School Choice and Educational Mobility: Lessons from Secondary School Applications in Ghana

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Abstract

Merit-based school choice often presents an unfulfilled promise of educational mobility. In Ghana, where a standardized exam determines secondary school admission, students from low-performing elementary schools apply to weaker secondary schools than equally qualified students from high-performing elementary schools. This paper investigates why students with the same academic potential make different application choices. I outline a theoretical model and empirical strategy to analyze heterogeneity in student demand. Using administrative data, I show that disadvantaged students value school proximity more and live farther away from high-performing schools, suggesting the interaction between demand and the spatial distribution of schools limits educational mobility.

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1 Introduction

Few issues in public discourse on education have attracted as much attention as the imperative of reducing inequality. Policymakers and researchers increasingly recognize open enrollment school choice systems as a way to address disadvantage, by giving children in low-performing schools the chance to move to higher performing schools. Merit-based systems are particularly appealing because admission priorities reward a student's individual performance instead of favoring luck, residential location, or family connections. Yet, school choice can only foster educational mobility if parents and students make expedient choices.

It is therefore concerning that studies of school choice consistently find that disadvantaged students forgo opportunities to attend better schools. Figure 1 plots secondary school application behavior by educational background for elementary school students in Ghana. Although a standardized exam determines admission, students from low-performing elementary schools apply to lower performing secondary schools than students from high-performing elementary schools with the same exam scores. Disadvantaged students applying to less selective schools than they merit is a global phenomenon that has been widely documented, especially regarding college applications in the United States (e.g., Manski and Wise, 1983; Avery and Kane, 2004; Bowen, Chingos and McPherson, 2009; Hoxby and Avery, 2013).

This paper investigates why students with the same academic potential make different application choices. Existing literature has identified at least two possible explanations: 1) utility maximization and 2) decision-making ability. Under the first hypothesis, disadvantaged students make utility-maximizing decisions not to apply to higher performing schools. Their choices could stem from a preference to attend nearby schools or those with peers from a familiar background (Hastings, Kane and Staiger, 2008; Burgess et al., 2015; Walters, 2018). They could also reflect

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lower actual or expected returns from attending high performing schools, which may arise from differences in expected completion rates (e.g., Dustan, de Janvry and Sadoulet, 2017). Additionally, students' choices could reflect their concerns about school attendance costs, given their budget constraints. Under the second hypothesis, disadvantaged students would optimally choose to attend high performing schools if they were fully informed and strategically sophisticated, but they have limited information and are prone to application mistakes because of difficulties identifying or adopting the optimal application strategy (e.g., Abdulkadiroğlu et al., 2006; Hastings and Weinstein, 2008; Pathak and Sönmez, 2008; Lai, Sadoulet and de Janvry, 2009; Lucas and Mbiti, 2012; Hoxby and Turner, 2013; Pallais, 2015).

I use rich administrative data on secondary school applications in Ghana to test the first hypothesis, that students from disadvantaged backgrounds have a weaker demand for attending selective schools. Although this paper focuses on the role of demand, the goal is not to definitively reject the second hypothesis and rule out the role of information challenges or other potential explanations, but rather to examine whether there is any evidence supporting the first hypothesis that students from disadvantaged backgrounds are less willing to attend high-performing schools. I do not directly observe any indicators of family background, so I proxy for students' socioeconomic status using the type of junior high school they attended and classify disadvantaged students as those coming from low-performing public schools relative to those coming from high-performing public schools or from private schools.

A key identification challenge is how to uncover preferences from observed application lists in a setting where students have incentives to strategically select their choices. I formulate a generalizable school choice model and generate precise predictions to test for differences in preferences using two complementary empirical methodologies. The first approach looks at the

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ordering of schools in students' ranked lists, based on the insight that students do not have any incentives to misrepresent the rank ordering of their submitted choices once they have decided on the set of schools to include on their list. Analyzing the ordering of schools in each student's ranked list, I show that disadvantaged students are significantly more likely to rank non-selective schools above more selective schools on their lists, indicating a weaker preference for attending selective schools that cannot be explained by differences in strategic considerations. Using secondary school exam performance as an alternative measure of school quality, I similarly find that disadvantaged students are relatively more likely to rank a lower performing secondary school above higher performing schools on their list.

The second approach evaluates students' preferences for observable school characteristics. Here, I focus on the characteristics of a student's first choice school. To eliminate the possibility of strategic application behavior, I restrict students' choice sets to schools of similar selectivity and then estimate a discrete choice model. The results indicate that disadvantaged students have stronger preferences for schools in close proximity and place relatively less weight on schools' academic performance. Combined with evidence that disadvantaged students are less likely to have high-performing schools nearby, this analysis supports the argument that the interaction between demand and the spatial distribution of schools limits educational mobility. This estimation approach relies on a simplifying assumption about student information. In modeling students' beliefs about their admission chances, I assume that students have perfect information about school selectivity, even though they may still face uncertainty about their own exam performance. To provide support for my assertion that student application behavior is not driven by a lack of information about school selectivity in this context, I show that school rankings in Ghana are stable over time, and I conduct several robustness checks, including focusing on students in areas with

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historically stable school rankings. Nevertheless, information remains a potential explanation for some of the differences in school choice behavior that I observe.

As an alternative approach to address the possibility that students omit more-preferred selective schools from their rank ordered lists because of low expected admission chances, I estimate an additional set of results using the method proposed by Artemov, Che and He (2021). This strategy estimates students' likelihood of selecting their assigned school out of a set of other clearly feasible choices. I find similar preference patterns, reinforcing my conclusions that students from disadvantaged backgrounds place a higher value on school proximity.

My results broaden the perspective of research on this topic. Much of the existing school choice literature analyzes lottery-based admission systems. My analysis of Ghana's merit-based system provides new insights about application differences in situations where individual performance determines admission and where strategic behavior may affect outcomes. Moreover, much of the educational mobility literature focuses on high-income settings. These findings from Ghana temper growing optimism over the efficacy of providing information or simplifying the application process as a means to encourage disadvantaged students to apply to higher performing schools. Efforts such as these are likely to succeed in contexts with free schooling or where financial aid programs enable low-income students to attend selective schools at a subsidized cost. In lower income settings without these provisions, the barriers to educational mobility will likely be harder to overcome.[1]

Understanding what restricts educational mobility has crucial implications for students' future outcomes. Duflo, Dupas and Kremer (2011) find positive effects of academic tracking on test scores using a randomized experiment in Kenya, suggesting that high-achieving students in low-performing schools would benefit from moving to schools with similarly high-achieving peers. A

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growing literature also finds that attending a better school improves nonacademic outcomes (Cullen, Jacob and Levitt, 2006; Deming, 2011; Lavy, 2010). Additionally, Black, Denning and Rothstein (2020) analyzing the effect of the Texas Top Ten Percent rule find that access to selective colleges increased graduation rates and earnings for high performing students from non-traditional sending schools.[2]

2 Institutional Background

Compulsory education in Ghana consists of six years of primary school and three years of junior high school (JHS). Each year, all 350,000 students graduating from the over 9,000 JHSs compete for admission to senior high school (SHS) and may apply to any of the 700 SHSs in the country that follow the national curriculum. This provides an ideal context in which to study educational mobility because there is considerable variation in school quality at both levels of schooling.

In 2005, Ghana introduced a centralized merit-based admission system to improve the transparency and fairness of the secondary school transition process. The Computerized School Selection and Placement System (CSSPS) allocates JHS students to SHS based on students' ranking of their preferred program choices and their performance on a standardized exam (Box 1 in Online Appendix Section A provides more detail). I refer to students as the decisionmakers throughout this paper for simplicity, however application choices often result from discussions between students and their parents, teachers, or friends.[3] In practice, admission occurs in three stages:

1. Students submit a ranked list of choices, stating a senior high school and a program track within that school for each choice.[4]
2. Students take the nationally administered Basic Education Certificate Exam (BECE).

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3. All students who qualify for admission to SHS are admitted to a school and program.

On average, only half of all candidates received a sufficient grade in the BECE to qualify for admission to SHS during the first five years of the CSSPS.[5]

Programs have a predefined capacity and admit students using a deferred-acceptance algorithm (Gale and Shapley, 1962, see Online Appendix A.1 for a more detailed discussion of the matching properties of this algorithm), with priority determined strictly by academic merit as follows:

- *Step 1*: Each student applies to the first program in her ordered list of choices. Each program tentatively assigns its seats to applicants one at a time in order of students' academic performance (based on BECE scores). Each program rejects any remaining applicants once all of its seats are tentatively assigned.

In general, at

- *Step k*: Each student who was rejected in the previous round applies to the next choice on her list. Each program compares the set of students it has already tentatively accepted with the set of new applicants. It tentatively assigns its seats to these students one at a time in order of students' academic performance and rejects remaining applicants once all of its seats are tentatively assigned.

The algorithm terminates when no spaces remain in any of the programs selected by rejected students. Each student is then assigned to his or her final tentative assignment.[6] Rejected students who do not gain admission to any of their chosen programs are administratively assigned to an under-subscribed program with available spaces. Efforts are made to place these students in their preferred district or region wherever possible but there is limited regard for students' initially ranked choices. As such, there are high stakes involved in the application decision.

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Two aspects of the Ghanaian school choice system are especially noteworthy. First, students can only submit a limited number of choices. This is partly a legacy of the manual application system which preceded the CSSPS. Initially, students were allowed to list up to three choices as they had been under the manual system. This increased to four choices in 2007 and to six choices in 2008. Between 94 and 100 percent of students listed the maximum number of choices each year.

Second, the application process includes a substantial degree of uncertainty. Students must submit their applications before taking the entrance exam;[7] and admission cutoffs are endogenously determined by the quality of applications to a given program each year since schools only define the number of available spaces, but not an explicit exam score required for admission. Therefore, students have incomplete information about their admission chances when they select their choices even though admission is definitively based on exam performance.

These features of constrained choice and incomplete information are remarkably common. In the US, school choice systems in Denver, Chicago, and New York respectively limit the number of choices to 5, 6, and 12 (Pathak and Sönmez, 2013). Ghana-like merit-based systems are used for secondary school admission in other countries including Kenya (limit 3), Trinidad and Tobago (limit 4), and the United Kingdom (varies by local council but typically 3 to 6), and for college entry in Canada (e.g., limit 5 in Ontario), Chile (limit 8), Hungary (limit 4), and Spain (limit 8).[8] Moreover, students generally apply under uncertainty – either due to random assignment or endogenous cutoffs in merit-based systems in which schools predefine their vacancies but not an explicit exam score that guarantees admission.[9] Theoretical studies by Chade and Smith (2006), Haeringer and Klijn (2009), and Chade, Lewis and Smith (2014) model the problem of constrained choice with incomplete information and show that these features severely complicate the decision-making process. Although Calsamiglia, Haeringer and Klijn (2010) confirm several theoretical

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predictions in a lab experiment, we know little about how the effects of constrained choice and uncertainty differ based on students' socio-economic backgrounds or the extent to which they limit the ability of high-achieving students to attend better schools in practice.

Another notable component of Ghana's school choice environment is the variety of available alternatives. Although students can apply to any school in the country, cost and distance may be key considerations for disadvantaged families because education in public schools was tuition free for primary and JHS but not for SHS. Junior high schools often still charged various non-tuition fees but senior high school was substantially more expensive. For example, fees for day students in public SHSs in 2007 were c33,000 ($30) per term and boarding fees were c784,700 ($75) per term. The feeding fee was c746,700 ($72) and the approved list of total fees payable on admission (covering admission, school uniform, house attire, and physical education kits) was c442,000 ($42) (Ghanaian Times, 2007). A boarding student therefore had to pay up to $190 per term or $570 per year. Annual GDP per capita was $1,100 and the minimum wage was approximately $650 per year.

Thus, both the complexity of the school choice process and the varying characteristics of available options are potential factors that could deter disadvantaged students from applying to better schools. The next section describes the detailed administrative data from Ghana that allow me to empirically examine school choice and educational mobility in this setting.

3 Data

I use CSSPS administrative data on senior high school applicants and supplementary data on school characteristics to analyze application behavior and admission outcomes in Ghana.

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A Student Applications

CSSPS data cover the universe of students who took the BECE in Ghana between 2005 and 2009 and report their background characteristics, application choices, BECE scores, and admission outcomes. Panel A in Online Appendix Table A.1 presents descriptive statistics by year. Data on admission outcomes are incomplete for 2006 (administrative assignments are missing), so I use a panel of data from 2007 to 2009 as the core of my analysis.

For each student, I observe the junior high school attended and the complete ordered list of choices submitted to the CSSPS – the student's "application portfolio".[10] In most specifications, I focus on the 50 percent of students who qualify for senior high school admission because I also observe individual exam scores and admission outcomes for these students. I convert BECE scores for each year into a standardized score with a mean of zero and standard deviation of one so that they are comparable across years.

To examine the extent of educational mobility, I proxy for students' socioeconomic status using the type of junior high school they attended, since I do not directly observe any indicators of family background. I calculate junior high school performance on the BECE exam for the period 2005 to 2009 and split the sample into three groups: students from public junior high schools where the average BECE score is above the median average for all public schools in the country, students from public JHSs with performance below the median, and students from private JHSs. Table 1 presents a comparison of background characteristics, application choices, and admission outcomes for students in my 2007 to 2009 analysis sample. The majority of students attend public junior high schools (82 percent overall and 73 percent among students who qualify for senior high school admission).

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There are large differences in BECE performance across schools. 49.8 percent of students overall qualify for SHS admission. The respective qualification rates are 33.0 percent, 67.4 percent, and 75.6 percent for students from low-performing public, high-performing public, and private junior high schools.

B Secondary School Characteristics

I supplement the CSSPS student data with information on secondary school characteristics. Ghana Education Service updates a register of schools each year to provide information on each school's location and to indicate whether a school is public or private, single sex or coeducational, and day or boarding. The register also lists the types of programs offered and the number of vacancies in each program. Additionally, I obtained school-level distributions of grades in the Secondary School Certificate Examination (SSCE) from the West African Examination Council. The SSCE is taken at the end of senior high school and used for admission to university. It is centrally administered to students at a national level, so exam scores are comparable across schools. As a measure of schools' academic performance, I standardize the average percentage of students earning a credit on the SSCE math and English exams for the period 2003 to 2008, to have mean zero and a standard deviation of one.[11] I use the CSSPS data on students' admission outcomes to construct a measure of school selectivity based on the distribution of BECE scores of students admitted each year.

Finally, I use three additional indicators of school quality. The first measure indicates the 34 "colonial" schools that were constructed before Ghana gained independence in 1957. These pre-independence schools have a historical prestige similar to that of the Ivy League universities in the United States. The second measure indicates the 65 top-ranked ("Category A") schools according to a categorization scheme introduced by the government in 2009 to reflect schools' available

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facilities. The third measure indicates the 22 "elite" schools that are both colonial and Category A schools. Panel B in Online Appendix Table A.1 summarizes the senior high school data.

C Evidence of Systematic Differences in Student Outcomes

Figure 1 presents a descriptive illustration of students' application behavior. I plot the average academic performance of senior high schools in students' application portfolios against students' individual BECE scores for each of the three groups of applicants: students from public junior high schools where the mean BECE score is below the median average for all public schools in the country, students from public JHSs above the median performance, and students from private JHSs. The upward slope for all three groups in the figure indicates that students with higher BECE scores apply to higher performing schools. However, there is a persistent divergence in application behavior based on students' JHS backgrounds. For a given BECE score, students from private and high-performing JHSs apply to a higher performing set of schools than students from low-performing JHSs.

This divergence in application behavior implies qualified students from low-performing schools are not taking full advantage of the opportunity to attend higher performing schools. Throughout this study, I interpret BECE scores as a measure of students' true underlying ability. An alternative interpretation would be to presume that students who received a high BECE score but came from a low-performing school were simply lucky. Empirical analysis in a related paper (Ajayi, 2014) and presented in Online Appendix Table A.2 informs my interpretation of BECE scores. Conditioning on individual BECE scores, I find that students who attended low-performing JHSs perform better on the SSCE exam than their senior high school peers who attended high-performing JHSs. Thus, BECE scores likely understate the true ability of students from low-

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performing schools and observed differences in application behavior would be even more extreme if we could compare students with the same academic potential.[12]

To provide additional evidence on the extent of educational mobility, Table 2 evaluates the main predictors of students' application choices and admission outcomes. Each column presents coefficients from a linear regression of the following form:

$$Y_{ijd} = \alpha_0 + \alpha_1 T_i^* + \alpha_2 \phi_j + \alpha_3 Public_j + \delta_d + \epsilon_{ijd} \quad (1)$$

where Y_{ijd} is some characteristic of the application set or admission outcome of student i from junior high school j in district d. T_i^* is student i's standardized BECE score, ϕ_j is the mean BECE score in student i's junior high school j, and $Public_j$ is an indicator for whether student i attended a public junior high school. I also include district fixed effects, δ_d, for each of Ghana's 138 administrative districts in the study period, to ensure that comparisons focus on students in the same geographical area and to account for any district-specific factors that may influence school choice. I cluster standard errors at the junior high school level to allow for correlations in unobserved factors within schools. The key parameters of interest – α_2 and α_3, indicate how JHS background relates to application behavior and admission outcomes.

This analysis examines how application behavior and admission outcomes vary with individual ability (T_i^*), and separately with socioeconomic background (proxied by JHS type). I use two indicators of JHS characteristics to capture two components of family background. Average BECE test scores ϕ_j indicate the average educational ability of peers as well as the average productivity of the school. Attending a public over a private JHS ($Public_j$) proxies for a family's ability and willingness to invest in education (capturing both the value placed on education as well as available resources). Both ϕ_j and $Public_j$ have independent explanatory power. They both significantly predict application and admission outcomes – the R^2 on the equation goes from 0.349 to 0.375 with

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the inclusion of ϕ_j and increases further to 0.390 with the inclusion of $Public_j$. Although we may expect that higher and lower ability students from different backgrounds behave differently, I do not include an interaction between T_i^* and ϕ_j to maintain the focus on the question of whether equally qualified students from different backgrounds make the same application choices.

Panel A of Table 2 presents models that take as a dependent variable the average academic performance of the portfolio of schools to which student i applies, where academic performance is the standardized percentage of students earning a credit in the SSCE English and math exams. Column 1 indicates that a standard deviation (σ) increase in individual BECE scores implies a 0.231σ increase in the average academic performance of schools to which a student applies, while a standard deviation increase in JHS average performance implies a 0.203σ increase in the performance of selected schools. Column 2 includes controls for whether a student attended a public JHS, and the coefficient on JHS average performance falls to 0.163. The negative coefficient on attending a public JHS ($\alpha_3 = -0.180$) indicates that students from public schools apply to lower performing senior high schools holding all else equal. Column 3 adds an indicator for having an elite, colonial, or Category A school in a student's JHS district. The correlation with portfolio selectivity is positive and the coefficient on JHS average performance falls again to 0.145. Column 4 includes district fixed effects and the coefficient on JHS average performance decreases to 0.084, which suggests that geographical location is an important determinant of differences in portfolio choices, and that application differences by JHS background exist even within districts.

The final column looks for evidence of school-specific determinants of application choices, by controlling for the average number of students in a given JHS who applied to an elite SHS in the first two years of the CSSPS. The coefficient on previous application behavior is positive and

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significant. Meanwhile, the coefficient on JHS average performance decreases to 0.048, suggesting a strong persistence in application behavior within schools.

Panel B of Table 2 presents an additional set of results on the academic quality of students' chosen schools and their admission outcomes. Column 1 repeats my preferred specification from column 4 of Panel A, using the regression specified in equation 1 to examine the average performance of schools in a student's application portfolio. Column 2 analyzes school selectivity as an alternative measure of school quality and finds similar results. Columns 3 to 5 focus on admission outcomes: the performance, selectivity, and peer quality in a student's assigned senior high school. The results consistently indicate that while individual ability predicts the quality of schools to which students apply and gain admission, junior high school background is also a significant predictor of students' choices and admission outcomes.

Higher performing students and students from higher performing and private schools are more likely to apply to schools that are located far from their homes. This certainly appears to be a dimension that separates students from different educational backgrounds. 54.7 percent of students from low performing public schools are admitted to high school as a boarding student, compared to 69.4 percent and 73.0 percent of students from high performing public schools and private schools. Students from low performing public schools apply and gain admission to high schools that are approximately 5 and 10 miles closer than students from high performing public schools and private schools, respectively.

Despite these differences in geographical mobility by educational background, I find persistent gaps in application behavior and admission outcomes when I restrict the sample to the 55 percent of students who only applied to schools within their JHS region or the 5 percent who only applied within their JHS district (results reported in Online Appendix Table C.1). The coefficients on a

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student's individual BECE score decrease (indicating that a student's academic performance becomes a weaker predictor of application choices and admission outcomes). Meanwhile, the coefficients on measures of students' educational background remain statistically significant, with larger magnitudes in some cases compared to the full sample (indicating that disadvantaged students apply and gain admission to less selective high schools even when compared to more advantaged students choosing from schools in the same local market).

4 School Choice Model

My primary objective is to evaluate whether differences in demand can explain differences in the application choices of equally qualified students from different educational backgrounds. The central contribution of the model below is to establish the optimal application behavior given the school choice mechanism (allowing me to interpret the rank order of selected schools as a truthful preference ordering) and to outline an approach to estimate the parameters of underlying student preferences (allowing me to characterize the determinants of demand for schools, despite the presence of strategic application behavior). An alternative methodology would be to estimate a fully structural model of students' application behavior and to then simulate the choices that students would submit under counterfactual scenarios. The large number of alternatives and interdependence between admission chances in a typical merit-based system prevent simplification of the school choice problem. Thus, a fully structural solution requires a substantial number of additional assumptions and is extremely challenging to implement.

A Setup

I model the application decision in terms of a portfolio choice problem, following Chade and Smith (2006). Consider a finite set of students $I = \{1, \cdots, K\}$ each with ability T_i^*, which is unknown to

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the student, and a finite set of schools $S = \{1, \cdots, M\}$ each with a known selectivity level q_s. Each student receives some utility U_{is} from attending a school.[13] Given the uncertainty about her actual ability, each student forms a belief about her expected exam performance T_i and associates this belief with some subjective probability of being admitted to a given school, $\Pr(T_i^* > q_s) \equiv \tilde{p}_{is} \in [0,1)$. Thus, each student has some expected value of applying to a school: $z_{is} = \tilde{p}_{is} U_{is}$.

Students face the task of selecting an application portfolio which is an ordered subset of A schools. Finally, there is an application cost $c(|A|)$ associated with selecting a portfolio of size $|A|$ schools. For the CSSPS case, institutional restrictions permit a fixed number of applications n, so $c(|A|) = 0$ if $|A| \leq n$ and $c(|A|) = \infty$ if $|A| > n$.

In the resulting portfolio choice problem, each student i chooses an application portfolio $A_i = \{1, \cdots, N\}$ to maximize net expected utility: $\max_{A_i \subseteq S} \mathrm{f}(A_i) - \mathrm{c}(|A_i|)$. The optimal portfolio (A_i^*) consists of a ranked set of chosen schools and solves:

$$\max_{A_i \subseteq S} f(A_i) = \tilde{p}_{i1} U_{i1} + (\tilde{p}_{i2} - \tilde{p}_{i1}) U_{i2} + \cdots + (\tilde{p}_{iN} - \tilde{p}_{iN-1}) U_{iN} \tag{2}$$

where the numerical subscript indicates the cth-ranked choice in the application set, and $N \leq n$. Further, $(\tilde{p}_{ic} - \tilde{p}_{ic-1})$ is the conditional probability of being admitted to choice c given that a student is not admitted to any of her more preferred choices.[14]

B Optimal Application Strategy

Haeringer and Klijn (2009) theoretically analyze the problem of constrained school choice and conclude that while there is no weakly dominant strategy, an undominated strategy is to select a set of n schools and to rank these schools truthfully (p. 1929, Proposition 4.2). Although students might be strategic in selecting the set of n schools to include in their application list, they do not gain by misrepresenting their relative preferences for these schools when it comes to submitting their rank ordering. This means that any school included in a student's list of submitted choices

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should be weakly preferred to any schools ranked lower on that list (i.e., $U_{i1} \geq U_{i2} \geq \cdots \geq U_{iN}$). I therefore take students' ranking of schools in their submitted list as a truthful preference ordering.[15]

Another notable implication of the portfolio choice problem is that a student does not necessarily apply to her most preferred school overall – the school that satisfies $\max(U_{is})$, because admission chances are uncertain and students are constrained in the number of schools to which they can apply.[16] Instead, students pick schools based on their expected utility, $z_{is} = \tilde{p}_{is} U_{is}$. This implies that although a school in a student's application portfolio may not be preferred overall, it will be preferred to all other schools that are perceived to be equally selective (i.e., all other schools to which a student believes she has equal admission chances). This key insight provides the foundation for my empirical estimation of demand-related factors responsible for application differences.

C Empirical Estimation Strategy

We would need to know students' expected admission chances at each school to compute the optimal application portfolio. Without this information, I focus on estimating the demand parameters that characterize student preferences. Given that students pick schools based on their expected utility: $z_{is} = \tilde{p}_{is} U_{is}$, any school in the application portfolio will be preferred to all other schools which are perceived to be equally selective. This allows us to estimate students' revealed preferences for schools selected from alternatives in a restricted choice set.

Taking the highest-ranked choice for example, student i's expected utility satisfies the following statement:

$$\tilde{p}_{i1} U_{i1} > \tilde{p}_{it} U_{it} \quad \forall \ t \ \text{ s.t. } \tilde{p}_{it} = \tilde{p}_{i1} \tag{3}$$

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Consequently, $U_{i1} > U_{it} \quad \forall \ t$ s.t. $\tilde{p}_{it} = \tilde{p}_{i1}$. We can therefore specify a discrete choice estimation framework for the selection of a first choice school based on the fact that student i chooses the most preferred school s out of the set of all schools with equal selectivity as her first choice school, which I will denote by S_i^1. Defining the dependent variable of interest as:

$$\mathrm{y_{is}} = \begin{cases} 1 & iff \quad U_{is} > U_{it} \quad \forall \ t \ \in \ S_i^1 \\ 0 & otherwise \end{cases}$$

it follows that the probability that student i lists school s as a first choice is:

$$P_i(s) = Pr(U_{is} > U_{it} \quad \forall \ t \in \ S_i^1).$$

If we assume that $U_{is} = \boldsymbol{X_{is}\beta} + \epsilon_{is}$, where $\boldsymbol{X_{is}}$ is a vector of observable school characteristics and the idiosyncratic component ϵ_{is} of student utility is independently and identically distributed (i.i.d.) extreme value, then the probability that student i chooses school s as a first choice can be written as:

$$P_i(s) = Pr(U_{is} > U_{it} \ \forall \ t \ \in \ S_i^1) \tag{4}$$

$$= \frac{e^{\boldsymbol{X_{is}\beta}}}{\sum_{t \epsilon S_i^1} e^{\boldsymbol{X_{it}\beta}}} \tag{5}$$

This yields the log-likelihood function:

$$LL(X, \beta) = \sum_{i=1}^{N} \sum_{s=1}^{S_i^1} y_{is} \, ln \frac{e^{\boldsymbol{X_{is}\beta}}}{\sum_{t \epsilon S_i^1} e^{\boldsymbol{X_{it}\beta}}} \tag{6}$$

which we can estimate using maximum likelihood. The independence from irrelevant alternatives property of the multinomial logit model implies that focusing on the subset of alternatives in this restricted choice set (S_i^1) still provides a valid estimate of the parameters determining student preferences.[17]

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D Student Beliefs

A core component of linking the theory to data is to specify students' formulation of beliefs about their admission chances in the absence of complete information. The model's setup implies that uncertainty about $\Pr(T_i^* > q_s) \equiv \tilde{p}_{is} \in [0,1)$ stems from uncertainty about individual ability and assumes that admission cutoffs are known. This setup abstracts from year-to-year variation in school selectivity (taking admission cutoffs q_s as fixed) and models uncertainty as coming entirely from students' incomplete information about their exam performance. In essence, this simplification requires that students' subjective expectations of their admission chances are a rank-preserving transformation of their actual admission chances, so that $\tilde{p}_{is} = g(q_s)$ where the function $g(\cdot)$ is a rank-preserving transformation which ensures that $\tilde{p}_{is} = \tilde{p}_{it} \Leftrightarrow q_s = q_t$.[18] Empirically, I assume that students form expectations about their admission chances based on the selectivity of schools in the previous year. School selectivity in Ghana is indeed relatively stable over the period studied, with a correlation in selectivity levels above 0.90 for all years. Figure 2 illustrates the correlation in school selectivity between 2007 and 2008.

E Student Utility

My empirical approach also relies on standard assumptions about students' utility functions. I assume that student i's utility from attending school s depends on a set of observed and unobserved factors, where the observable component is a linear function of school selectivity q_s and a vector of student-specific school characteristics, $\boldsymbol{X_{is}}$. Thus, demand for school selectivity is additively separable from demand for other school characteristics:

$$U_{is} = \alpha q_s + \boldsymbol{X_{is}}\boldsymbol{\beta} + \epsilon_{is} \tag{7}$$

The error term in this utility function denotes students' valuation of school characteristics which are unobserved by the researcher. The subscript *is* indicates that school characteristics result from

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an interaction between school attributes and student characteristics. For example, proximity to a given school varies across students.

To examine heterogeneity in preferences, I allow demand for school characteristics $\boldsymbol{X_{is}}$ to vary by student performance, T_i^*, the mean performance in a student's junior high school, ϕ_j, and attendance of a public junior high school, $Public_j$. I therefore parameterize students' utility function in the following way:

$$\mathrm{U_{ijs}} = \boldsymbol{X_{is}}\boldsymbol{\beta}_1 + (\boldsymbol{X_{is}} \times \mathrm{T_i^*})\boldsymbol{\beta}_2 + \left(\boldsymbol{X_{is}} \times \phi_\mathrm{j}\right)\boldsymbol{\beta}_3 + \left(\boldsymbol{X_{is}} \times \mathrm{Public_j}\right)\boldsymbol{\beta}_4 + \epsilon_\mathrm{ijs} \tag{8}$$

My key objective is to evaluate whether preferences for school characteristics significantly vary by JHS background – i.e., whether $\boldsymbol{\beta}_3 \neq 0$ and $\boldsymbol{\beta}_4 \neq 0$. In this analysis, I would like to see how preferences for school characteristics vary with individual ability and separately with educational background (proxied by JHS type), after accounting for differences in expected admission chances. If students from disadvantaged backgrounds have significantly different preferences for school attributes, then this would suggest that demand-related factors limit educational mobility. Once again, I cluster standard errors at the junior high school level to allow for correlation in the preferences of students within a school.

5 Results

The theoretical model presented in the preceding section suggests two approaches for analyzing differences in students' application behavior in the face of constrained choice under uncertainty. First, we can focus on heterogeneity in the rank ordering of schools in a students' submitted list of choices to establish whether students from disadvantaged backgrounds are more likely to rank a high performing school below a lower performing one. Second, we can estimate the parameters of student preferences by restricting their choice sets to schools of equal selectivity and can then

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examine heterogeneity by educational background. In the remainder of this section, I therefore adopt these two approaches to explore whether demand-related factors appear to explain observed differences in application choices. I begin by looking for differences in students' rank ordering of their selected schools. I then look for differences in students' preferences for observable school characteristics.

A Heterogeneity in Ranking of Selected Schools

I examine revealed preferences for selective schools using the fact that it is an undominated strategy for applicants to rank their chosen schools in truthful order of preference. I measure the selectivity of schools using the performance distribution of students admitted to a school in previous years. I then assess the extent to which students rank a selective school lower than a less selective school on their submitted list. I use four measures to characterize students' application portfolios according to school selectivity (q_s): 1) choices are strictly ranked in order of selectivity. 2) choices are weakly ranked in order of selectivity. 3) the highest-ranked choice is the most selective school in a student's portfolio and the lowest-ranked choice is the least selective school. 4) the highest-ranked choice is weakly more selective than the lowest-ranked choice. Each row of Table 3 indicates the share of students who satisfy each condition.

Overall, students from low-performing junior high schools are more likely to rank a more selective secondary school below a less selective school on their list. As Panel B of Table 3 shows, less than 8 percent of students in the full sample ranked their choices strictly in order of selectivity. This figure was 11.4 percent among students who qualified for high school admission. The likelihood that students consistently list selective schools above less selective schools on their list changes with students' educational background – 6.5 percent of qualified students from low performing public schools, 12 percent of qualified students from high performing public schools,

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and 17.4 percent of students from private schools satisfied this criterion. The likelihood that students ranked their most selective choice first and their least selective choice last shows a similar pattern, with respective rates of 23.5 percent, 34.9 percent, and 46.3 percent. Similarly, 82.5 percent of students ranked their selected schools such that their first-choice school was equally or more selective than their lowest-ranked school. Among students who qualified for high school admission, 88.6 percent did. Notably, only 82.4 percent of students who qualified from low-performing public schools did, compared to 90.5 percent of students who qualified from high-performing public schools and 94.4 percent of students from private junior high schools. These differences are all statistically significant at the 1 percent level.

Altogether, these statistics indicate that students from lower performing schools are substantially more likely to rank selective schools below less selective ones they choose. In addition, students from more disadvantaged backgrounds apply to a less diversified portfolio of schools. The final row in Table 3 reports the standard deviation of selectivity of schools in the application portfolio. The standard deviation in selectivity of selected schools is 0.601 for qualified students from low performing public schools, 0.696 for those from high performing public schools and 0.792 for private school students.

Panel B of Table 3 presents a similar analysis instead using the SSCE performance of selected schools as the key measure of interest. Again, I find that students from high performing and private JHSs are significantly more likely to rank their selected schools in order of SSCE performance, indicating that they have a stronger preference for attending high performing schools. Notably, students' rank ordered lists reflect the value they place on school quality as well as their concerns about other school characteristics including location or distance. These results thus confirm that

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students from disadvantaged backgrounds are less willing to attend higher performing schools, but without providing additional insights into the underlying reasons why.

B Heterogeneity in Preferences for School Characteristics

To further examine heterogeneity in preferences, I estimate the discrete choice model outlined in Section 4.3. Table 4 summarizes portfolio characteristics and confirms that the subset of five equally or less selective schools used in the discrete choice estimation represents schools of more similar selectivity than those in students' actual application portfolios. Table 5 reports coefficient estimates from the resulting multinomial logit regressions. Columns 1 to 4 include all students who qualified for admission to SHS. Column 1 estimates average preferences and shows that students generally prefer schools with higher SSCE performance and those established before Ghana gained independence (a signal of historical prestige). They also prefer public, single-sex, and schools with boarding facilities, as well as those that are closer to their JHS districts.

Column 2 allows for heterogeneity by student BECE score, column 3 includes heterogeneity by JHS performance, and column 4 includes heterogeneity by public JHS attendance. The coefficients on these additional interaction terms indicate that higher performing students and students from higher performing JHSs have a stronger preference for attending high performing and single-sex secondary schools. Moreover, students from high-performing JHSs have a weaker preference for attending public schools and are more willing to attend boarding schools and schools that are farther away, presumably because they can afford the associated increases in cost. Students from public JHSs have a stronger preference for school proximity, are less inclined to select boarding schools, and have a weaker preference for attending high performing, colonial, and single-sex secondary schools.[19]

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To provide a more conservative estimate of heterogeneity in preferences for senior high school characteristics, I limit my analysis to public school students in column 5. Public JHS students are more likely to comply with their admission outcomes instead of opting out into the handful of elite international schools which have independent admissions procedures but charge substantially more than schools following the national curriculum. Despite restricting my analysis to the more homogeneous group of public JHS students, the differences in preferences by JHS background remain statistically significant and reflect the same patterns as within the full sample.[20]

Overall, these results indicate that students from disadvantaged educational backgrounds are less willing to travel to attend higher performing schools. While the coefficient on the interaction between individual exam scores and school distance is of equal magnitude to the coefficient on the interaction with JHS mean scores, individual student scores are four times as important as JHS mean scores in determining heterogeneity in preferences for academic performance. This suggests that students from different educational backgrounds differ more in their preferences for school proximity than they do in their preferences for school quality.

As an additional approach to address the possibility that students omit more-preferred selective schools from their rank ordered lists because they have low expected admission chances, I estimate another set of results using the strategy proposed by Artemov, Che and He (2021). I begin by restricting the sample to students who are admitted to a clearly feasible choice (where they scored above the 5th percentile of admitted students). I then construct a choice set consisting of 5 randomly selected schools that are also clearly feasible, and estimate the probability that students select their admitted choice out of the set of other clearly feasible choices. Column 6 in Table 5 reports coefficient estimates from the resulting multinomial logit regression, again restricting the sample to students from public schools. These estimates reflect the same patterns as those from

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my main specifications, with students from low-performing schools having a stronger preference for school proximity and a weaker preference for school quality.

To address the fact that students' feasible choice sets differ based on their exam achievement, I also separately estimate this discrete choice model by BECE score decile. Table 6 reports these results. Each column presents estimates from a regression that compares students within the same BECE score decile, to focus on differences between students with similar choice sets. I find that preferences for school proximity still significantly differ by JHS mean scores across the whole BECE sore distribution, indicating that JHS background still predicts preferences for school attributes for students with similar individual BECE scores. Students from disadvantaged backgrounds are more likely to value schools that are close by and less likely to value schools with boarding facilities. Differences in preferences for SSCE performance are significant in the top BECE decile but there are no significant differences for lower performing students, suggesting that the aggregate heterogeneity in preferences for academic performance may largely be driven by higher performing students.

C Additional Robustness Checks

I conduct several sensitivity tests to provide additional supportive evidence for my assumptions about student beliefs and to show the robustness of my results to alternative econometric specifications. My baseline estimates measure school selectivity using the mean BECE scores of students admitted to a school in the previous year. As a robustness check, I estimate these same models using the 5th percentile BECE score of students admitted to a school in the previous year as an alternative measure of school selectivity. The idea here is that if students are primarily concerned about their admission chances, they might be focused on the lower tail of the exam score distribution for admitted students instead of focusing on the mean. The results estimated

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using this alternative measure of school selectivity are reported in Online Appendix Tables A.3, A.4, and A.5. The one result which changes is that the estimated difference in preferences for SSCE performance by JHS mean exam score in the discrete choice analysis becomes smaller and switches sign, providing further indication that school proximity likely matters more than preferences for school quality, although students from private schools continue to place more value on school quality than students from public schools. Models using the 5th percentile BECE scores of admitted students as a measure of selectivity generally produce a lower R^2, suggesting that using mean BECE scores provides a better fit to the data.

I also examine whether the estimates are robust to including students who do not qualify for secondary school admission, by imputing a constant value for students' missing BECE scores and running my analysis on the full sample of students with an indicator to control for having a missing BECE score. My main findings remain.

To isolate the potential role of geographical mobility, I estimate separate regressions for the 55 percent of students who only applied to schools within their JHS region and the 5 percent who only applied within their JHS district. Tables C.1, C.2, and C.3 present these results. Students who apply within their local district are almost twice as likely to rank their schools weakly in order of selectivity, while there are no differences for students who apply to their local region. Yet, there is a persistent divergence in application behavior and admission outcomes by JHS background for both students applying to their local districts and regions, suggesting that any improved information students may have about local schools is not sufficient to overcome constraints to educational mobility.

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D Areas with Stable School Rankings

As a final empirical exercise, I present suggestive evidence from areas with exceptionally stable secondary school rankings over time. If student uncertainty about school selectivity is driving the main results, then we should expect to see an increase in the coefficient on individual student performance and a decrease in the coefficients on measures of JHS background when we estimate equation 1 for students in stable areas. If students are generally well-informed about school selectivity, then we should expect the main results to hold even when focusing on areas with especially predictable school rankings. Since most students apply to schools across the country, I separately analyze the behavior of students in stable areas who exclusively applied to schools within their districts.

Cape Coast Municipal district has the highest stability in school selectivity among districts with more than 3 schools.[21] The district was the original capital of the British colonial administration and has a long educational legacy. Its 11 secondary schools include the oldest secondary school in the country and 5 of Ghana's 22 elite schools (established before independence and ranked in the top category by the 2009 classification scheme). As Figure 3 illustrates, the correlation in school selectivity was 0.9974 between 2007 and 2008. It remained above 0.99 during the period of study. 11 percent of Cape Coast JHS students who qualified for secondary school admission exclusively applied to schools within their district, which is over twice the nationwide rate.

As Table 7 indicates, the correlation between individual exam scores and student outcomes is higher than elsewhere. Column 1 analyzes the average performance of students' selected schools. The coefficient on individual BECE scores is 0.230 for students nationwide (Panel A), 0.283 for students in Cape Coast (Panel B), and 0.380 for local applicants in Cape Coast (Panel C). Similarly,

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the correlation between individual performance and the selectivity of selected schools also increases (Column 2). The remaining three columns indicate an associated increase in the correlation between individual performance and students' admission outcomes. Column 3 analyzes the academic performance of a student's assigned school. The coefficient on individual BECE scores is 0.614 for students nationwide, 0.654 for Cape Coast students, and 0.784 for Cape Coast local applicants. Thus, individual academic performance becomes a stronger predictor of student outcomes.

Nevertheless, the importance of educational background also increases. The coefficients on JHS mean performance for Cape Coast local applicants are 0.246 and 0.267 in Columns 1 and 3 (compared to 0.084 and 0.141 for students nationwide). This indicates that even when students are able to predict school rankings, students from higher performing junior high schools are more likely to apply and gain admission to high performing secondary schools. Breaking down the estimates by JHS type indicates that these results are largely driven by high performing students and by differences within the set of high performing public and private schools (see Figure 4 and results reported in Online Appendix Tables D.5 and D.6). While the role of JHS background becomes insignificant for students in the bottom half of the JHS performance distribution, students from the highest performing JHSs are substantially more likely to apply and gain admission to more selective schools when compared to equally qualified students from lower performing schools in the top half of JHSs.

I next turn to analyze the rank ordering of students' selected schools. Students in Cape Coast district are substantially more likely to rank their schools in order of selectivity and this is particularly true for students who exclusively apply to schools in that district. Table 8 reports characteristics of students' application portfolios for all students in the country (Panel A), for Cape

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Coast district students (Panel B), and for Cape Coast district students who restrict themselves to applying to schools in their district (Panel C). 10 percent of all students ranked their schools weakly in order of selectivity, 19 percent of Cape Coast students did, and 58 percent of Cape Coast local applicants did. Among local applicants, students from low performing public JHSs are more likely to rank their schools in order of school quality than students from high performing public JHSs.

I analyze application behavior and student outcomes in other areas with stable rankings over time to assess the extent to which these results generalize. Online Appendix Section D presents results for three additional districts – Sunyani, which has a correlation of 0.9960 in school selectivity and no elite schools; Kumasi Metro, which a correlation of 0.9920 and 3 elite schools; and East Akim, which has a correlation of 0.9903 and no elite schools (illustrated in Figure D.1).

In contrast to the Cape Coast case, JHS background becomes a less significant predictor of application behavior and admission outcomes in Sunyani, Kumasi and East Akim, while individual student performance becomes a stronger predictor of student admission outcomes (Online Appendix Table D.1). Strikingly, the coefficient on individual performance is 0.987 in a regression analyzing the performance of student's assigned school for local applicants in Kumasi and the coefficient on JHS performance is -0.024. In Sunyani, where students do not have local access to an elite school, the correlation on individual student performance is 0.654, while the correlation on JHS performance is -0.099 (statistically insignificant). The respective coefficients in East Akim are 0.212 and -0.073 (statistically insignificant). In the two districts without elite schools, the coefficient on individual exam scores remains substantially lower than 1 despite the reduced significance of JHS background. This result suggests the importance of geographical mobility as a determinant of educational mobility in a nationwide merit-based school choice system – in many cases, high performing students would need to move outside their district to attend high performing

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schools. Across the board, local applicants in stable areas are substantially more likely to rank their schools in order of selectivity (Online Appendix Table D.3).

Looking at all students in districts with stable rankings, individual exam scores have a stronger correlation with students' application behavior and admission outcomes in areas with stable rankings, but JHS background remains a significant factor and students from higher performing JHSs apply and gain admission to more selective schools than equally qualified students from lower performing JHSs (Panel B in Online Appendix Table D.2).

Altogether, these results suggest that in some cases application differences may decrease when students are better able to predict school rankings, whereas in other settings (such as Cape Coast), students appear to be making informed choices to apply to lower quality schools than they merit. A caveat to note is that these results are tenuous because they focus on the small minority (2 to 11 percent) of students who exclusively apply to schools within their JHS districts. Additionally, districts with stable rankings tend to be in urban areas and with well-established schools. The choice to focus on local schools could indicate other unobserved factors rather than capturing a causal effect of living in a place with stable rankings – students who choose to apply locally in stable areas might be those who particularly value school quality, so the observed differences in application behavior and admission outcomes may reflect selection bias rather than capturing the causal effect of being in an area with predictable school rankings.[22] At a larger level, school ranking stability is likely to be endogenous. In areas with stable rankings, there is stronger sorting by individual exam scores and higher achieving students are consistently more likely to attend high performing secondary schools, which could suggest that students in these areas place more value on schools' academic performance, leading to stronger educational mobility.

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6 Conclusions

A key objective of school choice systems is to offer disadvantaged students access to better schools, yet eligible students often forgo available opportunities. Understanding this puzzle is crucial to the success of efforts to reduce inequality.

This paper empirically examines why equally qualified students make different application choices based on their educational backgrounds. The first contribution has been to outline a theoretical model that formulates two methods to estimate preferences in the presence of strategic application behavior. The second contribution has been to apply the theory to rich administrative data on secondary school applications in Ghana, generating new insights on the barriers to educational mobility in a large merit-based school choice system. I find that students from disadvantaged educational backgrounds are significantly more likely to rank low performing schools above higher performing ones on their application lists. Additionally, I find considerable heterogeneity in demand for school attributes, with disadvantaged students being more sensitive to school distance and suggestive evidence that they place less value on academic performance. These findings suggest firm limits on the extent to which merit-based school choice systems can increase educational mobility without additional support to disadvantaged students.

My results have broader implications for other contexts in which policymakers seek to provide disadvantaged students the opportunity to attend better schools. Research on educational mobility in the US and other high-income settings increasingly emphasizes information and decision-making ability as a dominant part of the policy solution. I provide contrasting evidence from a developing economy and demonstrate that household demand and geographical access to high-performing schools are persistent impediments. Thus, while realizing the potential for school choice mechanisms to reduce inequality will require ensuring that students have the ability to make

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informed decisions, complementary interventions such as offering merit-based financial assistance for students from disadvantaged backgrounds or improving the quality of secondary schools in underserved areas may also be necessary to address the fundamental challenges of affordability and geographical access.

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[1] In related work, Ajayi, Lucas and Friedman (2020) find that providing information to students in Ghana did not increase their likelihood of attending higher performing secondary schools.

[2] Research on the academic effects of attending a selective school has produced mixed findings, however most studies do not identify the effects of merit-based educational mobility. Researchers studying merit-based admission systems typically use regression discontinuity designs that focus on students marginally admitted to selective schools and therefore cannot directly speak to the effects of high-achieving students gaining admission to schools with similarly high-achieving peers (e.g., Clark, 2010; Jackson, 2010; Pop-Eleches and Urquiola, 2013; Abdulkadiroğlu, Angrist and Pathak, 2014; Dobbie and Fryer, 2014; Lucas and Mbiti, 2014; Dustan, de Janvry and Sadoulet, 2017). Researchers studying lottery-based admission systems typically estimate effects of random assignment to a preferred school that need not be high-performing, and therefore identify average effects for randomly selected students, rather than for high-achieving students moving to schools with high-achieving peers (e.g., Cullen, Jacob and Levitt, 2006; Hastings, Kane and Staiger, 2008). Notably, Hastings, Kane and Staiger (2008) find positive effects of lottery-based admission exclusively for the subgroup of students who applied to high-performing schools.

[3] Less than half of parents have attended senior high school and parents with higher levels of education are more likely to assist their children with selecting schools (Ajayi and Telli, 2013). Parental involvement may therefore be one channel through which the gaps between privileged and underprivileged children persist.

[4] Available programs include: General Arts, General Science, Agriculture, Business, Home Economics, Visual Arts and Technical Studies.

[5] The requirements for admission to SHS are that students receive a passing grade in the four core subjects (Mathematics, English, Integrated Science and Social Studies) as well as in any two additional subjects. All students who qualify are guaranteed admission to a school.

[6] Note that the deferred acceptance feature of this assignment mechanism means that a student who lists a program as her second choice could displace a student who has a lower score but listed that same option as her first choice and was tentatively assigned to that program in an earlier round.

[7] Logistical concerns largely dictate timing of the application process. Because students have dispersed on vacation by the time they get their BECE scores in August, it is easier to register their senior high school application choices earlier in the year when they are still enrolled in school.

[8] Kenya (Lucas and Mbiti, 2014), Trinidad and Tobago (Jackson, 2010), the UK (Coldron et al., 2008), Ontario (http://www.ontariocolleges.ca/apply), Chile (Hastings, Neilson and Zimmerman, 2013; Busso et al., 2016), Hungary and Spain (Calsamiglia, Haeringer and Klijn, 2010).

[9] Additionally, these contexts have strong parallels to the context of college choice in the United States: students apply to a limited number of schools because of application costs (both in terms of time and money); and students are relatively uncertain about their admission chances because admission is partly based on measures of students' academic performance which may be known at the time of applying (e.g. SAT/ACT scores and high school GPA), but also on subjective assessments of other background information (such as personal statements, extracurricular activities, and recommendation letters).

[10] These data are especially informative because over 95 percent of students submit a complete list of senior high school choices. This is an extremely high participation rate compared to most school choice programs which have been studied in existing literature. For example, in the US, less than 50 percent of students in Boston Public Schools listed the full number of available choices (Abdulkadiroğlu et al., 2006) and 40 to 60 percent did in Charlotte-Mecklenburg Public Schools (Hastings, Kane and Staiger, 2008). This comprehensive coverage of applications allows me to compare students from a wide range of backgrounds.

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[11] I aggregate the SSCE data over multiple subjects and years to create a measure of persistent rather than transitory academic performance. This measure is missing for a small number of new schools that had not yet presented any SSCE candidates.

[12] Consider three students from three different backgrounds: student 1 attends a rural public school with few resources and has illiterate parents, student 2 attends an urban public school and comes from a wealthy family, student 3 attends an expensive private school with state-of-the-art facilities. All three students get the same BECE score and go on to senior high school. Once in an environment with more similar resources, student 1 outperforms the other two. Presumably, student 1 has higher intrinsic academic ability.

[13] We can think of this utility as a comprehensive measure of the positive and negative factors associated with attending a school (including the costs of tuition payments and distance traveled as well as the benefits of available facilities, peer quality, and the net present value of expected future income).

[14] This basic notion of conditional probabilities captures the more general observation that merit-based assignment implies that a student's admission chances are correlated, so rejection from choice *c* reduces the expected admission chances at all other chosen schools. For example, a student who receives a negative shock and performs poorly on the BECE will have a lower chance of gaining admission to all schools than if she had performed as well as expected. As such, her realized admission outcome for a given school provides additional information on her admission chances for her lower ranked choices.

[15] In Ghana, the CSSPS explicitly encourages students to truthfully order their set of selected schools. The official handbook issued each year provides limited advice to students about their selection of schools and the guidelines specifically instruct students to be truthful about their ordering of choices, urging that "choices must be listed in order of preference" (MOES, 2005, (p.5)).

[16] See Online Appendix A.2 for an analysis of the equilibrium solutions in the cases of perfect information and unconstrained choice.

[17] The theoretical foundations of this discrete choice estimation approach are reviewed in Train (2003). Several recent empirical studies use application data to analyze revealed preferences in school choice settings, including: Agarwal and Somaini (2018), Avery et al. (2013), Calsamiglia, Fu and Guell (2020), Fack, Grenet and He (2019), Griffith and Rask (2007), and Hastings, Kane and Staiger (2008). This paper contributes an alternative estimation strategy to this growing literature.

[18] The key requirement of this assumption is that students should be able to accurately gauge which set of schools are equally as selective as their preferred choice. Although this assumption is somewhat restrictive, it allows for students to have different beliefs about their absolute admission chances and only imposes that students have correct beliefs about their *relative* chances of gaining admission into various schools (i.e., certain students may be more or less confident than others, but they must be uniformly biased about their chances of gaining admission to all schools.)

[19] An alternative interpretation of distance to schools could be that it reflects a lack of information, if students are more likely to be aware of schooling options within close proximity. While distance could be an especially important barrier to information acquisition for disadvantaged students, this alternative interpretation does not explain the heterogeneity in preferences for public and boarding schools.

[20] Nonetheless, I cannot entirely rule out the possibility that students from high-performing public JHSs apply more aggressively because they have the outside option of attending a private school, see Shorrer (2019) for a theoretical discussion of this possibility.

[21] There are 20 districts with 2 or 3 schools and a correlation in school selectivity above 0.99 for all years. Very few students exclusively apply to schools within these districts, so the samples are not large enough to analyze differences by JHS background.

[22] A suggestive indication of this is the fact that in general, lower performing students are more likely to exclusively apply locally (7 percent of non-qualifying students do and 5 percent of qualifying students do). In Cape Coast and Kumasi (both areas with stable rankings and a high number or elite schools), higher performing students are more likely to exclusively apply locally – local applicants make up 7 and 1 percent of students who don't qualify for admission, respectively; and 11 and 5 percent of students who do qualify. In Sunyani and East Akim, the pattern reverses again (3 and 9 percent for students who fail; and 3 and 4 percent for students who pass).

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Figures

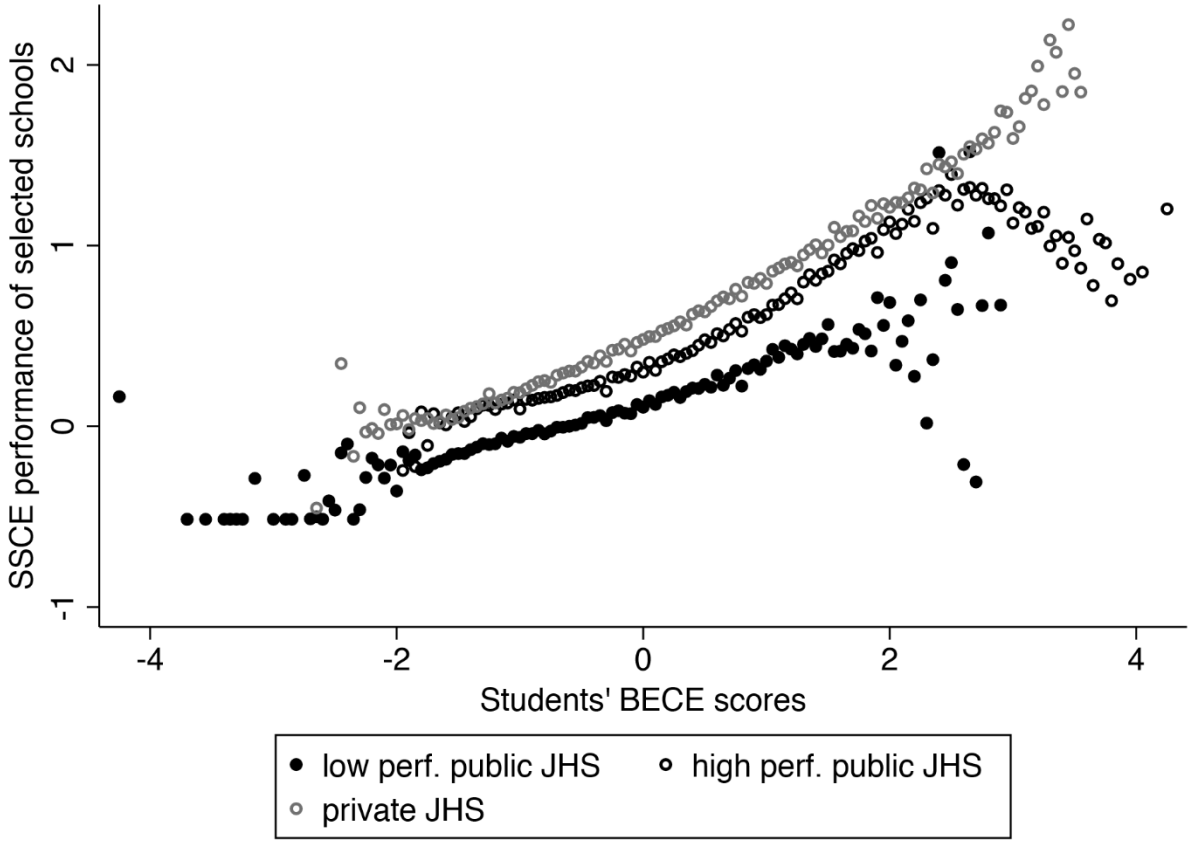

Figure 1
Exam Performance and Application Choices
Notes: Figure illustrates differences in academic performance of selected secondary schools for students with the same 9th grade basic education certificate exam (BECE) scores but from low-performing public, high-performing public, and private junior high schools (JHSs). Secondary school performance is a normalized measure of the average percentage of students earning a credit in the math and English 12th grade secondary school certification exam (SSCE) for the period 2003 to 2008. Low-performing public JHSs are those where the average BECE score of students is below the median for public schools in the country; high-performing public JHSs are those with above-median performance.

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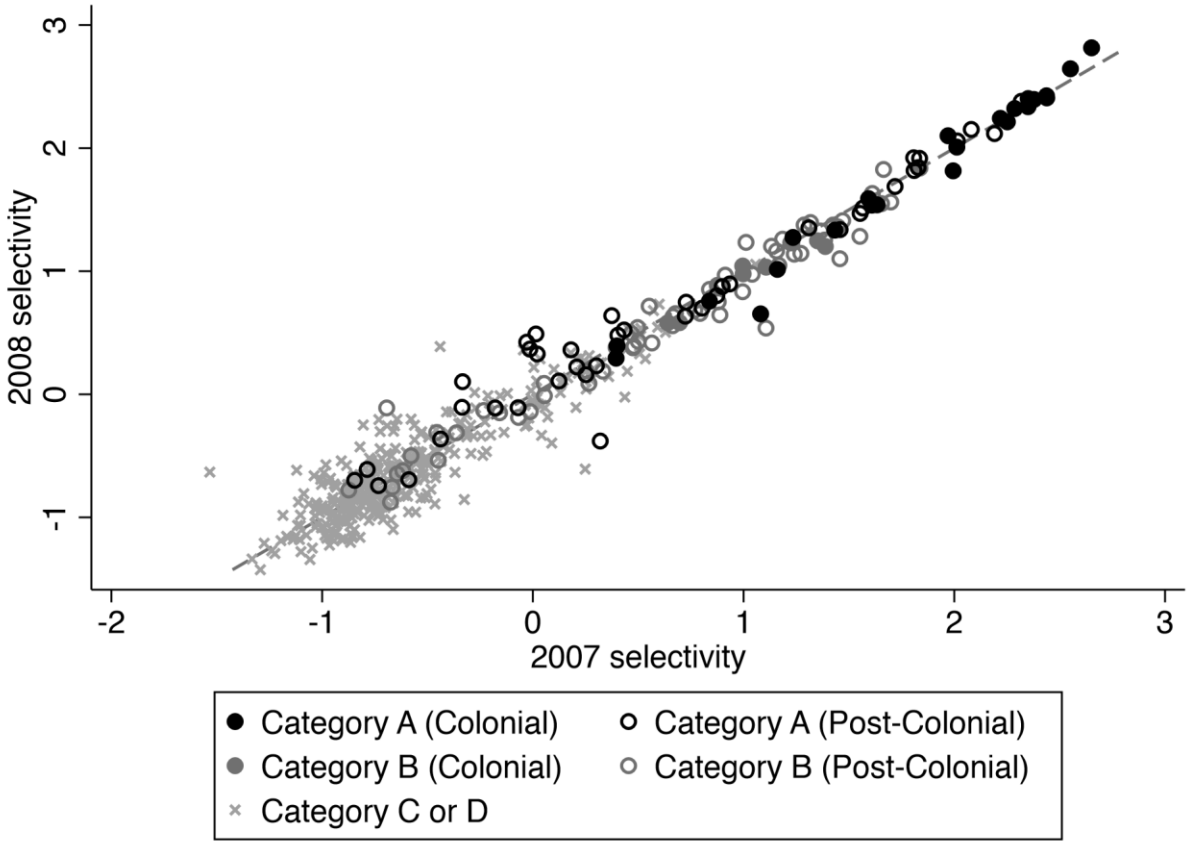

Figure 2
Correlation in Secondary School Selectivity over Time
Notes: School selectivity measures the average exam score of students admitted to a secondary school in a given year.

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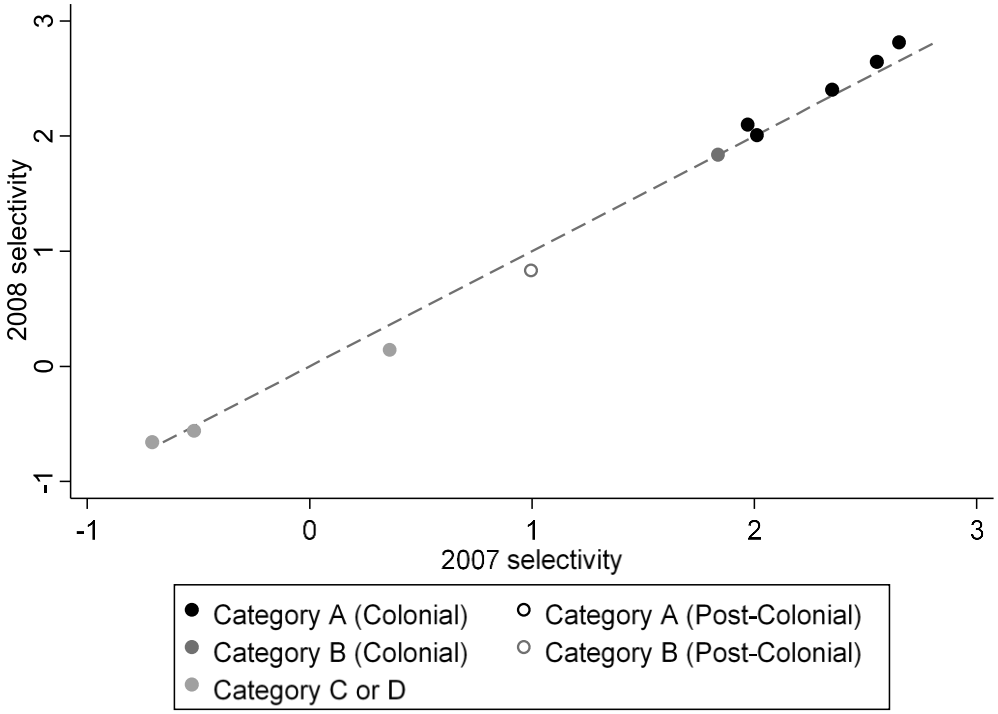

Figure 3
Correlation in Secondary School Selectivity over Time (Cape Coast District)
Notes: School selectivity measures the average exam score of students admitted to a secondary school in a given year.

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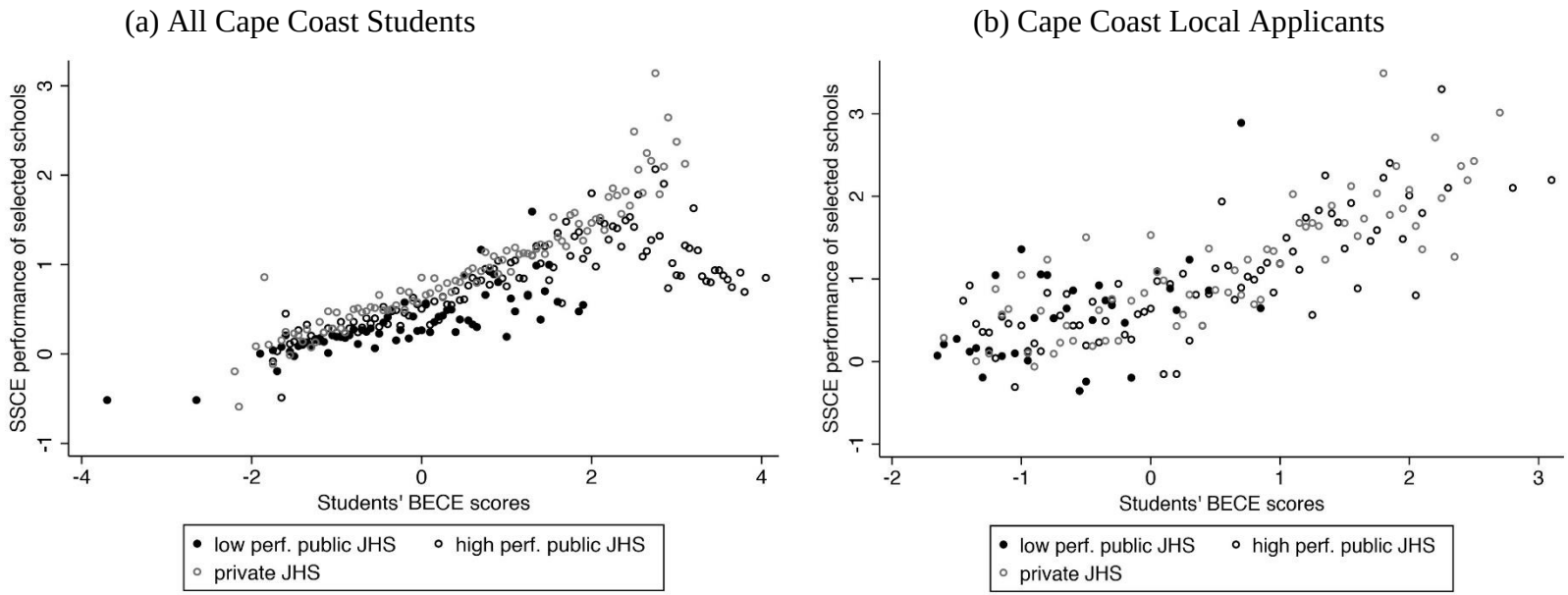

Figure 4
Exam Performance and Application Choices (Cape Coast District)
Notes: Figure illustrates differences in academic performance of selected secondary schools for students with the same 9th grade basic education certificate exam (BECE) scores but from low-performing public, high-performing public, and private junior high schools (JHSs). Secondary school performance is a normalized measure of the average percentage of students earning a credit in the math and English 12th grade secondary school certification exam (SSCE) for the period 2003 to 2008. Low-performing public JHSs are those where the average BECE score of students is below the median for public schools in the country; high-performing public JHSs are those with above-median performance.

Tables

Table 1
Summary Statistics by JHS Performance

	Full sample	Qualified students	Qualified, high-perf. public JHS	Qualified, low-perf. public JHS	Qualified, private JHS
	(1)	(2)	(3)	(4)	(5)
Panel A: Student background					
Age	17.166	16.704	17.249	16.584	16.121
Male	0.546	0.582	0.650	0.551	0.530
Student's BECE score	0.000	0.000	-0.627	0.242	0.529
JHS high-performing	0.413	0.604	0.000	1.000	0.893
JHS public	0.824	0.732	1.000	1.000	0.000
JHS pass rate	0.497	0.692	0.483	0.786	0.851
JHS mean BECE score	-0.318	-0.003	-0.628	0.239	0.525
JHS classmates	65.654	67.471	57.672	80.952	62.523
JHS applicants to elite SHS	14.884	20.645	7.345	25.407	31.511
JHS admits to elite SHS	2.945	5.126	0.353	5.593	10.620
Elite SHS in district	0.267	0.310	0.167	0.357	0.440
Colonial SHS in district	0.316	0.352	0.206	0.393	0.496
Category A SHS in district	0.423	0.462	0.345	0.496	0.575
Panel B: First choice school					
SSCE performance	0.614	1.044	0.429	1.160	1.727
SHS selectivity	0.464	0.833	0.295	0.962	1.396
Elite	0.141	0.216	0.103	0.216	0.371
Public	1.000	1.000	1.000	1.000	1.000
Mixed sex	0.834	0.740	0.893	0.731	0.542
Boarding facilities	0.818	0.887	0.834	0.898	0.944
Located in JHS district	0.397	0.331	0.382	0.329	0.264
Located in JHS region	0.766	0.703	0.792	0.705	0.578
Miles from JHS	29.342	34.972	30.962	35.017	40.410
Number of programs	4.980	5.062	5.002	5.142	5.038
Number of vacancies	426.891	438.275	426.372	449.409	439.412
Panel C: Admission outcomes					
Qualified for SHS admission	0.498	1.000	1.000	1.000	1.000

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Admitted to first choice		0.274	0.268	0.297	0.250
SHS in JHS district		0.366	0.447	0.336	0.295
SHS in JHS region		0.758	0.856	0.750	0.634
Miles from JHS to SHS		32.234	27.181	33.699	37.161
Boarding student		0.650	0.547	0.694	0.730
SSCE performance		0.146	-0.295	0.267	0.581
SHS selectivity		-0.038	-0.514	0.116	0.405
N	978760	487562	178991	178035	130536

Notes: BECE is the 9th grade basic education certificate exam; SSCE is the 12th grade secondary school certification exam; JHS is junior high school; SHS is senior high school.

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Table 2

Differences in Application Choices and Admission Outcomes

Panel A: Application Portfolios	Average SSCE Performance of Selected Schools				
	(1)	(2)	(3)	(4)	(5)
Student's BECE	0.231***	0.231***	0.231***	0.230***	0.230***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
JHS mean BECE	0.203***	0.163***	0.145***	0.084***	0.048***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)
JHS public		-0.180***	-0.167***	-0.147***	-0.144***
		(0.010)	(0.010)	(0.009)	(0.008)
Elite SHS in district			0.093***		
			(0.012)		
Colonial SHS in district			0.015		
			(0.012)		
Category A SHS in district			0.043***		
			(0.010)		
JHS applicants to elite SHSs					0.002***
					(0.000)
District FEs	No	No	No	Yes	Yes
R2	0.375	0.390	0.401	0.470	0.482
N	487562	487562	487562	487562	487562
Panel B: Application and Admission	Application Portfolio			Admission Outcomes	
	Avg. SSCE Performance	Average Selectivity	SSCE Perf. of SHS	Selectivity of SHS	Peer Quality in SHS
	(1)	(2)	(3)	(4)	(5)
Student's BECE	0.230***	0.205***	0.614***	0.615***	0.633***
	(0.002)	(0.001)	(0.007)	(0.004)	(0.003)
JHS mean BECE	0.084***	0.085***	0.141***	0.107***	0.111***
	(0.006)	(0.005)	(0.008)	(0.004)	(0.004)
JHS public	-0.147***	-0.148***	-0.033***	-0.041***	-0.045***
	(0.009)	(0.007)	(0.009)	(0.005)	(0.005)
District FEs	Yes	Yes	Yes	Yes	Yes
R2	0.470	0.580	0.563	0.702	0.749
N	487562	487562	472542	487562	487562

Notes: Table reports coefficients from a set of linear regressions. Outcome of interest is indicated at the top of each column. SSCE performance measures the percentage of secondary school students who earned a credit in the 12th grade English and math exams. School selectivity measures the average 9th grade exam score of students admitted to a secondary school between

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2005 and 2009. Peer quality measures the average 9th grade exam score of students admitted in the current year. Standard errors are clustered at the junior high school level and reported in parentheses, *p<0.1, **p<0.05, ***p<0.01.

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Table 3

Differences in Ordinal Ranking of Selected Schools

	Full sample	Qualified students	Qualified, low-perf. public JHS	Qualified, high-perf. public JHS	Qualified, private JHS
	(1)	(2)	(3)	(4)	(5)
Panel A: Rank Ordering by School Selectivity					
$q_{i1} > q_{i2} > ... > q_{iN}$	0.079	0.114	0.065	0.120	0.174
$q_{i1} \geq q_{i2} \geq ... \geq q_{iN}$	0.100	0.140	0.085	0.148	0.206
$q_{i1} = \max(q_i)$ and $q_{iN} = \min(q_i)$	0.262	0.338	0.235	0.349	0.463
$q_{i1} \geq q_{iN}$	0.825	0.886	0.824	0.905	0.944
Std. deviation of school selectivity	0.621	0.687	0.601	0.696	0.792
N	978760	487562	178991	178035	130536
Panel B: Rank Ordering by School SSCE Performance					
$ssce_{i1} > ssce_{i2} > ... > ssce_{iN}$	0.059	0.087	0.049	0.091	0.131
$ssce_{i1} \geq ssce_{i2} \geq ... \geq ssce_{iN}$	0.079	0.111	0.068	0.117	0.161
$ssce_{i1} = \max(ssce_i)$ and $ssce_{iN} = \min(ssce_i)$	0.217	0.284	0.189	0.289	0.403
$ssce_{i1} \geq ssce_{iN}$	0.780	0.845	0.769	0.864	0.921
Std. deviation of SSCE performance	0.689	0.783	0.650	0.804	0.932
N	888319	453006	163787	165328	123891

Notes: Table indicates the share of students whose ranking of application choices satisfies a given measure, for example: choices are strictly ranked in order of selectivity (row 1) or choices are weakly ranked in order of selectivity (row 2). School selectivity measures the mean 9th grade exam score of students admitted in the previous year. SSCE performance measures the percentage of secondary school students who earned a credit in the 12th grade English and math exams, and is missing for schools that had not yet presented any SSCE candidates. Both are normalized to have mean 0 and standard deviation of 1.

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Table 4
Summary Statistics for Discrete Choice Analysis

	Full sample	Qualified students	Qualified, low-perf. public JHS	Qualified, high-perf. public JHS	Qualified, private JHS
	(1)	(2)	(3)	(4)	(5)
Panel A: Application Portfolio Characteristics					
Standard deviation of school selectivity	0.623	0.688	0.603	0.696	0.790
Range of school selectivity	1.540	1.698	1.482	1.716	1.964
Selectivity of first choice school	0.482	0.852	0.306	0.980	1.413
Selectivity of most selective school	0.849	1.128	0.692	1.230	1.579
Selectivity of least selective school	-0.691	-0.569	-0.791	-0.486	-0.385
N	973934	484827	176309	177724	130794
Panel B: Discrete Choice Set Characteristics (First Choice + Five Next Most Selective Alternatives)					
Standard deviation of school selectivity	0.035	0.048	0.026	0.051	0.075
Range of school selectivity	0.090	0.123	0.067	0.129	0.191
Selectivity of first choice school	0.482	0.852	0.306	0.980	1.413
Selectivity of most selective school	0.482	0.852	0.306	0.980	1.413
Selectivity of least selective school	0.393	0.729	0.238	0.852	1.223
N	973934	484827	176309	177724	130794

Notes: Panel A reports characteristics of the schools students submitted on their ranked order application lists. Panel B reports characteristics of the choice sets used for the discrete choice analysis, consisting of students' first choice schools and the five next most selective alternatives. School selectivity measures the mean 9th grade exam score of students admitted to a secondary school in a given year. Sample includes all students with non-missing characteristics for their first choice school.

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Table 5
Discrete Choice Model Estimates

	All Qualified Students				Public JHS	Public JHS (ACH)
Choice characteristic	(1)	(2)	(3)	(4)	(5)	(6)
SSCE performance	0.774***	0.763***	0.767***	0.924***	0.698***	0.320***
	(0.013)	(0.012)	(0.012)	(0.021)	(0.015)	(0.011)
Colonial	0.651***	0.636***	0.635***	0.690***	0.607***	0.137***
	(0.012)	(0.011)	(0.011)	(0.019)	(0.014)	(0.034)
Public	2.375***	2.241***	2.399***	3.350***	2.125***	2.922***
	(0.267)	(0.255)	(0.223)	(0.554)	(0.243)	(0.084)
Single sex	0.710***	0.482***	0.466***	0.592***	0.397***	0.992***
	(0.014)	(0.014)	(0.015)	(0.021)	(0.019)	(0.031)
Boarding facilities	1.037***	1.160***	1.164***	1.349***	1.107***	0.903***
	(0.015)	(0.017)	(0.017)	(0.038)	(0.021)	(0.014)
Distance	-0.044***	-0.047***	-0.048***	-0.042***	-0.051***	-0.060***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Student's BECE score						
× SSCE performance		0.446***	0.362***	0.368***	0.301***	0.411**
		(0.011)	(0.010)	(0.010)	(0.012)	(0.013)
× Colonial		0.071***	0.053***	0.063***	0.030**	0.257***
		(0.012)	(0.012)	(0.012)	(0.015)	(0.038)
× Public		0.014	0.335	0.418*	0.221	-0.162*
		(0.379)	(0.246)	(0.214)	(0.213)	(0.093)
× Single sex		0.192***	0.101***	0.106***	0.086***	-0.014
		(0.011)	(0.014)	(0.014)	(0.017)	(0.037)
× Boarding facilities		0.244***	0.122***	0.130***	0.118***	0.307***
		(0.016)	(0.016)	(0.016)	(0.018)	(0.017)
× Distance		0.012***	0.006***	0.006***	0.006***	0.005***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
JHS mean BECE score						
× SSCE performance			0.138***	0.086***	0.079***	0.089***
			(0.018)	(0.019)	(0.024)	(0.018)
× Colonial			0.044**	0.022	0.039	-0.088**
			(0.018)	(0.019)	(0.025)	(0.042)
× Public			-0.597	-0.882*	-0.992*	-0.212
			(0.400)	(0.469)	(0.534)	(0.167)
× Single sex			0.135***	0.089***	0.118***	0.231**

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			(0.019)	(0.020)	(0.027)	(0.048)
× Boarding facilities			0.240***	0.184***	0.171***	-0.021
			(0.028)	(0.030)	(0.035)	(0.027)
× Distance			0.008***	0.006***	0.007***	0.004***
			(0.000)	(0.000)	(0.000)	(0.000)
JHS public						
× SSCE performance				-0.216***		
				(0.027)		
× Colonial				-0.087***		
				(0.025)		
× Public				-1.168*		
				(0.666)		
× Single sex				-0.213***		
				(0.028)		
× Boarding facilities				-0.237***		
				(0.043)		
× Distance				-0.009***		
				(0.001)		
Students	484827	484827	484827	484827	354033	292406

Notes: Dependent variable is an indicator for the student's first choice school. Alternatives consist of five next most selective schools relative to the student's first choice (measured by mean exam score of students admitted to school in previous year). Regressions also include distance squared, number of programs offered, and number of vacancies. Standard errors are clustered at the junior high school level, *p<0.1, **p<0.05, ***p<0.01. See notes in Table 6 for column 6.

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Table 6
Discrete Choice Model Estimates by BECE Score Decile (ACH)

Choice characteristic	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SSCE performance	0.252	0.299	-0.281	0.075	-0.029	0.249***	0.403***	0.329***	-0.045	0.275**
	(0.325)	(0.296)	(0.215)	(0.139)	(0.062)	(0.022)	(0.048)	(0.084)	(0.107)	(0.115)
Colonial	1.727	-0.562	0.300	-1.341**	0.658**	0.105	-0.112	0.466**	0.319	0.344*
	(4.814)	(1.652)	(1.054)	(0.675)	(0.260)	(0.067)	(0.149)	(0.215)	(0.235)	(0.204)
Public	1.404	1.972	3.182***	1.636**	2.922***	3.220***	2.978***	3.684***	2.747*	3.764***
	(1.475)	(1.518)	(1.224)	(0.807)	(0.388)	(0.171)	(0.546)	(0.836)	(1.549)	(0.889)
Single sex	1.687	0.997	0.994	1.582***	1.422***	1.144***	1.346***	0.930***	0.711**	0.650**
	(1.401)	(1.182)	(0.840)	(0.523)	(0.223)	(0.065)	(0.168)	(0.273)	(0.294)	(0.270)
Boarding facilities	-0.044	1.016***	0.902***	0.570***	0.789***	0.879***	0.939***	1.031***	0.704***	0.956***
	(0.346)	(0.304)	(0.218)	(0.156)	(0.073)	(0.025)	(0.066)	(0.126)	(0.200)	(0.331)
Distance	-0.085***	-0.071***	-0.057***	-0.055***	-0.059***	-0.061***	-0.063***	-0.064***	-0.065***	-0.069***
	(0.008)	(0.007)	(0.005)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)	(0.003)
Student's BECE score										
× SSCE performance	0.127	0.255	-0.313	0.144	-0.536***	0.245	-0.135	0.244*	0.792***	0.453***
	(0.241)	(0.280)	(0.271)	(0.254)	(0.206)	(0.190)	(0.149)	(0.126)	(0.095)	(0.066)
× Colonial	1.276	-1.195	0.306	-2.439*	2.754***	1.458**	1.198**	-0.134	0.108	0.059
	(3.704)	(1.578)	(1.325)	(1.267)	(0.922)	(0.726)	(0.470)	(0.315)	(0.207)	(0.116)
× Public	-1.330	-1.024	-0.408	-3.051**	-0.340	1.336	0.992	-1.067	-0.231	0.048
	(1.036)	(1.441)	(1.537)	(1.517)	(1.395)	(1.772)	(1.689)	(1.262)	(1.356)	(0.512)
× Single sex	0.681	0.381	0.191	0.968	0.383	-1.068*	-1.624***	-0.093	-0.020	0.065
	(1.048)	(1.110)	(1.065)	(0.956)	(0.756)	(0.646)	(0.547)	(0.404)	(0.261)	(0.156)
× Boarding facilities	-0.520**	0.540*	0.397	-0.133	0.083	0.535**	0.087	0.050	0.429**	0.378**
	(0.261)	(0.288)	(0.273)	(0.282)	(0.239)	(0.232)	(0.213)	(0.192)	(0.181)	(0.193)
× Distance	-0.019***	-0.008	0.008	0.017***	0.015***	0.007	0.010**	0.009**	0.011***	0.013***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.002)
JHS mean BECE score										
× SSCE performance	0.081	0.083	0.030	-0.013	0.059	-0.058	0.015	0.017	0.044	0.119***
	(0.093)	(0.076)	(0.066)	(0.056)	(0.046)	(0.042)	(0.037)	(0.032)	(0.028)	(0.034)
× Colonial	-0.344	0.849**	0.692**	0.239	0.240	0.182	-0.167*	-0.063	-0.019	-0.053

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	(0.912)	(0.380)	(0.282)	(0.230)	(0.181)	(0.131)	(0.095)	(0.072)	(0.057)	(0.065)
× Public	0.521	0.163	0.625*	0.292	0.120	-0.811***	-0.809**	-1.168***	-0.105	-0.989*
	(0.375)	(0.376)	(0.330)	(0.311)	(0.307)	(0.306)	(0.315)	(0.356)	(0.362)	(0.522)
× Single sex	-0.142	-0.183	0.266	-0.163	0.543***	0.181	0.114	0.299***	0.421***	0.197**
	(0.399)	(0.252)	(0.214)	(0.177)	(0.146)	(0.125)	(0.113)	(0.089)	(0.080)	(0.087)
× Boarding facilities	0.112	-0.039	0.003	-0.019	-0.070	-0.064	-0.039	-0.027	0.112**	-0.052
	(0.098)	(0.078)	(0.065)	(0.061)	(0.054)	(0.050)	(0.048)	(0.051)	(0.056)	(0.117)
× Distance	0.016***	0.011***	0.009***	0.006***	0.004***	0.007***	0.003***	0.002***	0.001	0.004***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Students	22749	30549	33547	32397	33791	31956	31770	29019	25539	21089

Notes: Estimates using method proposed by Artemov, Che and He (2021). Sample restricted to students admitted to a clearly feasible choice (where they scored above the 5th percentile of admitted students). Dependent variable is an indicator for the student's assigned school. Alternatives consist of five randomly selected clearly feasible schools. Regressions also include distance squared, number of programs offered, and number of vacancies. Standard errors are clustered at the junior high school level, *p<0.1, **p<0.05, ***p<0.01. Each column reports estimates from a separate regression for students in a given BECE score decile.

Table 7
Differences in Application Choices and Admission Outcomes (Cape Coast District)

	Application Portfolio			Admission Outcomes	
	Avg. SSCE Performance	Average Selectivity	SSCE Perf. of	Selectivity of SHS	Peer Quality in SHS
	(1)	(2)	(3)	(4)	(5)
A. All Qualified Students					
Student's BECE	0.230***	0.205***	0.614***	0.615***	0.633***
	(0.002)	(0.001)	(0.007)	(0.004)	(0.003)
JHS mean BECE	0.084***	0.085***	0.141***	0.107***	0.111***
	(0.006)	(0.005)	(0.008)	(0.004)	(0.004)
JHS public	-0.147***	-0.148***	-0.033***	-0.041***	-0.045***
	(0.009)	(0.007)	(0.009)	(0.005)	(0.005)
District FEs	Yes	Yes	Yes	Yes	Yes
R2	0.470	0.580	0.563	0.702	0.749
N	487562	487562	472542	487562	487562
B. JHS in Cape Coast District					
Student's BECE	0.283***	0.236***	0.654***	0.659***	0.669***
	(0.022)	(0.013)	(0.050)	(0.027)	(0.028)
JHS mean BECE	0.082**	0.102***	0.234***	0.148***	0.175***
	(0.035)	(0.026)	(0.032)	(0.023)	(0.031)
JHS public	-0.189***	-0.165***	0.026	-0.016	-0.017
	(0.058)	(0.053)	(0.059)	(0.037)	(0.029)
District FEs	No	No	No	No	No
R2	0.414	0.434	0.649	0.717	0.759
N	4185	4185	4042	4185	4185
C. JHS in Cape Coast District and Applied in JHS district only					
Student's BECE	0.380***	0.296***	0.784***	0.707***	0.728***
	(0.051)	(0.026)	(0.101)	(0.053)	(0.060)
JHS mean BECE	0.246***	0.233***	0.267*	0.166**	0.192**
	(0.058)	(0.051)	(0.134)	(0.074)	(0.073)
JHS public	-0.024	0.005	0.045	0.062	0.065
	(0.118)	(0.098)	(0.096)	(0.073)	(0.068)
District FEs	No	No	No	No	No
R2	0.485	0.499	0.674	0.722	0.743
N	459	459	446	459	459

Notes: Same as Table 2.

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Table 8
Differences in Ordinal Ranking of Selected Schools (Cape Coast District)

	Full sample	Qualified students	Qualified, low-perf. public JHS	Qualified, high-perf. public JHS	Qualified, private JHS
	(1)	(2)	(3)	(4)	(5)
Panel A: Rank Ordering by School Selectivity					
$q_{i1} > q_{i2} > ... > q_{iN}$	0.079	0.114	0.065	0.120	0.174
$q_{i1} \geq q_{i2} \geq ... \geq q_{iN}$	0.100	0.140	0.085	0.148	0.206
$q_{i1} = \max(q_i)$ and $q_{iN} = \min(q_i)$	0.262	0.338	0.235	0.349	0.463
$q_{i1} \geq q_{iN}$	0.825	0.886	0.824	0.905	0.944
Std. deviation of school selectivity	0.621	0.687	0.601	0.696	0.792
Selectivity of first choice school	0.482	0.852	0.306	0.980	1.413
N	978760	487562	178991	178035	130536
Panel B: Rank Ordering by School Selectivity; JHS in Cape Coast					
$q_{i1} > q_{i2} > ... > q_{iN}$	0.119	0.176	0.129	0.172	0.212
$q_{i1} \geq q_{i2} \geq ... \geq q_{iN}$	0.194	0.281	0.204	0.286	0.323
$q_{i1} = \max(q_i)$ and $q_{iN} = \min(q_i)$	0.373	0.503	0.362	0.499	0.602
$q_{i1} \geq q_{iN}$	0.898	0.954	0.934	0.952	0.972
Std. deviation of school selectivity	0.752	0.845	0.789	0.835	0.898
Selectivity of first choice school	0.955	1.429	0.897	1.419	1.797
N	8944	4185	859	2026	1300
Panel C: Rank Ordering by School Selectivity; JHS in Cape Coast and Applied Locally					
$q_{i1} > q_{i2} > ... > q_{iN}$	0.231	0.305	0.338	0.284	0.331
$q_{i1} \geq q_{i2} \geq ... \geq q_{iN}$	0.577	0.686	0.718	0.659	0.726
$q_{i1} = \max(q_i)$ and $q_{iN} = \min(q_i)$	0.669	0.769	0.803	0.742	0.806
$q_{i1} \geq q_{iN}$	0.935	0.959	0.972	0.947	0.976
Std. deviation of school selectivity	0.678	0.740	0.750	0.738	0.737
Selectivity of first choice school	0.949	1.335	1.020	1.294	1.604
N	797	459	71	264	124

Notes: Same as Table 3.

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