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Preferences, selection, and value added: A structural approach

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ABSTRACT

What do applicants take into consideration when choosing a high school? To what extent do schools contribute to their students' academic success? To answer these questions, we model students' preferences and obtain average valuation placed on each school. We then investigate what drives these valuations by carefully controlling for endogeneity using a set of creative instruments suggested by our model. We find that valuation is based on a school's location, its selectivity as measured by its cutoff score, value added and past performance in university entrance exams. However, cutoffs affect school valuation an order of magnitude more than does value added.

"*The C student from Princeton earns more than the A student from Podunk not mainly because he has the prestige of a Princeton degree, but merely because he is abler. The golden touch is possessed not by the Ivy League College, but by its students*."

Shane Hunt, "Income Determinants for College Graduates and the Return to Educational Investment," Ph.D. thesis, Yale University, 1963, p. 56.

1. Introduction

In much of the world, elite schools are established and very often subsidized by the government. Entry into these "exam" schools is based on performance in open competitive entrance exams. Applicants leave no stone unturned in their quest for higher scores on these entrance exams, creating enormous stress. The belief seems to be that getting into these schools is valuable, presumably because future outcomes are better in this event. Students, it is argued, will do better by going to an exam school where they are challenged by more difficult material and exposed to better peers. What actually happens? Students of these elite exam high schools, without a doubt, do better on college entrance exams and are more likely to be placed at the best university programs. But is this due to selection or value-added by these schools? It is quite possible that the success of students from exam schools creates the belief that these schools add value. This belief results in better students sorting into exam schools so that students from these schools do better, which perpetuates the belief system.

The usual way of ranking schools is in terms of their selectivity, how hard they are to get into in terms of some performance measure like the SATs in the US,[1] or in terms of how well students who graduate from them do as measured by wages, eminence in

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[1] Schools are sometimes less than honest: some inflate their statistics on the performance of their entering class. Some schools manipulate the system by keeping their class size small, thereby having high SATs and looking very selective. See "Academic integrity should count in rankings" in the Kansas City Star, 2/8/2013. http://www.centredaily.com/2013/02/12/3499088/editorial-academic-integrity-should.html

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later life, or admission into further schooling. However, schools may do well in all of these dimensions merely because they admit good students and not because they provide value added and thereby *improve* the performance of the students they admit.[2] How can we control for such selection and estimate value added? What do students seem to value? Can we model and estimate their preferences? These are the questions we try to address.

Turkey is a good place to look for answers to these questions for a number of reasons. To begin with, the Turkish admissions system is exam-driven. Admissions are rationed on the basis of performance on open competitive national central exams at the high school and university level. This eliminates incentive problems when there are a large number of students.[3] Second, as education is highly subsidized in public institutions, educational options outside the country or at private institutions are much more expensive so that these exams are taken seriously by the applicants. When the stakes are high, as in Turkey, it is less likely that outcomes are driven just by noise.

We develop a way to answer the questions of interest by taking a more structural approach than much of the literature. The structure imposed allows us to economize on the data requirements. Our data consists of information on all high schools (Exam Schools) in Turkey which admit students on the basis of an open competitive exam administered at the end of middle school. Not all middle schoolers take this exam as it is voluntary. We obtained (from public sources) the admission cutoff scores of each exam school, the number of seats in each such school, and the overall distribution of scores of students who chose to take this exam. For one school only, we also have the distribution of scores of admitted students. We also have the mean performance of students in each exam high school in the university entrance exam. We would like to emphasize that we do not have individual level data on performance in the high school (or university entrance) exam or on stated preferences for high schools.

We use this data in Section 3 to estimate a nested logit model of preferences over high schools, taking into account that exam schools only admit the highest scoring students who apply. Thus, students choose their best school from schools whose cutoff is below their score. We estimate preferences in two steps. First, by using information on the minimum cutoff scores, we derive the demand for each school, conditional on the correlation of shocks within a nest. We obtain the mean valuation for each school by setting demand equal to the number of available seats and solving for mean valuation. Second, we pin down the correlation of shocks within a nest using information on the maximum and minimum cutoff scores in each school. This twist, to our knowledge, is novel. The idea is quite simple. If preference shocks are perfectly correlated within a nest, then preferences are purely vertical and the minimum score in the most valued school in the nest cannot be lower than the maximum score in the second most valued school in the nest. Thus, the extent of overlap in the scores between schools within a nest identifies the correlation in preference shocks in the nest.

Finally, in Section 3, to see what applicants care about in a school, we regress the mean valuation of schools on the schools' characteristics (its location, size, mean performance in the verbal and quantitative parts of the university entrance exam, type of school, and the cutoff score). The error term, which is meant to capture shocks to school valuations, is likely to be correlated with the cutoff, as greater valuations raise demand and hence the cutoff, biasing the estimates upwards. We use a clever instrument suggested by our model to correct for endogeneity bias. We find that selectivity does indeed seem to raise valuations.

Section 4 focuses on value added. In this section we restrict attention to a subset of schools (Science high schools). To understand the value added by a school, we use the data on the overall distribution of scores on the high school entrance exam, along with the estimated preference parameters, to allocate students to high schools and obtain the simulated distribution of students' scores on the high school entrance exam in each school. We then compare the mean of the simulated distribution for each school to its mean score in the University Entrance Exam after standardizing the scores. This gives a (possibly contaminated by mean reversion) estimate of the value-added by a school. Mean reversion is likely to be especially severe at the top and bottom of the school hierarchy as it is a consequence of randomness in performance. Students in the best (worst) schools disproportionately include those who are just lucky (unlucky) so that their performance in the university entrance exams will tend to be below (above) that in the high school entrance exams even if there is zero value added. We use simulation-based methods as well as information on each student in a *single* school to estimate the average value-added by a school, while controlling for mean reversion. Note that the extent of the mean reversion depends on both preferences and the extent of noise in the high school entrance exam score so that correcting for it can only be done by taking a structural approach. Finally, we ask if value added also drives mean valuation of a school.

Our results show that highly valued schools do not all have high value-added. Some have negative value added, while others have positive value added. Our estimates suggest that students like more selective schools so that better students, who have more options open to them, sort into these schools. We also find that they also care about the value added by the school, but its importance (in a standardized regression) is far less than that of the cutoff score. Consequently, even when schools do not add value to the students (in terms of their performance on the university entrance exam) they attract good students, providing an advantage to incumbents and an impediment to entry and the functioning of the market.

A major contribution of our paper is to relate the valuations placed on schools to measures of school characteristics such as selectivity, facilities, location and value added by the school. It is important to understand what lies behind preferences. If preferences seem to be driven by selectivity alone, selective schools need not be those that are adding the most value and circular causation will drive rankings. Preferences may be unrelated to school performance (i.e., value added) either because it is hard to

[2] There has recently been considerable effort in determining value-added by a school as part of the accountability in the No Child Left Behind legislation. See Darling-Hammond et al. (2012) for a critique of the approach usually taken.

[3] Students prefer to report their true preferences, no matter what other students report as they take the cutoffs as given.