any other foundational justification, but rather on it pragmatic advantages as a powerful empirical tool to parsimoniously explain data in a variety of contexts (page 1633)". An inability to obtain data on players' private information and the difficulty of inferring players' beliefs from their observed actions may explain this lack of empirical research.[4]

We overcome these difficulties using college admissions data where the college's inference on the applicant's perceived quality influences the college's acceptance decision. We estimate this inference using application and admission data from two liberal arts schools (Colleges X and Y) that have an *optional SATI policy*. This policy allows applicants to choose whether or not to submit their standardized math and verbal SATI scores to the college – generating, for those applicants who do not submit, yet another dimension along which the college must make an inference. Through an agreement with the College Board, we obtained the SATI scores of the applicants who chose not to submit. This allows us to structurally estimate a model and quantify the degree to which the colleges underestimate the relationship between an applicant's decision not to submit and the applicant's actual SATI scores. Because we are unable to directly observe what SATI score the colleges infer for applicants who choose not to submit, we use the admission decisions to estimate this inference. We parameterize this inference in the manner proposed by Eyster and Rabin (2005).

For the sixteen percent of College X applicants and the twenty four percent of College Y applicants who chose not to submit their SATI scores, we find that both colleges underestimate the relationship between the applicants' decision not to submit and the applicant's actual SATI score. The results from our structural estimation suggest that the admissions departments overestimate the SATI scores of applicants who do not submit by 15–25 points on an 800 point scale.

The fact the colleges infer only slightly higher average scores reflects the fact that the other information in the college application, such as high school grade point average, class rank, SATII score, ACT score, gender, and race, are accurate predictors of an applicant's actual SATI score. Because the additional information the college obtains from an applicant's actual SATI score is not large, our simulations suggest that the composition of the student body would not change appreciably if the colleges correctly inferred SATI scores or if the colleges required all applicants to submit their SATI scores.[5]

2. Application/admission process and data

2.1. Application/admission process

The college admission process culminates with colleges making acceptance decisions and students accepting or declining those offers of acceptance. During the process, colleges and students exchange much information; colleges make inferences on which students are "best" for the school; and student make inferences about whether the school is their best option. The formal application process begins in November for students applying early decision and in January for students applying regular decision. When applying, students fill out an application to the school that includes basic information about demographics, high school experience, financial aid intent, extracurricular activities, and a personal essay. Students also provide information to the colleges through campus visits and interviews, as well as interactions with their guidance counselors and college admissions personnel. Students who apply in the early decision process sign a written agreement stating that they will attend if admitted and, because it is costly to renege on this contract, applying early decision provides a signal of an applicant's willingness to attend if accepted.[6] Finally, students typically provide a required standardized test score to the college.

In the Northeast, where the schools in our data are located, the SAT is the standardized test potential college students typically take.[7] A high school student takes the SAT exams in her junior and/or senior year during one of the seven annual test dates offered by the College Board. At the time of our data (the early 2000s), the SATI consisted of a two-part standardized verbal and math exam each scored on an 800 point scale.[8] Some students might also choose to take a subset of the 20 different SATII exams on subjects including English, history, mathematics, science and languages scored on an 800 point

[4] The empirical literature on saliency and shrouding is related to how players make inferences. See, for example, Gabaix and Laibson (2006), Chetty et al. (2009), Finkelstein (2009) and Brown et al. (2010).

[5] Using the same dataset as this paper, Conlin et al. (2013) find that these colleges' acceptance decisions are influenced by strategic considerations pertaining to the pool of students (i.e., those who submit and enroll) whose SAT scores are reported to ranking organizations such as *U.S. News & World Report*. At the time of the data, almost a quarter of the top 100 liberal arts colleges ranked by *U.S. News & World Report* had optional SATI policies. Relative to larger universities, these liberal arts colleges are able to collect and individually evaluate substantially more information on each applicant. Thus, applicants' SATI scores provide much less additional information to liberal art schools than to larger universities.

[6] The agreement is not legally binding and the applicant may be released if the college does not meet financial need. However reneging on an early decision acceptance may be costly if it is too late to reapply to alternative schools and could adversely affect the reputation of the high school guidance counselor who also signs the agreement (Avery et al., 2003). Avery et al. (2003) report that often more than 40% of enrolled students applied early decision, when early decision is an option, highlighting the importance of the policy for schools.

[7] During the time of our data, the SAT was the most common standardized test taken along the East and West coasts, as well as in Texas. The ACT was most common in the Midwest.

[8] Students often take the SATI multiple times (Vigdor and Clotfelter, 2003). We do not have information on how many times the applicant took the different exams.