The consequences of going to a better school

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Abstract

This paper estimates school effects in the context of Romania's educational system, in which students request entry into specific high schools via a centralized process. Their placement depends solely on a transition score, which is a function of their performance in a nationwide 8th grade test and their GPA, and on predetermined school-specific slot constraints. This gives rise to almost 2,000 regression discontinuity-type quasi-experiments in which the average school quality children experience (measured, for instance, by peer quality) is a discontinuous function of their transition score. Using this variation, we find that being able to attend a better school has positive effects on cognitive outcomes measured using a high-stakes Baccalaureate exam. This impact is often stronger, and almost always more precisely estimated, for children whose transition scores are high, and who therefore have a chance to access the best schools. Finally, we do not find consistent evidence that scoring above a cutoff affects the probability that students actually take the Baccalaureate test.

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I. Introduction

Whether students would benefit from attending higher-achieving schools is an enduring question in education. Indeed, part of the rationale behind *No Child Left Behind* (and school choice initiatives more generally) is that a child in a low-achievement institution would be better off transferring to a higher-scoring school. This might be the case, for instance, if her new school provided greater value added, or if she benefited from exposure to higher-achieving peers. On the other hand, if the new school's better outcomes simply reflected that it admitted "better" students, then there might be little gain. Further, there might even be negative effects if children transferring to a higher-achievement environment become stigmatized or receive less teacher attention.

Solid evidence on these issues has proven difficult to produce, mainly because students are not randomly allocated to schools. Nonetheless, several analyses have exploited compelling research designs to circumvent this problem. For example, Dale and Krueger (2002) compare students who applied to and were accepted and rejected by comparable sets of colleges, and find no earnings advantage to attending a more selective school. Cullen, Jacob, and Levitt (2005) exploit a lottery to suggest that students who transfer to higher-achieving high schools show no improvement in test scores.[1]

Two more recent papers rely on a regression discontinuity (henceforth RD) design. First, Clark (2008) suggests that relative to students who just miss gaining admission to high achieving public high schools in the U.K., those who do gain entry have only a small advantage in test scores.[2] Duflo, Dupas, and Kremer (2007) study an intervention which "tracked" Kenyan students into high and low achievement classes (as opposed to schools), and find that students who just got into the better classes experience no testing advantage relative to those who just missed gaining entry.[3]

In this paper, we apply a similar RD design to Romania's educational system, which is configured in a way that provides two distinct advantages for such an approach. First,

[1] In an exception to this pattern, students moving to career academies (which organize instruction around a career focus) do display a test score advantage.
[2] However, they take more academic courses and have a higher probability of attending college.
[3] These issues are also related to whether children benefit from moving from public to private schools. See for instance Rouse (1998), Angrist et al. (2002), Howell and Peterson (2002) and Krueger and Zhu (2004).

our data cover the universe of Romanian high schools and provide information on 1,984 potential RD type-cutoffs generated by three cohorts of entering students. This allows us to pool a large number of quasi-experiments, obtaining larger sample sizes than, to our knowledge, have been previously available for this type of research. Second, the large number of cutoffs allows us to explore the heterogeneity of school effects—whether being able to attend a more selective school, for example, is more valuable to a student whose initial performance is high or low.

These advantages originate in that as they transition from primary (grades 1-8) to secondary (grades 9-12) education, Romanian children's ability to choose a high school depends solely on a transition score, which is in turn the average of their performance on a nationwide 8th grade test and their grade point average in *gymnasium* (grades 5-8). After obtaining a given transition score, students submit an (essentially unlimited) list of high school/subject track combinations they wish to enroll in, where the tracks are Mathematics, Natural Sciences, Technical Studies, Social Studies, and Literature. These tracks are essentially "schools within a school" in that the students in them take all their classes together and do not take courses with members of other tracks, although they of course share infrastructure, meet during breaks, and might share teachers.

After students have submitted their choices, their allocation to school/subject tracks takes place through a nationally centralized process that honors higher scoring students' requests subject to pre-established school/track slot constraints.[4] This gives rise to cutoff scores that we set equal to the transition score of the child that fills the last slot in a given school or school/track.

We show that this produces clear RD-type "first stages" in that it induces discontinuities in school quality at the cutoffs that determine access to schools or tracks. For instance, relative to students who score just below a cutoff, those who score just above experience, on average, a highly significant 0.2 standard deviation increase in the average transition score displayed by their peers. The motivation of the RD design is that *if* individuals close to either side of the cutoffs otherwise have similar characteristics, then one can attribute differences in their outcomes to the fact that they enroll in schools

[4] Schools do not have the ability to choose students, and since their enrollment capacities are pre-announced, students have incentives to truthfully reveal their preference rankings.

of different quality. We apply this design noting that in our case it is best given an intent-to-treat type interpretation for two reasons. First, not all students eligible to attend a higher ranked school in fact do, although as the above result suggests, the proportion that do so jumps discretely at the cutoffs. Second, we do not observe the list of choices students submit, only their transition scores and the schools they actually attend.

We use the RD design to analyze two "high stakes" outcomes: whether students take a "Baccalaureate" exam, and how well they score on it. Passing the Baccalaureate is a requirement for application to university, and the actual grade is used by many institutions as an important (sometimes the sole) admission criterion. As an example, at the Technical University of Cluj, the Baccalaureate exam counts for 50% of the score used for admission to most engineering programs.

Our basic "reduced form" result is that students do benefit from access to higher achievement schools. Specifically, relative to individuals who just miss scoring above a cutoff, those who succeed display a (statistically significant) 0.05 standard deviation advantage in Baccalaureate performance. Scaled by the associated improvements in peer quality, for instance, these effects are of magnitude consistent with some estimates in the literature. In contrast, we find no consistently significant impacts on test taking

Importantly, there is significant heterogeneity in these effects, although as one might expect statistical power issues constrain the extent to which we can explore it. First, the first stage gains are somewhat more pronounced when cutoffs occur in the middle ranges of the cutoff score distribution, but are also evident in its upper and lower reaches. Second, the effects on grades are often larger and almost always more precisely estimated for cutoffs that occur at higher grade levels—gaining access to a better school seems to be more valuable for students whose initial grades are higher, and we do not find clearly consistent evidence of an effect among the cutoffs relevant for lower-scoring students.

We further find all these results to be qualitatively similar if one focuses on cutoffs that occur between school/tracks rather than those that occur between schools, an interesting analysis in part because students' preferences are listed at this level, and because this approach generates about three times as many cutoffs.

To summarize, our findings are consistent with the existence of positive and significant school effects, which the literature has generally found elusive. They raise the possibility that previous work has not produced clear evidence of them both because these effects are not uniform across the distribution of initial student performance, and because substantial samples are necessary to identify them.

We underline that while our estimates are relevant to several literatures including that on peer effects,[5] they are best given a reduced form interpretation. This reflects that while on average students who score above cutoffs do experience better peers, they may also enjoy better instructors if, as some literature suggests, more effective teachers gravitate towards better schools.[6] Second, we show these students tend to experience more homogenous peer groups, an aspect Duflo et al. (2007) suggest can have a causal impact on cognitive performance.

Having stated these caveats, the paper closes with some exercises that attempt to provide some insight regarding possible channels that may be at work. One fact that emerges, for instance, is that the positive impacts on Baccalaureate performance remain even in settings when peer heterogeneity increases along with average peer quality at the cutoffs, suggesting we are not identifying a pure "tracking" result. Additionally, the effects persist in situations in which the tracks on either side of between-track cutoffs are located in the same schools, suggesting that they at least partially operate through channels not having to do with school-specific attributes like infrastructure. We leave further exploration of possible mechanisms for a subsequent version of the paper, which, as we discuss, we expect to incorporate new survey-based and administrative data.

The remainder of the paper proceeds as follows. Section II describes the institutional setting and data, and Section III our methodology. Section IV presents results, and Section V concludes.

II. Institutional setting and data

This paper focuses on the transition between middle and high school (8^{th} to 9^{th} grade) in Romania, which results in one of the most systematic allocations of students observed

[5] See for instance Evans, Oates, and Schwab (1992), Hoxby (2000), Sacerdote (2001), Oreopoulos (2002), Figlio (2003), and Kremer and Levy (2003).

[6] There is a literature suggesting this is the case in the U.S.; see for instance Hanushek, Kain, and Rivkin (2001), Boyd et al. (2007), and Jackson (2008).

around the world. Specifically, every child who completes middle school receives a transition score which is a function of: i) her performance in an annual national 8^{th} grade exam covering Language, Math, and History/Geography, and ii) her *gymnasium* (grades 5-8) grade point average.[7]

After receiving their transition scores, students submit an essentially unlimited list of ranked choices which specify a combination of: i) a high school, and ii) one of five academic tracks: Mathematics, Natural Sciences, Technical Studies, Language/Literature, and Social Studies. These tracks constitute "schools within a school" in that the students in them take all their coursework together and do not take classes with members of other tracks—although they share infrastructure, meet during breaks, and might share teachers. Not all schools offer all tracks; in contrast, some schools offer more than one class per track. In the three years of our data (2001, 2002, 2003), class sizes were limited to 25, 28, and 30 students respectively, such that in 2001, for example, a school that offered Technical Studies might have had 75 slots in this track, divided into three classes.

Figure 1 presents some evidence on the prevalence of schools and track/classes for the 2001 admission cohort. Panel A plots the number of schools according to towns' total 9^{th} grade enrollment, and the solid line plots fitted values of a locally weighted regression relating these two variables, showing that the relationship is nearly linear.[8] Panel C presents analogous information regarding the number of track/classes per town, showing a tight fit, which reflects the class size cap regulations.[9] Panel E summarizes some of this by plotting only fitted values of regressions like those in Panel C, but considering

[7] All tests and grades at the high school admission level use the same scale that ranges from 1 to 10, where 10 is the highest score and the passing grade is 5. Students who do not score at least a 5 on the transition score are not allowed to apply to a high school, but they are allowed to enroll in a vocational school.

[8] We will use the term town to denote high school markets. The term that appears in the administrative data is locality or *Localitate*, in Romanian. In most cases these units actually correspond to cities/towns. In a few, they denote the largest of a number of small towns or villages—the town which actually contains the high school that might draw from a corresponding catchment area composed of smaller towns or villages. In all cases, these units should denote essentially self-contained (high school) educational markets, an issue we return to below.

[9] In fact we do not observe the precise number of track/classes schools run; we infer it with enrollment data (and the result of this is what is plotted in Figure 1). This calculation is purely for descriptive purposes and not central to any of the results we present below.

different types of track/classes separately. As this illustrates, Technical Studies tracks are the most common, followed by Mathematics.[10]

Students' school/track choices are expressed through an application form submitted (through their *gymnasium*) to the Ministry of Education in the capital, Bucharest. Using a computerized system, the Ministry then allocates individuals into school/tracks, giving priority to higher scoring students and assigning them their most preferred choices until predetermined school/track capacity constraints bind. Schools submit their slot offerings by track to the Ministry in advance, and simply apply the admissions list returned from the capital, essentially eliminating any scope for gaming the system—students have incentives to truthfully reveal their preference rankings.

Finally, we note that in cases in which a school offers multiple classes of the same track, the system will just return to it the list of students admitted into the track, without further instructions on how to go about separating them into classes. We have no information on the resulting division, although the anecdotal evidence suggests that while schools may not divide up the children randomly, they do not engage in further explicit tracking by ability.

As Table 1 describes, we pool data on three (2001-2003) high school admission cohorts, which yield about 334 thousand observations on students' transition test scores, and data on which of about 800 schools, in 135 towns, they attended. We underline that we do not observe the choices students made, merely their transition grade and the school they enroll in.

Table 1 also describes the two outcome variables we have information for: whether students took the Baccalaureate exam and what score they obtained. These are important outcomes in Romania, as a satisfactory Baccalaureate grade is a prerequisite for applying to university, and an excellent one will essentially guarantee admission to the most prestigious institutions.[11]

We note that Table 1 describes the universe of students admitted to Romanian high schools with three important exceptions, the first two of which are related to fact that, as

[10] Further data on school and track prevalence at the town level are available in Table 1, which also shows the transition test averages by track.

[11] In order to pass the Baccalaureate exam a student must achieve a grade of 5 or higher in each subject, and must have an overall grade higher than 6.

explained below, we rank schools and set cutoff scores under the assumption that towns are self-contained educational markets. We therefore first omit the capital, Bucharest, which is composed of six independently coded towns the borders of which students can cross with relative ease. We do not find this omission to affect our key conclusions. Second, when our analysis focuses on between-school cutoffs, we omit towns that have only one high-school. Finally, we drop all students who enroll in the vocational sector, since this precludes their access to higher education and we do not observe Baccalaureate outcomes for them.[12]

The data described in Table 1 are available online from the Romanian Ministry of Education. The admission data for 2001-2003 provide the name, gymnasium, transition score, and the allocated school/track for all students, but no information on their actual ranking of school/track preferences or their socio-economic characteristics. The Baccalaureate data for the same individuals, who graduated in 2005-2007, contains the name, overall grade, and the performance on each subject. The admission and Baccalaureate data were merged by student name and county using a fuzzy matching technique to allow for some amount of misspelling of names.[13]

III. Empirical approach

Although in principle a student can request any high school/track combination in the country, we suppose that in fact students restrict their choices to the towns they live in, a reasonable assumption since the applicants are 13-14 year olds likely to still be living with their parents. Within each town, we rank schools and school/tracks (in separate exercises) according to the minimum score of they require for admission, and set the cutoffs equal to these minimum scores. In other words, we set each school or school/track's cutoff to the transition score of the child that fills its last slot, where the number of available slots are announced by schools prior to the admissions process. This yields a large number of quasi-experiments—1,984 if one considers schools; 5,641 if one considers school/tracks—since each cutoff score in our sample makes for a potential RD

[12] For analyses of vocational education in Romania, see Malamud and Pop-Eleches (forthcoming, 2008).
[13] Our main results are not sensitive to different levels of precision of the fuzzy matching algorithm, and are also similar if we restrict the analysis to exact matches.

analysis. In this section we first discuss the conceptual basis for analyzing any given one of these experiments, focusing on schools for simplicity. We then describe how we go about summarizing the information they contain.

A. Empirical setup for a single between-school cutoff

Consider a given town, where i indexes the students it contains, and $s=1,\ldots,S$ indexes its schools, where we assume these have been ordered from the worst to the best in terms of the minimum score they require for admission.[14] Additionally, let $z=1,\ldots,(S-1)$ index cutoffs, such that, for example $z=1$ denotes the cutoff between the worst and next-to-worst school in a town, and $z=(S-1)$ indicates the cutoff between the top-ranked school and the next best institution. Let T_i stand for the average transition score among the peers of a student i (i.e., the average transition score among all the children at her school), and let t_i denote the student's own transition score. Finally, let $\underline{t}_z$ be the minimum grade required for admission into the higher-ranked school of the two schools indexed by z.

In this setup, consider the regression:

$$T_i = \alpha\, 1\{t_i \geq \underline{t}_1\} + a(t_i) + u_i \qquad (1)$$

where $1\{t_i \geq \underline{t}_1\}$ is an indicator for whether a student's transition score is greater than or equal to the cutoff which determines access into the next-to worst school (cutoff $z=1$), and $a(t_i)$ is a flexible control function for the transition score. In this case, α will estimate by how much students' peer group improve, on average, when their transition score is just above rather than just below $\underline{t}_1$.

The idea behind RD designs, originally proposed by Thistlewaite and Campbell (1960) and more recently applied to several issues in the economics of education,[15] is that discontinuities like those measured by α can be used to identify the causal effect of scoring above a cutoff even if students' transition scores are systematically related to

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[14] One could think of different ways of ordering the schools, for example, by their average transition score rather than by the minimum admission score. We explored this alternative, with rather similar results to those we present below.

[15] For a recent overview of the RD design, see Imbens and Lemieux (2007).

factors that affect outcomes like Baccalaureate grades. Intuitively, suppose the transition score is smoothly related to characteristics that affect achievement. Under this assumption, students with scores just below $\underline{t}_1$ will provide an adequate control group for individuals with scores just above, such that any differences in these students' baccalaureate outcomes can be attributed to the fact that they experience schools of different quality.

Specifically, one can run a reduced form regression analogous to (1) to explain outcomes like Baccalaureate performance, which we denote g_i:

$$g_i = \beta\, 1\{t_i \geq \underline{t}_1\} + a(t_i) + v_i \tag{2}$$

Again, if in a small enough neighborhood around the cut-off, $a(t)$ is constant, then the effect of achieving access to the next to worst school, β, is non-parametrically identified at $\underline{t}_1$ (Hahn, Todd, and VanderKlaauw, 2001). More generally, if $a(t)$ is specified correctly it will capture all dependence of the Baccalaureate grade on the transition scores away from the cut-off, and one can use all the data to estimate (2). Below we will present such results, but also estimates that rely only on observations close to cutoff scores.

In some cases, we will also present results from a more full fledged instrumental variables-type specification (van der Klaauw, 2002):

$$g_i = \delta\, E(T_i|t_i) + a(t_i) + e_i \tag{3}$$

$$E(T_i|t_i) = \gamma\, 1\{t_i \geq \underline{t}_1\} + a(t_i). \tag{4}$$

In this case, under assumptions analogous to those made above, and if the mean of T conditional on the transition score, $E(T_i|t_i)$, is discontinuous at $\underline{t}_1$, then (3)-(4) will consistently estimate δ—the effect of having access to a better quality school as measured by peer group quality—effectively using only the discontinuity in $E(T_i|t_i)$.

Below we implement (3)-(4) mainly as a descriptive exercise to compare the magnitude of δ across cutoffs like $\underline{t}_1$, since δ cannot be given a strict instrumental variables interpretation. This reflects that as previewed above and shown in greater detail below, other aspects of school quality—and not just average peer achievement—will change at the cutoffs, such that reduced form specifications like (2) are the most appropriate.

B. Summarizing information for many cutoffs

Specifications (1)-(4) explain how one might exploit one regression discontinuity—that arising from the hypothetical transition from the worst to the next-to worst school in a given town. In fact, our data contain 1,984 such between-school cutoffs and 5,641 between-track cutoffs.[16] Below, we present information that exploits this wealth of quasi-experiments, summarizing, for example, how estimates of the impact of scoring above a given cutoff vary with where in the transition test score distribution these cutoffs are located.

However, in order to summarize these data and for the sake of statistical power, we first report regressions in which we pool data across cutoffs. For this, we normalize each cutoff score, z, to zero, and create a variable that measures the distance between each cutoff and the transition score of each student in a town. In some cases we then "stack" the resulting data such that every student in a town serves as an observation for every cutoff, and (since individual level observations are used more than once) run the analyses clustering at the student level.[17] Including all students as on observation for every cutoff is relevant in that, for example, the student with the best score in town could in principle attend any school she wanted.

We note, however, that regressions restricted to students in narrow bands close to the cutoff scores will in fact rarely use student-level observations more than once. Further, we also present summary exercises in which by construction student observations enter only once. For example, we pool the top cutoffs in each town to consider the effects of access into the "elite" school in each market, and, in a separate exercise, consider the consequences of having the option of escaping the worst ones.

[16] The between-school cutoffs are 663, 665, and 666 for the 2001, 2002, and 2003 entry cohorts, respectively; for the between-track cutoffs, the corresponding numbers are 1,956, 1,880, and 1,805.

IV. Results

This section first presents results that summarize the evidence by pooling all the between-school cutoffs. It then turns to descriptions of the heterogeneity observed when discontinuities take place at different points of the transition score distribution. Finally, it closes with a discussion of such effects when we focus on between-tracks rather than between-school cutoffs, and a review of exercises that aim to get a sense of the mechanisms that might account for some of the effects found.

A. Basic results: First stage

Figure 2a, Panel A illustrates the basic first stage results in our data, pooling all between-school cutoffs as described in Section III. The x-axis describes students' transition scores relative to the cutoffs (normalized to zero) that allow the possibility of access to better schools; the y-axis describes the peer quality students experience, as measured by the mean transition score at their respective school. Panel A plots this mean transition score collapsed into cells containing individuals who are within .01 of a transition grade from each other. The right hand side Panel B plots analogous information, but the y-axis is based on residuals from a regression of the mean transition score on a linear trend in students' transition grade and a series of cutoff fixed effects.[18] Both panels present visual evidence that the average peer quality students experience increases significantly and discontinuously if their transition score crosses the threshold that gives them the option of going to a better school. The vertical distance between the points close to the discontinuity, further, is analogous to the estimate of α in expression (1).

Table 2, Panel A presents the regression analog to these results. Column 1 uses about 3.6 million observations from 1,984 cutoffs observed across the three admissions cohorts. It regresses the average transition grade that students experience at school on an indicator

[17] To illustrate, in the first year of our data, 2001 the first town in our data, Alba-lulia, has 836 students in 7 schools, producing 6 between-school cutoffs. For that year, this produces a dataset of 5,016 (=836*6) observations, with similar calculations for the other two years of data.

[18] Figures 2a, 2b, 3, 4, and 7 have a similar structure in the sense that the raw data is plotted in the left panels and the right panels use residuals based on regressions that control for a linear trend in the transition grade and cutoff fixed effects.

for whether their scores are above a cutoff, and includes controls for a quadratic in students' distance to the cutoffs, and cutoff dummies analogous to those used in Figure 2a, panel B. The key estimate suggests that scoring above a cutoff results in a highly statistically significant jump in the peer quality students experience, one equivalent to about 0.1 standard deviations in the transition test. We note that these and all the following results are not qualitatively affected by using a linear or a cubic (instead of a quadratic) specification for $a(t_i)$ in (1), or by excluding the cutoff fixed effects.

Column 2 restricts the sample to include only students whose transition scores are within 0.5 points of a cutoff, reducing the number of observations to less than a third of those analyzed in Column 1. Columns 3-5 are even more restrictive in additionally requiring that students be, respectively, within 20, 5, and 1 ranks of a cutoff—in short, the final column compares only the students just to the right of cutoffs with those just to the left.[19] Given these stringent conditions, columns 3-5 result in samples only 2 to 0.1 percent as large as those in Column 1. They nonetheless all sequentially result in increases in our point estimate of α, which additionally remains highly statistically significant throughout, suggesting that students who have transition scores above a cutoff on average experience peers whose average transition scores are about 0.2 standard deviations higher.

In short, these results show that the Romanian high school admissions process provides a clear first stage for an RD analysis. In order to elaborate on how this first stage originates, and because it is relevant for later interpretation, we note that while scoring above a cutoff gives students a chance to attend a better school, not all of them avail themselves of the opportunity. Specifically, panels A and B in (Appendix) Figure A.1 summarize information regarding the cutoffs that determine access to fairly selective schools, namely those that separate the best and second-best school (cutoff $z=S-1$ in the notation of Section III) in towns that contain at least three schools. Panel A plots transition score cell means of the percentage of students who attend the best school, and not surprisingly this is equal to zero when students' scores are to the left of the cutoff—these students are not eligible to attend the most selective school in their town. While the

[19] Note that unlike the previous specifications, Column 5 does not include a quadratic in grade distance (it still features a linear term).

proportion of students in the best school jumps discretely once one moves to the right, it does not rise to one; rather, roughly 40% of children eligible for enrollment in the best school take advantage of the opportunity. Panel B, which plots the percentage of individuals in the second best school, shows that about 25 percent of those eligible for the best decide to remain in the second-best school (with another 35 percent attending institutions other than the top two). [20]

Factors like proximity may account for why not all students take up the chance to go to the best school. Additionally, students may prefer certain schools because of the tracks they offer—an issue we return to below. In any case, Figure A.1 underlines that, as previewed above, the results our first stages generate should be interpreted with an "intent to treat" spirit. For further reference, panels C and D show analogous evidence for the cutoffs separating the worst and the next to worst schools in each town, and panels E and F plot similar information for towns that contain only two schools. We return to each of these samples below.

By way of closing our review of the first stage, we note that while these results show that students who score just above the cutoffs on average interact with higher-scoring peers, we also find that they encounter a more homogeneous environment, at least as measured, again, by their peers' transition scores. This finding is particularly relevant because in recent work that starts from a randomized setting, Duflo et al. (2007) suggest that such homogeneity is causally related to testing improvements, so it is important to keep this possible channel in mind in interpreting subsequent results.

Specifically, panels C and D in Figure 2a again present students' relative distance from the cutoffs on the x-axis, but in this case plot the standard deviation in transition scores observed at their schools. There is visual evidence of a discrete decline in this measure of heterogeneity at the cutoff. Panel B in Table 2 presents the corresponding regression evidence, showing consistently significant declines in the standard deviations in transition scores that children experience at school. This result, plus the possibility that other relevant school-level traits (such as teacher quality) may change discretely at

[20] A related note is that the regressions we present exclude the lowest ranked student that just made it into each school, since that student may be selected. This reflects that this student's score dictates the cutoff score, and mechanically, that student attends the better school with probability one, which is empirically

the cutoffs, lead us to emphasize that our results should be given a reduced form interpretation.

C. Basic results: Outcomes

Turning to outcomes, panels A and B in Figure 2b describe the behavior of Baccalaureate performance at the cutoffs, suggesting a discrete increase in average grades, particularly in Panel B. The corresponding reduced form regression evidence is in Panel C in Table 2, which presents estimates that are consistently significant—gains in the order 0.02 to 0.05 standard deviations, with the largest effects observed when the sample is restricted (Column 5 produces a similar, if insignificant, point estimate, which may in part reflect that by this specification the sample is less that one tenth of one percent of the original). In short, students who score above cutoffs giving them access to a better school perform better in the high stakes Baccalaureate exam, and under the assumptions underlying RD designs, this impact can be viewed as causal.

Panel D presents IV-type estimates of the effect of having access to a better set of peers on students' Baccalaureate grade—in other words, we instrument the average transition grade at students' schools with whether their own transition scores were greater than those necessary to get into better schools. Not surprisingly given the reduced form results, these effects are also significant (again except in Column 5, the most restricted sample), suggesting a one standard deviation increase in average peer quality measured by transition grades increases Baccalaureate performance by about 0.1-0.2 standard deviations.

We include these IV-type results for descriptive and comparative purposes—for instance, so that we can compare the changes in Baccalaureate grades in subsamples in which the first stages are of magnitudes different than those in this aggregate sample. In a strict sense, however, these results should not be interpreted as IV estimates of peer-effects, since as Panel B showed, the distance to the cutoff is not a valid instrument for

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not the case with the individuals right above him or her. This exclusion does not have a qualitative effect on any of our conclusions.

peer quality—other potential determinants of performance, including peer heterogeneity (and others we do not observe, like teacher quality) may also vary discretely at the cutoffs.

Finally, panels C and D in Figure 2b and Panel E in Table 2 present evidence on whether students who scored above the cutoffs were more likely to take the Baccalaureate exam. Here we find no consistently significant evidence of an effect—in some cases the coefficients are positive and in others negative, and they are generally not statistically significant. This result is similar in most of the subsamples we consider below, so that while we include the corresponding regression evidence, we no longer present graphical evidence, for the sake of space.

D. Heterogeneity

While figures 2a-2b and Table 2 pool all the between-school cutoffs to produce summary estimates, it is also relevant to explore if there is variation in these effects across the distribution of scores at which these cutoffs are located.[21] To begin this exercise, Figure 3 and Table 3, on the one hand, and Figure 4 and Table 4, on the other, present evidence analogous to Figure 2 and Table 2 for the top and bottom tercile of cutoffs, respectively. Specifically, Figure and Table 3 refer to the top third of cutoffs if these were ordered according to the grades at which they happen, and Figure and Table 4 to the bottom third.

Panels A and B give a first indication of heterogeneity, in this case in first stage effects. They reveal that the discontinuities in average peer quality (measured by school-level average transition scores) are of a larger magnitude in the top than in the bottom tercile of cutoffs. The estimates in columns 2-5 in tables 3 and 4 (those that restrict the sample to bands around the cutoffs) range between 0.12 and 0.47 standard deviations in the top tercile, but only between 0.03 and 0.09 in the bottom one. In contrast, however, the reductions in peer heterogeneity (Panel B) are generally of a greater magnitude in the bottom tercile.

The reduced form results in Panel C in each table show that the aggregate positive impact of attending a better school on the Baccalaureate grade (Table 2, Panel C) is

[21] For reference, Figure 5b, Panel A presents a kernel density of this distribution.

mostly driven by cutoffs in the upper third of the distribution in terms of cutoff score. While the significant reduced form effects in the upper tercile range between 0.03 and 0.07 standard deviations (the point estimate in the last column is similar but not significant), in the bottom third they fluctuate between 0.01 and -0.07 and are generally not significant. Thus, the smaller IV results on baccalaureate grade (Panel D) in the bottom tercile are not driven as much by a weaker first stage as by a much smaller reduced form effect in this part of the distribution. That said, we note that the IV-type results in Table 4 are not far in magnitude from the aggregate ones in Table 2, although they are not significant. This leaves open the possibility that there are relevant effects in the lower tercile as well, but that we lack power to identify them.

Table 5 and Figure 5a further explore the heterogeneity of effects by looking at the top and bottom cutoffs in towns that contain at least three schools. Panels A and B of the figure show the reduced form effects for the average peer quality and Baccalaureate grade based on plots that use residuals of the dependent variables (as in all the right hand side panels of figures 2-4) and focus (as in Figure A.1) on the top cutoffs—those that separate the best and second-best schools.[22] Panel A suggests a clear first stage effect, which is confirmed in regressions in Panel A of Table 5, suggesting that the magnitude of increases in peer quality is roughly on par with that observed for the aggregate sample in Table 2. Panel B (Table and Figure 5) presents evidence of a school effect at these "top" cutoffs, the latter in an IV-type specification, which again generally suggests larger effects than those we observe on average.[23] The IV-type effects on Baccalaureate performance are roughly of the same magnitude as those observed for the top tercile of cutoffs in Table 3.

Panels C and D in Figure 5a and Table 5 summarize information for the cutoffs that separate the worst and the next-to worst schools in towns that contain at least three schools. The first stages are still significant (except in the most stringent specification), and in this case not far in magnitude from those at the top cutoff. As in the results for the bottom tercile of cutoffs above, however, there is less evidence of an effect on

[22] We present evidence for two-school towns below.
[23] The coefficient in column 5 is not significant but is based on only 301 observations.

baccalaureate grades, with none of the restricted-sample coefficients being statistically significant

Overall, the results so far are consistent with there being heterogenous impacts of having access to better schools, and suggest second stage effects that are often larger and almost always more precisely estimated among cutoffs in the upper reaches of the grade distribution. For a final exploration of heterogeneity among between-school cutoffs, we treated each of the 1,984 between-school discontinuities individually and ran our first and second stage regressions separately around each cutoff.[24] To describe the results, the dark curve in Figure 5b, Panel B, plots the fitted values of a non-parametric Fan regression relating the increases in peer quality that occur at different cutoffs and the transition score at those cutoffs. The dotted curves plot the corresponding confidence intervals calculated using bootstrapped standard errors clustered at the town level. Panel B also includes parametric point estimates and confidence intervals of the first stage effects for the bottom, middle and top tercile of the cutoff score distribution.[25] Both the parametric and non-parametric plots show that the first stages generally display an "inverted U" pattern: the increase in the quality of peers is strongest when cutoffs happen at scores in the middle ranges of the transition test score distribution, and weakest when they happen at the extremes.

Panel C of Figure 5b shows the heterogeneity of the effect on the Baccalaureate grade from IV-type specifications which again use both a parametric and non-parametric approach. This figure is consistent with our earlier findings indicating stronger effects that are statistically significant at the top of the distribution. The figure also illustrates that despite our strong first stages, the second stage results are generally imprecisely estimated. This suggests that one possible reason why the literature has not always

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[24] More specifically we ran equations (1), and (3) and (4) for each of our 1,984 cutoffs separately, using a linear control for $a(t_i)$ and restricting our samples to include only students whose transition scores are within 0.5 points of the cutoffs and within 20 ranks of the cutoff (a variant of specification 2 in Table 2).

[25] More specifically we ran the following regression:

$$T_i = \Sigma_i\, \alpha_i * tercile^i * 1\{t_i \geq t_z\} + \Sigma_i\, \alpha_i * tercile^i * a(t_i) + \Sigma_i\, \alpha_i * tercile^i + u_i$$

where i ranges between one and three and *tercile* is a set of dummy variables taking on value 1 if a particular cutoff score is in tercile i; the rest of the equation is similar to (1). As above, we use a linear control for $a(t_i)$ and restrict our samples to include only students whose transition scores are within 0.5

identified significant school effects is that the sample size requirements necessary to do so are substantial. Finally, mirroring earlier findings, Panel D shows no significant effect on taking the baccalaureate exam throughout the distribution.

E. Between-track cutoffs

The effects found thus far are suggestive of "school effects" to the extent that they are consistent with otherwise comparable children having different outcomes if they attend schools of different selectivity. As already emphasized, a number of channels could account for these effects. For example, more selective schools might be able to attract better teachers,[26] be run by better administrators, or even receive favorable treatment from national or regional authorities. On the other hand, our findings could reflect something closer to conventional peer effects, where children benefit directly from the interaction with "better" classmates. Given the setting we study, it is ultimately impossible to disentangle these channels, but in the remainder of this section we attempt to comment on evidence in support or against some possibilities.

For a somewhat extensive but nonetheless necessary preliminary, Table 6 and Figure 6 replicate the basic analysis in Table and Figure 2, but do so considering between-track rather than between-school cutoffs. In other words, rather than ranking all schools in a town and calculating their cutoffs, we rank all the school/track combinations and calculate their corresponding cutoffs scores. This exercise is relevant, among other reasons, because students applying to high schools enter their preferences at the school/track level.

Table and Figure 6 again suggest a clear first stage effect: substantial increases in the average transition scores among children's peers if their own transition score is above a school/track cutoff. The magnitude of these effects, further, is comparable to that observed in the first stages for the between-school cutoffs in Table 2. On the outcomes

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points of the cutoffs and who are additionally within 20 ranks of the cutoff. The estimation equation for the second stage regressions are similar to those used above.

[26] There is a literature suggesting this is the case for the U.S.; see for instance Hanushek, Kain, and Rivkin (2001), Boyd et al. (2007), and Jackson (2008).

side, here too there is evidence of an effect on Baccalaureate grades (and none on test taking) with effect sizes that again are not too different from those in the main results.

Further, tables 7 and 8 (we omit the graphical evidence) are analogous to tables 3 and 4 (they have the same structure) in exploring the heterogeneity of these effects—namely whether there are differences depending on whether one considers the top or bottom tercile of between-track cutoffs. Here there are some differences with respect to the between-school analysis, but the overall pattern is consistent—there is clear evidence of first stage effects in either tercile, and also of impacts on Baccalaureate grades in the top one. For some specifications, the IV-type estimates for the bottom tercile are actually similar, but generally not statistically significant.

These results are consistent with the effects identified above not being completely driven by school-specific attributes. For further evidence, Table 9 focuses on between-track cutoffs that separate tracks within the same school. This should move some distance toward controlling for school-specific attributes like infrastructure or a location that makes it easier to attract effective teachers. Despite this, we still find generally positive and significant impacts on Baccalaureate performance.

F. **Higher peer quality vs. reduced peer heterogeneity**

Another interpretation-related issue arises because students who score above cutoffs have peers who aside from being higher achieving in terms of transition scores, tend to be more homogeneous in this dimension. This is relevant in light of the fact that Duflo et al. (2007) suggest that this in itself may lead to improved outcomes.

Yet the last set of results—Table 9, which refers to between-track cutoffs separating tracks in the same school—shows a situation in which peer heterogeneity does not display a decline at the cutoffs associated with increases in average peer quality. Specifically, Panel B displays small but significant increases in peer heterogeneity. Despite this, positive effects on Baccalaureate grades (Panel C) are still observed, save in column 5.

For another example of such a situation, and because it is a sample of interest in its own right, Table 10 reviews the results for the sample of towns that contain exactly two schools. Some initial background on these markets is provided in Figure A.1, where Panels E and F suggest that relative to the top and bottom cutoff in towns with three or more schools, a higher proportion of children who score above the cutoffs do in fact take up the opportunity of going to a better school. This probably reflects that there is likely to be a clear and simple school hierarchy in two school towns. Consistent with this, Table 10, Panel A, displays increases in average school achievement at the cutoff that are larger than those in any previous table—students with transition scores above cutoffs have peers whose average score is about 0.7 standard deviations higher. Panels C and D also show that statistically significant and positive effects on Baccalaureate performance (panels C and D) persist despite the fact that scoring at a level sufficient to be admitted to towns' top schools in this sample is in fact associated with increases in the peer heterogeneity that children experience at school (Panel B).

V. Conclusion

Whether students would benefit from attending higher-achieving schools is a classic question in education, one which the literature has struggled with mainly because it is difficult to identify situations in which otherwise comparable students enroll in schools of different quality. This paper has attempted to add to the set studies that address this obstacle, in this case, by relying on features of the Romanian educational system, which allocates students to high schools in one of the most systematic procedures observed around the world. This generates a situation in which every pair of schools or tracks in a town can potentially provide an RD-based quasi-experiment, a setting which yields large sample sizes and the possibility of exploring heterogeneity in effects at different points of the test score distribution.

Our central results are that access to a better school has a positive impact on cognitive outcomes when these are measured using achievement in the high-stakes Baccalaureate exam. Further, our results point to these effects often being stronger, and almost always more precisely estimated, for children whose initial transition scores are relatively high and therefore have a chance to access the best schools. The estimates surrounding cutoffs relevant for lower-achieving students are sometimes in similar ranges, but rarely statistically significant. Further, we do not find consistent evidence that scoring above a cutoff affects the probability that students actually take the Baccalaureate test, and all of these conclusions are qualitatively similar when we focus on cutoffs that occur between school/tracks rather than between schools.

In short, although not in all the outcome dimensions we consider, our findings point to the existence of positive and significant school effects, which the literature has generally found elusive. They raise the possibility that previous work has not produced clear evidence of them both because these effects are not uniform across the distribution of initial student performance, and because substantial samples are necessary to identify them.

As we emphasized in the introduction, the setting we consider dictates that our findings be given a reduced form interpretation, as the positive effects we find might originate in a number of factors including peer quality, peer homogeneity, school effectiveness, and teacher quality—as well as possible interactions effects between these mechanisms. One fact that emerges, however, is that the positive impacts on Baccalaureate performance remain even when we identify situations in which peer homogeneity decreases at the cutoffs, and in situations in which the tracks on either side of between-track cutoffs are located in the same schools. This suggests that at least part of the impacts operate through channels not having to do with peer homogeneity or school-specific attributes constant within schools, like infrastructure.

Future work on this project involves the collection of further administrative data, and the administration of a survey to students, oversampling those close to the cutoffs that give rise to our empirical strategy. The questionnaire will collect information on aspects including student and parental effort, and students' perceptions of their own abilities and of the amount of teacher attention they received. We hope to use this data to test some of the assumptions underlying the research design, and to further explore possible channels that may account for the effects we find.

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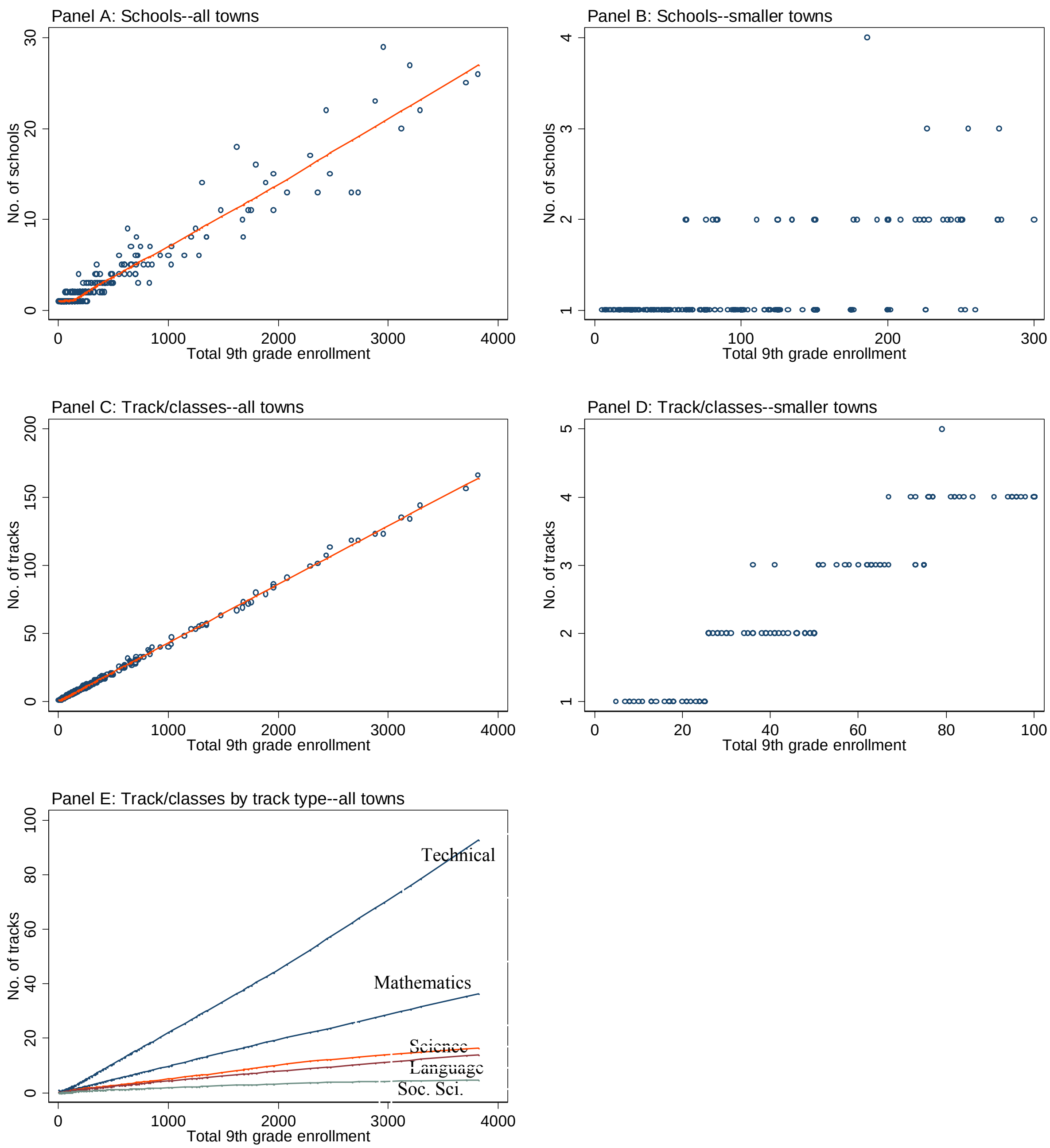
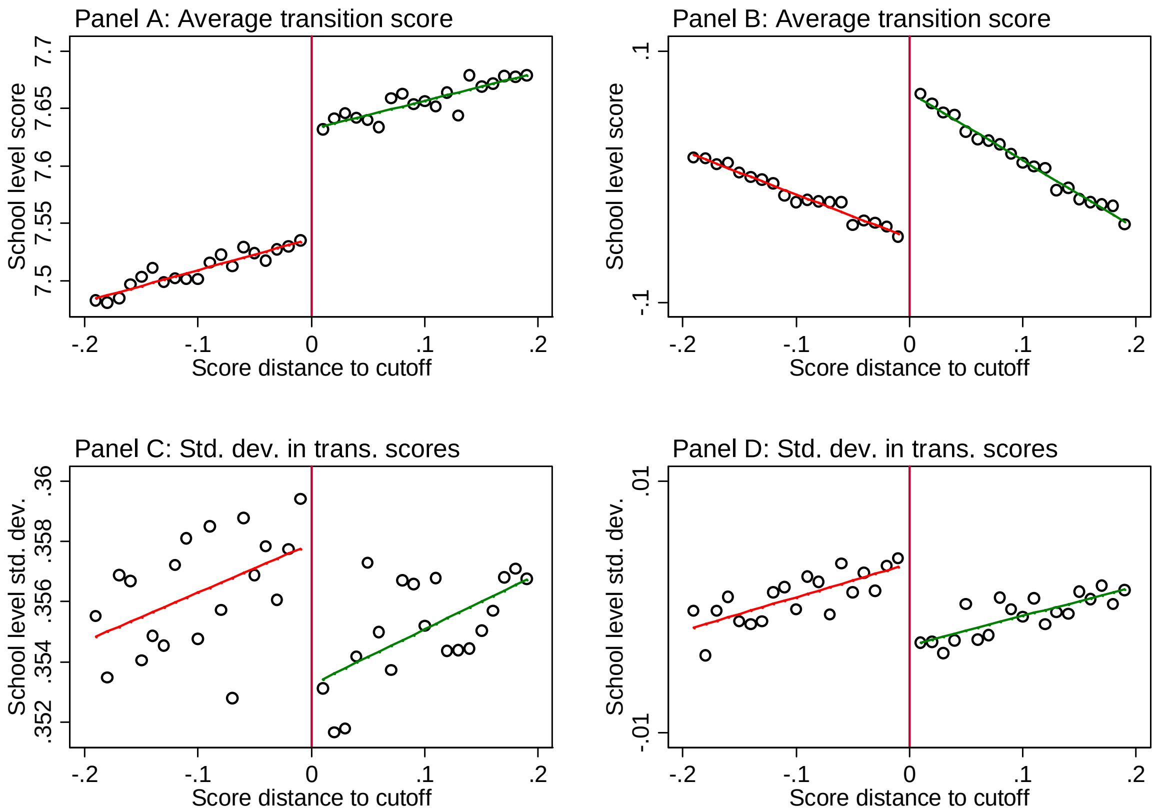
Figure 1: Number of schools and track/classes by town size, 2001 admissions cohort



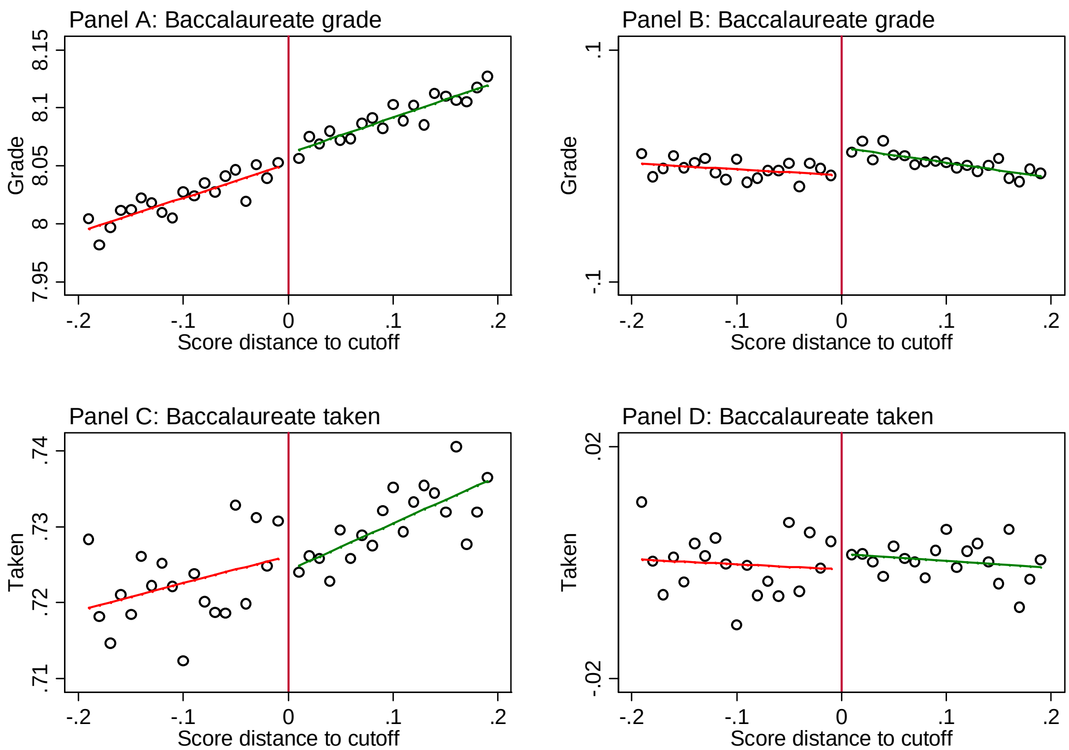
Note: The figures refer to the 2001 admission cohort. Panels A and B describe the number of schools by town size, and panels C-E the number of track/classes. Panels B and D replicate the information in panels A and C, respectively, but focusing only on smaller towns. In panels A, C, and E the curves describe fitted values of locally weighted regressions of the number of schools or track/classes on total enrollment.

Figure 2a: All between-school cutoffs



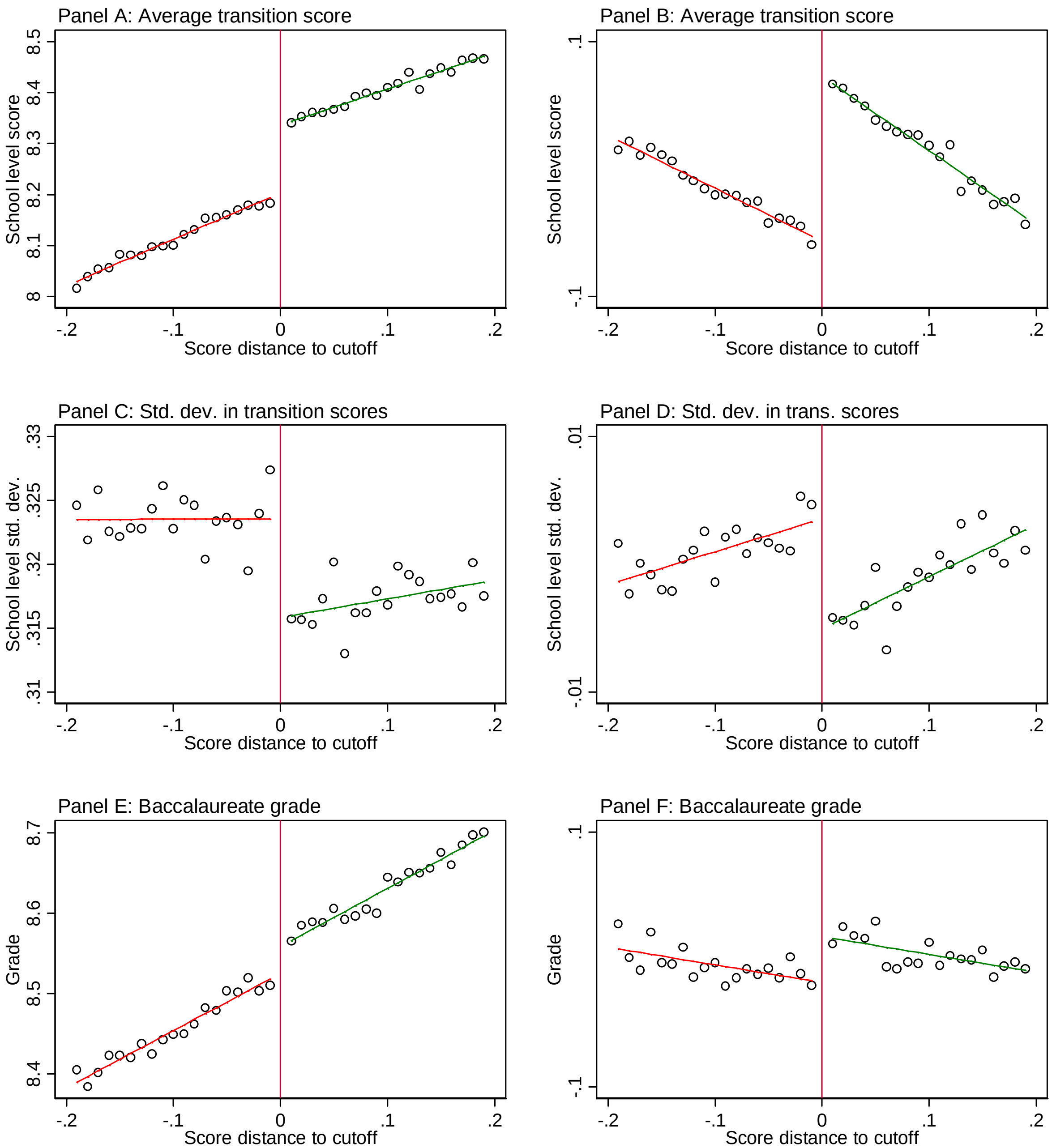
Note: All panels are based on 2001-2003 data, and restrict observations to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the average transition score of the peers students encounter at school; the dependent variable in panels C and D is the standard deviation of the transition score in students' schools. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 2b: All between-school cutoffs



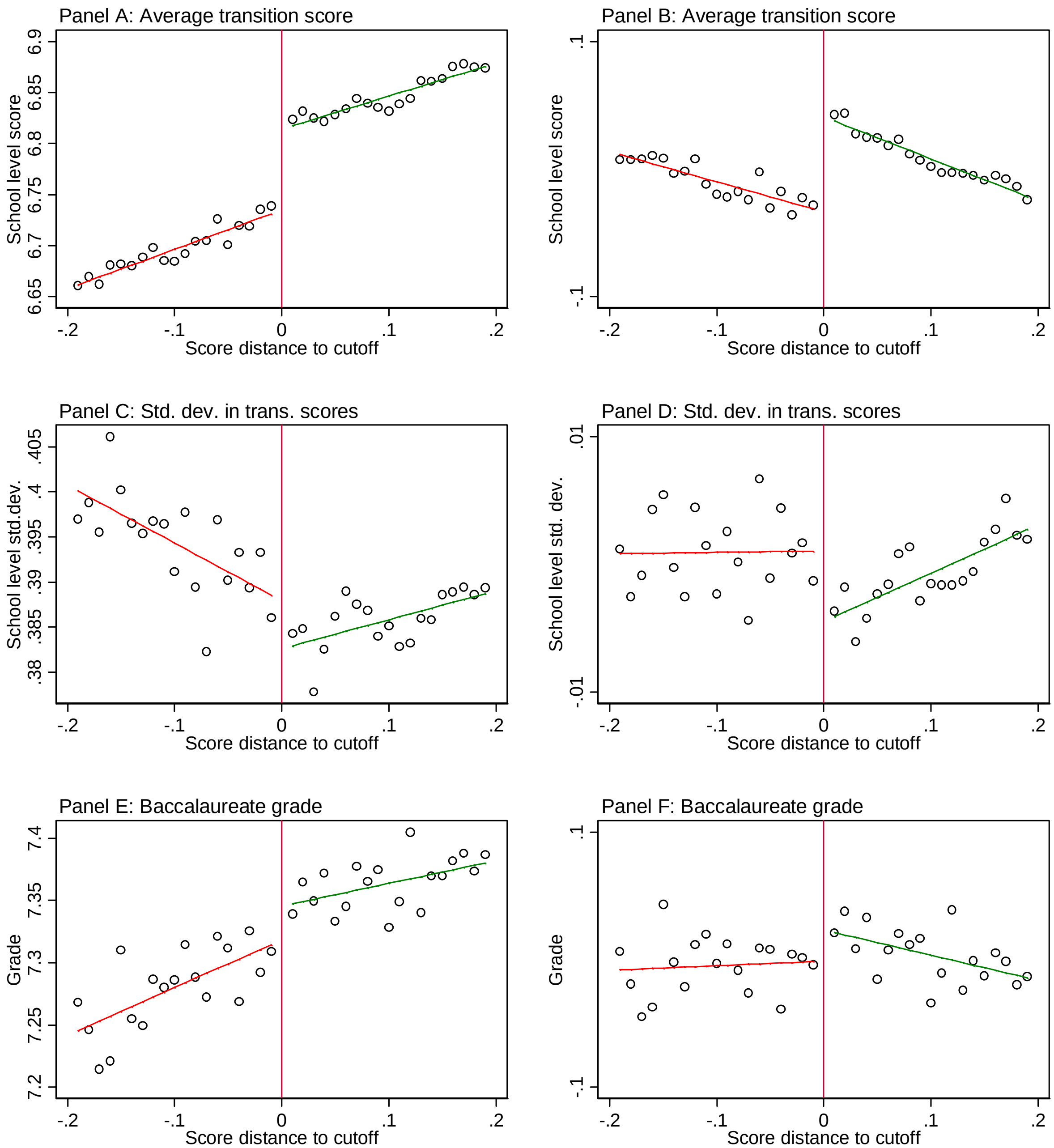
Note: All panels are based on 2001-2003 data, and restrict observations to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the Baccalaureate exam grade; the dependent variable in panels C and D is an indicator for having taken the Baccalaureate test. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 3: Top tercile of between-school cutoffs by transition score at the cutoff



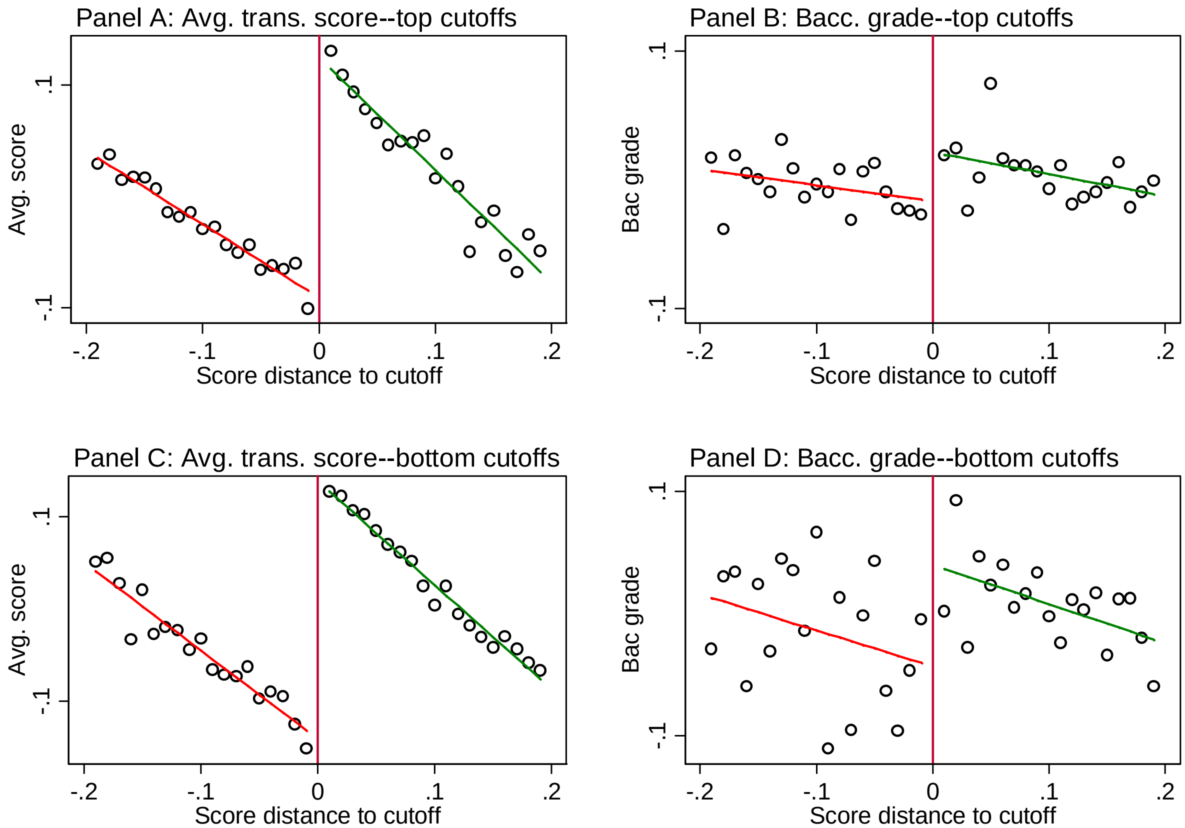
Note: All panels are based on 2001-2003 data, and restrict observations to cutoff scores in the top tercile, and to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the average transition score of the peers students encounter at school; in panels C and D it is the standard deviation of the transition score in students' schools; and in Panels E and F it is their Baccalaureate exam grade. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 4: Bottom tercile of between-school cutoffs by transition score at the cutoff



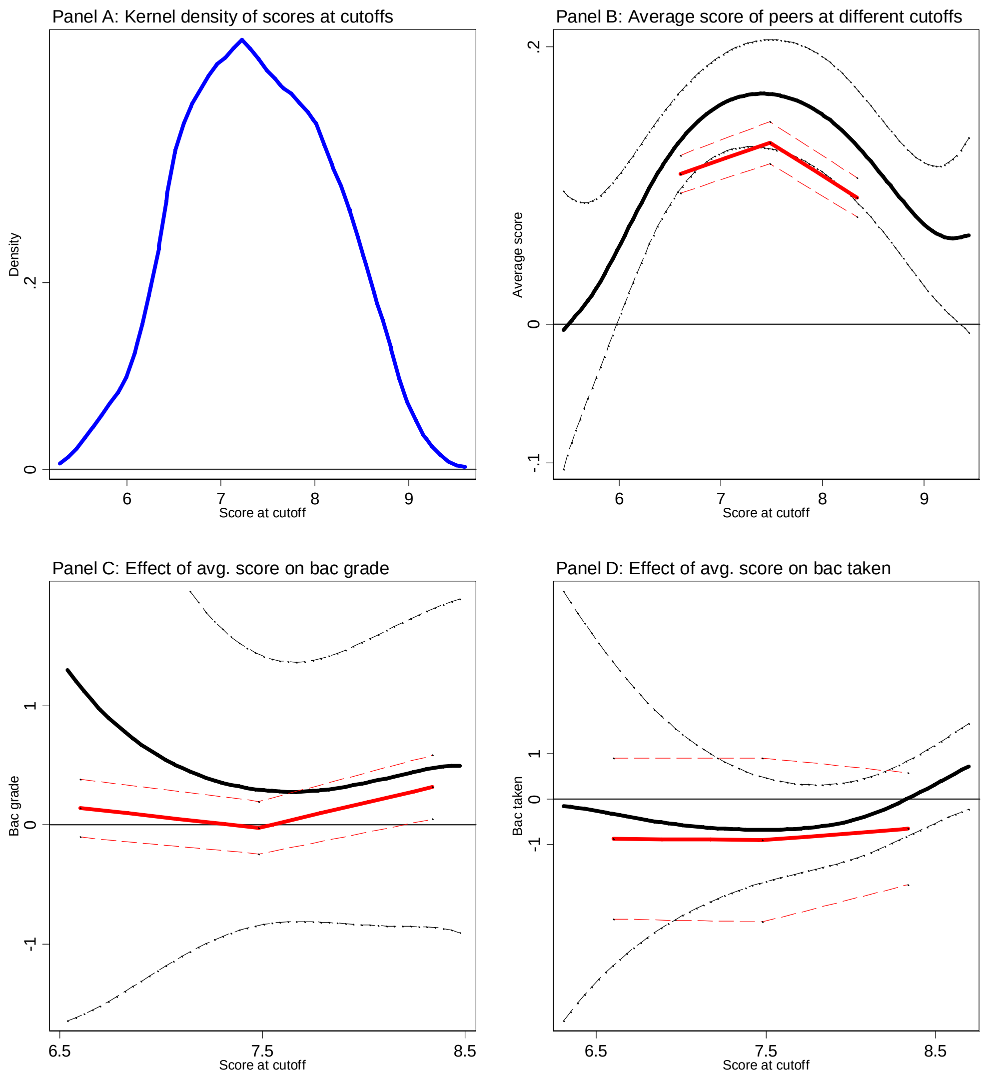
Note: All panels are based on 2001-2003 data, and restrict observations to cutoff scores in the bottom tercile, and to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the average transition score of the peers students encounter at school; in panels C and D it is the standard deviation of the transition score in students' schools; and in Panels E and F it is their Baccalaureate exam grade. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 5a: Top and bottom cutoffs (in towns with 3 schools or more)



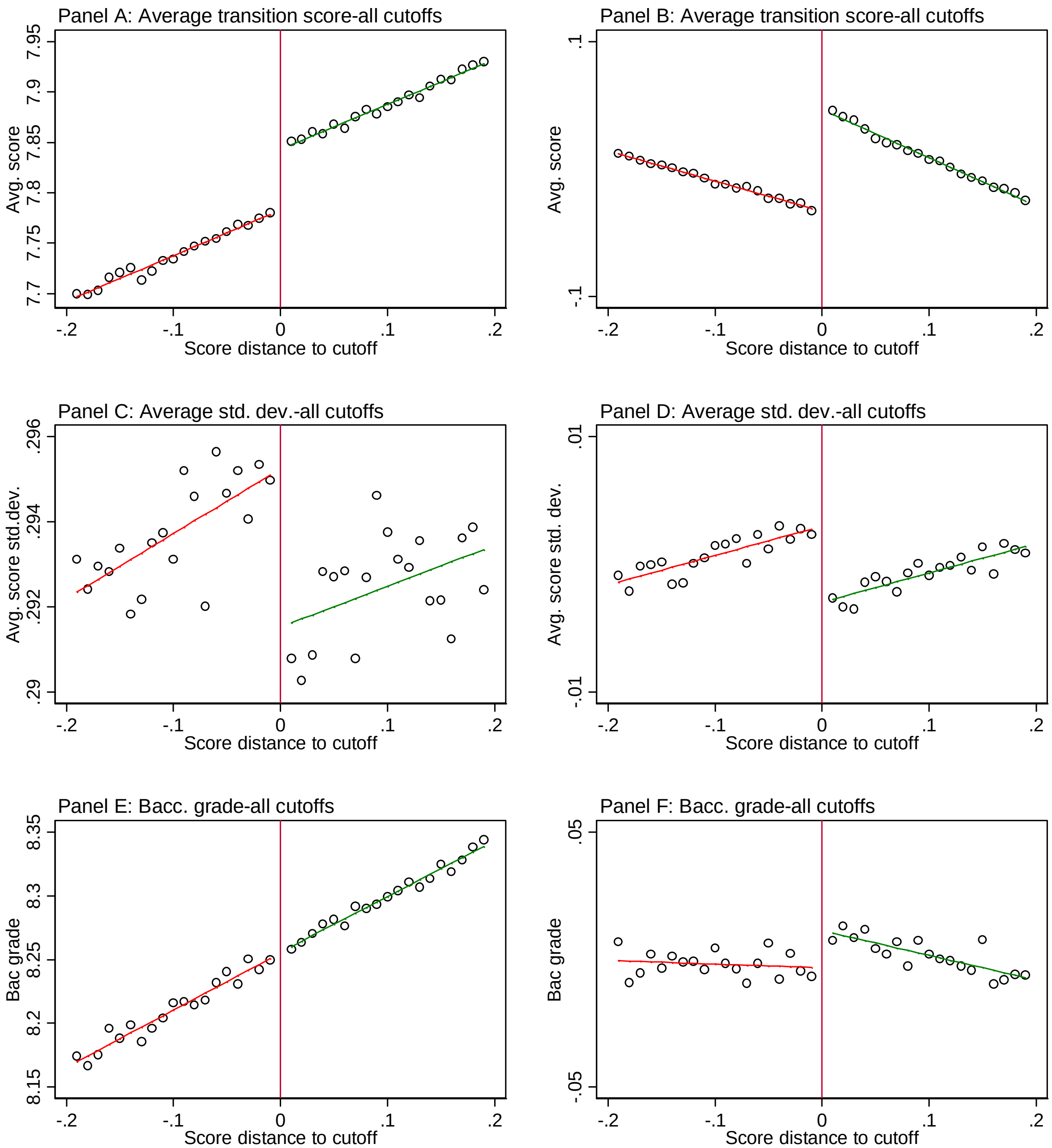
Note: All panels are based on 2001-2003 data, and restrict observations to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). All panels plot (0.01 point) transition score cell means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and C is the average transition score of the peers students encounter at school; in panels B and D it is the Baccalaureate exam grade. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 5b: Non-parametrics



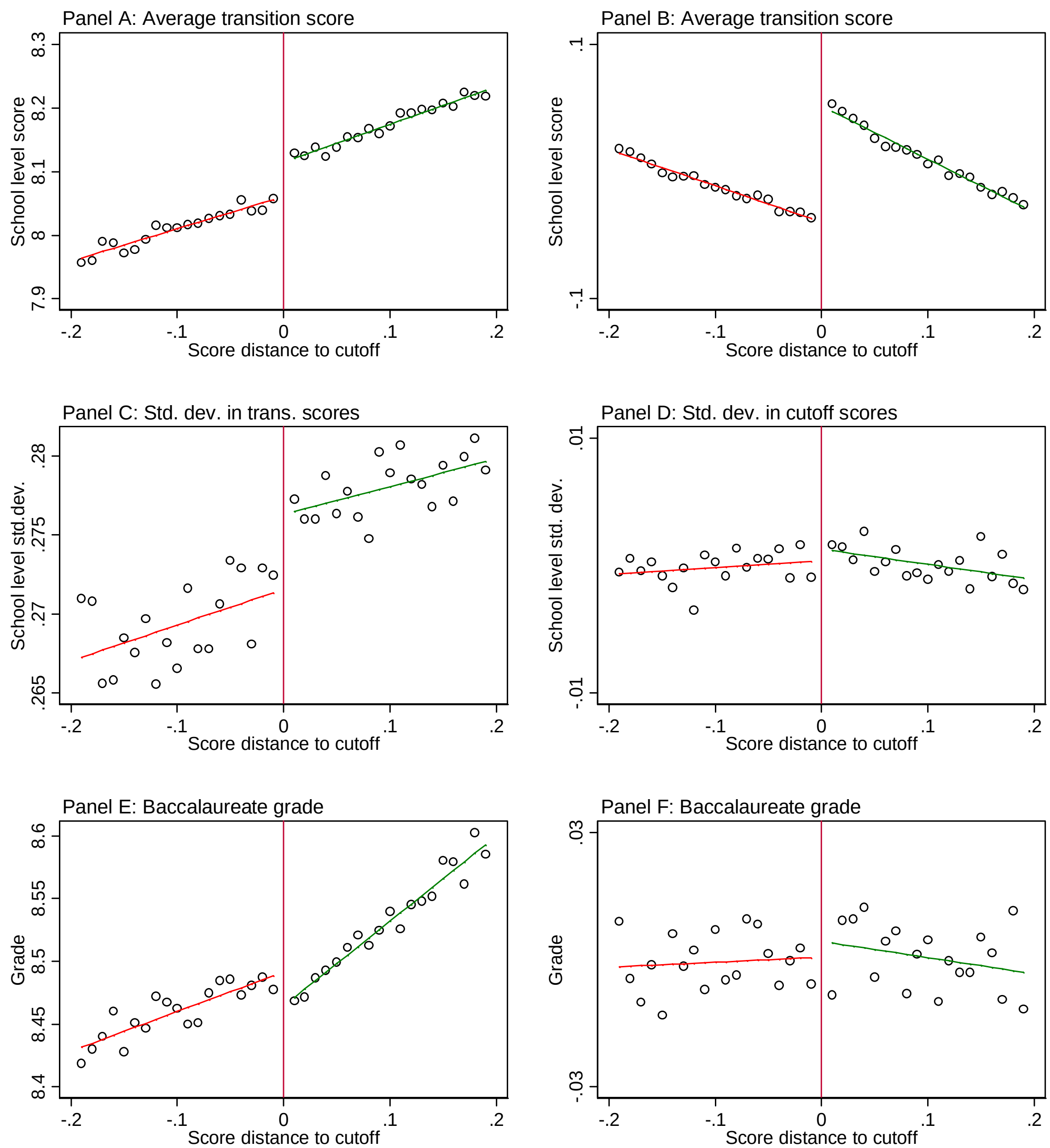
Note: Panel A plots the kernel density of between-school cutoffs. In Panels B, C and D, results from non-parametric Fan locally weighted regressions are graphically represented as the darker lines. The dotted dark lines are the corresponding confidence intervals based on bootstrapped standard errors clustered at the locality level. In the same panels the red lines represent parametric point estimates and confidence intervals for the bottom, middle and top tercile of the cutoff score distribution. Panel B presents reduced form specifications of the first stage, while Panels C and D are based on an "IV-type" specifications that analyze Baccalaureate grades and a dummy for having taken the test, respectively.

Figure 6: All between-track cutoffs



Note: All panels are based on 2001-2003 data, and restrict observations to individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the average transition score of the peers students encounter at school; in panels C and D it is the standard deviation of the transition score in students' schools; and in Panels E and F it is the Baccalaureate exam grade. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Figure 7: Between-track cutoffs that occur within schools



Note: All panels are based on 2001-2003 data, and restrict observations to: i) between-track cutoffs that occur within the same school, and ii) individuals with transition scores within 0.2 points of a cutoff (normalized to zero in all cases). The left hand side panels plot (0.01 point) transition score cell means of the dependent variable. The right hand side panels plot analogous means of residuals from a regression of the dependent variable on a linear trend in the transition score and a series of cutoff fixed effects. The dependent variable in panels A and B is the average transition score of the peers students encounter at school; in panels C and D it is the standard deviation of the transition score in students' schools; and in Panels E and F it is the Baccalaureate exam grade. The solid lines are fitted values of regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.

Table 1: Descriptive statistics at the individual, school, and town level

	High school admission cohort														
	2001					2002					2003				
	Mean	S.Dev.	Min	Max	N	Mean	S.Dev.	Min	Max	N	Mean	S.Dev.	Min	Max	N
Panel A: Individual level data															
Transition grade	7.68	0.94	5.18	10	107,812	7.87	0.86	5.17	10	110,912	7.96	0.97	5.13	10	115,413
Baccalaureate taken	0.847	0.360	0	1	107,812	0.822	0.383	0	1	110,912	0.809	0.393	0	1	115,413
Baccalaureate grade	8.31	0.93	5.1	10	87,410	8.28	0.95	5.18	10	85,946	8.51	0.88	5.27	10	84,110
Trans. grade, Math students	8.56	0.76	5.45	10.00	24,257	8.65	0.66	5.37	10.00	25,630	8.81	0.74	5.36	10.00	27,035
Trans. grade, Science students	7.92	0.71	5.47	9.94	12,345	8.13	0.67	5.46	9.83	12,664	8.25	0.79	5.13	9.99	12,439
Trans. grade, Technical students	7.13	0.69	5.18	9.89	55,970	7.36	0.66	5.17	9.72	57,080	7.35	0.73	5.19	9.94	56,906
Trans. grade, Language students	8.13	0.72	5.52	9.98	10,770	8.30	0.67	5.32	9.90	10,736	8.39	0.73	5.28	9.96	13,777
Trans. grade, Soc. Sci. students	7.97	0.73	5.76	9.90	4,470	8.19	0.64	5.75	9.82	4,802	8.32	0.67	5.35	9.89	5,256
Panel B: School level data															
9th grade enrollment	118.8	64.4	2	352	797	140.6	63.1	9	420	789	144.1	69.2	3	432	801
Average transition grade	7.62	0.82	5.9	9.52	797	7.80	0.77	6.03	9.44	789	7.78	0.86	5.78	9.63	801
Panel C: Town level data															
9th grade enrollment	804.6	849.6	62	3,819	134	827.7	875.5	60	4,088	134	854.9	919.5	45	4,169	135
No. of schools	5.9	6.0	2	29	134	5.9	5.8	2	28	134	5.9	5.9	2	29	135
No. of tracks	34.7	36.5	3	166	134	30.4	32.1	3	146	134	29.3	31.2	2	142	135
No. of Math tracks	7.8	8.7	0	48	134	7.0	7.7	0	42	134	6.8	7.4	0	37	135
No. of Science tracks	4.1	4.4	0	21	134	3.5	3.9	0	24	134	3.2	3.6	0	20	135
No. of Technology tracks	17.9	20.6	1	96	134	15.6	17.8	1	91	134	14.5	16.7	1	76	135
No. of Language tracks	3.5	3.5	0	17	134	3.0	3.0	0	15	134	3.6	3.7	0	19	135
No. of Social Science tracks	1.5	1.6	0	7	134	1.3	0.2	0	6	134	1.3	1.5	0	7	135

Note: These statistics are based on data covering the universe of Romanian high schools with two exceptions (both of which are further discussed in Section II): i) Students and schools located in the towns that make up Bucharest, and ii) students and schools located in towns that contain a single school.

Table 2: All between-school cutoffs

	Full sample	Students with scores within 0.5 points of cutoff:			
			and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. var.: Avg. school-level transition grade					
1{Trans. grade≥Cutoff}	0.088 ***	0.107 ***	0.145 ***	0.168 ***	0.255 ***
	(0.001)	(0.001)	(0.003)	(0.008)	(0.027)
Effect size	0.11	0.13	0.18	0.21	0.31
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.816	0.793	0.765	0.775	0.830
N	3,619,921	1,020,276	75,362	19,473	3,967
Panel B, Dep. var.: School-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	0.009 ***	-0.005 ***	-0.006 ***	-0.009 ***	-0.021 ***
	(0.000)	(0.000)	(0.001)	(0.002)	(0.008)
Effect size	0.06	-0.03	-0.04	-0.06	-0.13
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.294	0.340	0.562	0.585	0.709
N	3,619,921	1,020,276	75,362	19,473	3,967
Panel C, Dep. var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	0.036 ***	0.016 ***	0.025 ***	0.046 ***	0.043
	(0.002)	(0.003)	(0.008)	(0.018)	(0.074)
Effect size	0.04	0.02	0.03	0.05	0.05
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.566	0.470	0.500	0.567	0.830
N	2,553,235	680,773	46,013	11,603	2,296
Panel D, Dep. var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.423 ***	0.137 ***	0.173 ***	0.239 ***	0.110
	(0.019)	(0.025)	(0.054)	(0.091)	(0.188)
Effect size	0.36	0.12	0.15	0.20	0.09
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	2,553,235	680,773	46,013	11,603	2,296
Panel E, Dep. var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	-0.005 ***	0.003 *	-0.005	-0.004	-0.013
	(0.001)	(0.002)	(0.004)	(0.009)	(0.025)
Effect size	-0.01	0.01	-0.01	-0.01	-0.03
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.057	0.061	0.136	0.222	0.549
N	3,619,921	1,020,276	75,362	19,473	3,967

Note: All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by a transition score that is greater than or equal to the cutoff; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 3: Top tercile of between-school cutoffs by transition score at the cutoff

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. var.: Avg. school-level transition grade					
1{Trans. grade≥Cutoff}	0.216 ***	0.136 ***	0.100 ***	0.114 ***	0.346 ***
	(0.002)	(0.002)	(0.006)	(0.015)	(0.060)
Effect size	0.27	0.17	0.12	0.14	0.43
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.843	0.636	0.535	0.562	0.683
N	1,216,766	403,039	22,311	5,580	1,116
Panel B, Dep. var.: School-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	-0.006 ***	-0.007 ***	-0.010 ***	-0.004	-0.036 **
	(0.001)	(0.001)	(0.002)	(0.005)	(0.018)
Effect size	-0.04	-0.04	-0.06	-0.03	-0.23
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.203	0.300	0.431	0.490	0.630
N	1,216,766	403,039	22,311	5,580	1,116
Panel C, Dep. var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	0.098 ***	0.025 ***	0.030 **	0.066 **	0.303
	(0.003)	(0.004)	(0.012)	(0.030)	(0.198)
Effect size	0.10	0.03	0.03	0.07	0.32
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.568	0.343	0.308	0.376	0.713
N	865,905	316,209	17,580	4,411	864
Panel D, Dep. var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.485 ***	0.186 ***	0.307 **	0.553 **	1.44 ***
	(0.016)	(0.032)	(0.121)	(0.252)	(1.040)
Effect size	0.41	0.16	0.26	0.47	1.23
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	865,905	316,209	17,580	4,411	864
Panel E, Dep. var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	-0.002	0.002	-0.007	-0.018	-0.130 *
	(0.002)	(0.002)	(0.007)	(0.017)	(0.066)
Effect size	0.00	0.00	-0.02	-0.04	-0.30
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.054	0.027	0.060	0.134	0.476
N	1,216,766	403,039	22,311	5,580	1,116

Note: The sample covered in this table is obtained by ordering all cutoffs by the score at which they occur, and then selecting only the top third. All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 4: Bottom tercile of between-school cutoffs by transition score at the cutoff

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. var.: Avg. school-level transition grade					
1{Trans. grade≥Cutoff}	-0.132 ***	0.073 ***	0.077 ***	0.043 ***	0.022
	(0.003)	(0.003)	(0.006)	(0.013)	(0.041)
Effect size	-0.16	0.09	0.10	0.05	0.03
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.800	0.387	0.422	0.494	0.648
N	1,215,121	219,303	25,021	6,822	1,434
Panel B, Dep. var.: School-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	-0.007 ***	-0.001	-0.013 ***	-0.031 ***	-0.049 ***
	(0.001)	(0.001)	(0.002)	(0.005)	(0.013)
Effect size	-0.04	-0.01	-0.08	-0.19	-0.31
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.312	0.331	0.520	0.574	0.702
N	1,215,121	219,303	25,021	6,822	1,434
Panel C, Dep. var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	-0.124 ***	0.016 *	0.013	0.012	-0.069
	(0.008)	(0.009)	(0.017)	(0.038)	(0.201)
Effect size	-0.13	0.02	0.01	0.01	-0.07
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.566	0.191	0.292	0.431	0.802
N	845,422	108,920	10,518	2,751	560
Panel D, Dep. var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.921	0.205 *	0.125	0.160	-0.873
	(0.062)	(0.107)	(0.162)	(0.495)	(3.057)
Effect size	0.79	0.17	0.11	0.14	-0.74
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	845,422	108,920	10,518	2,751	560
Panel E, Dep. var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	0.015	0.008 *	0.006	0.007	0.022
	(0.004)	(0.004)	(0.008)	(0.016)	(0.039)
Effect size	0.03	0.02	0.01	0.02	0.05
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.060	0.051	0.127	0.221	0.562
N	1,215,121	219,303	25,021	6,822	1,434

Note: The sample covered in this table is obtained by ordering all cutoffs by the score at which they occur, and then selecting only the bottom third. All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 5: Top and bottom between-school cutoffs in markets with 3 or more schools

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A: Top cutoffs, towns with 3 or more schools; Dep. var.: Avg. school trans. grade					
1{Grade≥Cutoff}	0.284 ***	0.179 ***	0.198 ***	0.225 ***	0.251 ***
	(0.003)	(0.005)	(0.012)	(0.026)	(0.080)
Effect size	0.35	0.22	0.24	0.28	0.31
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.802	0.700	0.693	0.703	0.807
N	300,498	95,506	10,225	2,568	514
Panel B: Top cutoffs, towns with 3 or more schools; Dep. var.: Ind. level Bacc. grade					
Avg. school trans. grade	0.238 ***	0.042	0.319 **	0.388 **	0.747
	(0.018)	(0.049)	(0.109)	(0.197)	(0.711)
Effect size	0.20	0.04	0.27	0.33	0.64
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	210,545	73,961	7,526	1,899	301
Panel C: Bottom cutoffs, towns with 3 or more schools, Dep. var.: Avg. school trans. grad					
1{Grade≥Cutoff}	0.046 ***	0.182 ***	0.209 ***	0.122 ***	0.059
	(0.005)	(0.007)	(0.010)	(0.018)	(0.062)
Effect size	0.06	0.22	0.26	0.15	0.07
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.785	0.722	0.701	0.721	
N	300,498	33,476	7,577	2,280	513
Panel D: Bottom cutoffs, towns with 3 or more schools; Dep. var.: Ind. level Bacc. grade					
Avg. school trans. grade	3.370 ***	0.141	0.216	-0.310	0.188
	(1.190)	(0.101)	(0.115)	(0.308)	(0.938)
Effect size	2.87	0.12	0.18	-0.26	0.16
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	210,629	78,719	7,111	1,780	356

Note: All regressions are clustered at the student level and include cutoff fixed effects. Panels A and B refer to the top cutoffs in towns that contain at least three schools; panels C and D to the bottom ones. Panels A and C present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panels B and D present an IV-type specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A and C the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in panels B and D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 6: All between-track cutoffs

	Full sample	Students with scores within 0.5 points of cutoff:			
			and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. var.: Avg. track-level transition grade					
1{Trans. grade≥Cutoff}	0.078***	0.073***	0.105***	0.142***	0.222***
	(0.001)	(0.001)	(0.002)	(0.004)	(0.012)
Effect size	0.10	0.09	0.13	0.18	0.27
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.868	0.855	0.838	0.846	0.895
N	7,814,345	2,391,912	213,947	55,626	11,280
Panel B, Dep. Var.: Track-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	0.014***	-0.004***	-0.010***	-0.012***	-0.022***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)
Effect size	0.09	-0.03	-0.06	-0.08	-0.14
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.303	0.373	0.557	0.632	0.772
N	7,814,345	2,391,912	213,947	55,626	11,280
Panel C, Dep. Var.: Individual level Bacc. grade					
b	0.045***	0.011***	0.026***	0.046***	0.061*
	(0.001)	(0.002)	(0.004)	(0.009)	(0.037)
Effect size	0.05	0.01	0.03	0.05	0.06
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.566	0.486	0.520	0.581	0.826
N	5,503,583	1,698,597	144,828	37,099	7,440
Panel D, Dep. Var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.675***	0.144***	0.245***	0.345***	0.245
	(0.021)	(0.025)	(0.048)	(0.069)	(0.152)
Effect size	0.58	0.12	0.21	0.29	0.21
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	5,503,583	1,698,597	144,828	37,099	7,440
Panel E, Dep. Var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	-0.011***	0.000	-0.003	-0.012**	-0.012
	(0.001)	(0.001)	(0.002)	(0.005)	(0.014)
Effect size	-0.03	0.00	-0.01	-0.03	-0.03
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.058	0.061	0.134	0.215	0.557
N	7,814,345	2,391,912	213,947	55,626	11,280

Note: All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 7: Top tercile of between-track cutoffs

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. Var.: Avg. track-level transition grade					
1{Trans. grade≥Cutoff}	0.088 ***	0.066 ***	0.082 ***	0.093 ***	0.232 ***
	(0.002)	(0.001)	(0.003)	(0.008)	(0.030)
Effect size	0.11	0.08	0.10	0.11	0.29
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.881	0.647	0.522	0.55	0.714
N	2,749,530	858,591	60,417	15,140	3,028
Panel B, Dep. Var.: School-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	-0.002 ***	-0.004 ***	-0.008 ***	-0.016 ***	-0.040 ***
	(0.001)	(0.000)	(0.001)	(0.003)	(0.010)
Effect size	-0.01	-0.03	-0.05	-0.10	-0.25
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.247	0.283	0.414	0.475	0.676
N	2,749,530	858,591	60,417	15,140	3,028
Panel C, Dep. Var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	0.041 ***	0.007 **	0.018 ***	0.057 ***	0.149 **
	(0.003)	(0.003)	(0.006)	(0.015)	(0.063)
Effect size	0.04	0.01	0.02	0.06	0.16
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.566	0.321	0.299	0.358	0.826
N	1,948,172	696,218	49,214	12,381	2,458
Panel D, Dep. Var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.441 ***	0.115 ***	0.225 ***	0.589 ***	0.648 **
	(0.035)	(0.044)	(0.073)	(0.156)	(0.289)
Effect size	0.38	0.10	0.19	0.50	0.55
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	1,948,172	696,218	49,214	12,381	2,458
Panel E, Dep. Var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	-0.006 ***	-0.006 ***	-0.009 ***	-0.021 **	0.016
	(0.002)	(0.002)	(0.002)	(0.005)	(0.012)
Effect size	-0.01	-0.01	-0.02	-0.05	0.04
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.057	0.031	0.081	0.149	0.521
N	2,749,530	858,591	60,417	15,140	3,028

Note: The sample covered in this table is obtained by ordering all between-track cutoffs by the score at which they occur, and then selecting only the top third. All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 8: Bottom tercile of between-track cutoffs

	Full sample	Students with scores within 0.5 points of cutoff:			
			and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. Var.: Avg. track-level transition grade					
1{Trans. grade≥Cutoff}	-0.017 ***	0.070 ***	0.096 ***	0.115 ***	0.135 ***
	(0.002)	(0.001)	(0.003)	(0.006)	(0.017)
Effect size	-0.02	0.09	0.12	0.14	0.17
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.851	0.573	0.566	0.595	0.726
N	2,535,989	636,907	78,013	21,347	4,422
Panel B, Dep. Var.: School-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	0.002 ***	-0.002 ***	-0.012 ***	-0.015 ***	-0.023 ***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.006)
Effect size	0.01	-0.01	-0.08	-0.09	-0.14
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.326	0.406	0.566	0.644	0.772
N	2,535,989	636,893	78,013	21,347	4,422
Panel C, Dep. Var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	-0.071 ***	0.018 ***	0.024 ***	0.019	-0.052
	(0.004)	(0.005)	(0.009)	(0.018)	(0.073)
Effect size	-0.07	0.02	0.03	0.02	-0.05
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.564	0.242	0.349	0.453	0.817
N	1,771,628	358,070	40,852	10,928	2,191
Panel D, Dep. Var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	2.050 ***	0.250 ***	0.219 ***	0.14	-0.283
	(0.126)	(0.063)	(0.081)	(0.135)	(0.392)
Effect size	1.75	0.21	0.19	0.12	-0.24
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	1,771,628	358,070	40,852	10,928	2,191
Panel E, Dep. Var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	0.004 **	0.003	0.001	-0.013	-0.009 **
	(0.002)	(0.001)	(0.005)	(0.009)	(0.022)
Effect size	0.01	0.01	0.00	-0.03	-0.02
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.062	0.048	0.092	0.205	0.546
N	2,535,989	636,907	78,013	21,347	4,422

Note: The sample covered in this table is obtained by ordering all between-track cutoffs by the score at which they occur, and then selecting only the bottom third. All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 9: Between track cutoffs that occur within the same school

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A, Dep. var.: Track-level avg. transition grade					
1{Trans. grade≥Cutoff}	0.086 ***	0.087 ***	0.139 ***	0.198 ***	0.247 ***
	(0.002)	(0.001)	(0.003)	(0.006)	(0.019)
Effect size	0.11	0.11	0.17	0.24	0.30
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.857	0.896	0.877	0.883	0.932
N	1,437,640	486,424	84,805	22,761	4,805
Panel B, Dep. Var.: Track-level std. dev. in transition grades					
1{Trans. grade≥Cutoff}	0.021 ***	0.004 ***	0.003 ***	0.006 ***	0.007
	(0.001)	(0.001)	(0.001)	(0.002)	(0.007)
Effect size	0.13	0.03	0.02	0.04	0.04
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.563	0.641	0.723	0.775	0.877
N	1,437,640	486,424	84,805	22,761	4,805
Panel C, Dep. Var.: Individual level Bacc. grade					
1{Trans. grade≥Cutoff}	0.017 ***	0.008 **	0.019 **	0.043 **	0.031
	(0.003)	(0.004)	(0.007)	(0.015)	(0.066)
Effect size	0.02	0.01	0.02	0.05	0.03
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.530	0.490	0.546	0.639	0.882
N	1,097,092	364,425	59,333	15,661	3,282
Panel D, Dep. Var.: Individual level Bacc. grade; IV specification					
Avg. school trans. grade	0.229 ***	0.097 ***	0.141 ***	0.243 ***	0.176
	(0.040)	(0.043)	(0.552)	(0.086)	(0.300)
Effect size	0.20	0.08	0.12	0.21	0.15
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	1,097,092	364,425	59,333	15,661	3,282
Panel E, Dep. Var.: Individual level Bacc. taken dummy					
1{Trans. grade≥Cutoff}	-0.010 ***	-0.003	-0.009 *	-0.024 ***	-0.021
	(0.002)	(0.002)	(0.005)	(0.008)	(0.003)
Effect size	-0.02	-0.01	-0.02	-0.06	-0.05
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.079	0.093	0.169	0.274	0.666
N	1,437,640	486,424	84,805	22,761	4,805

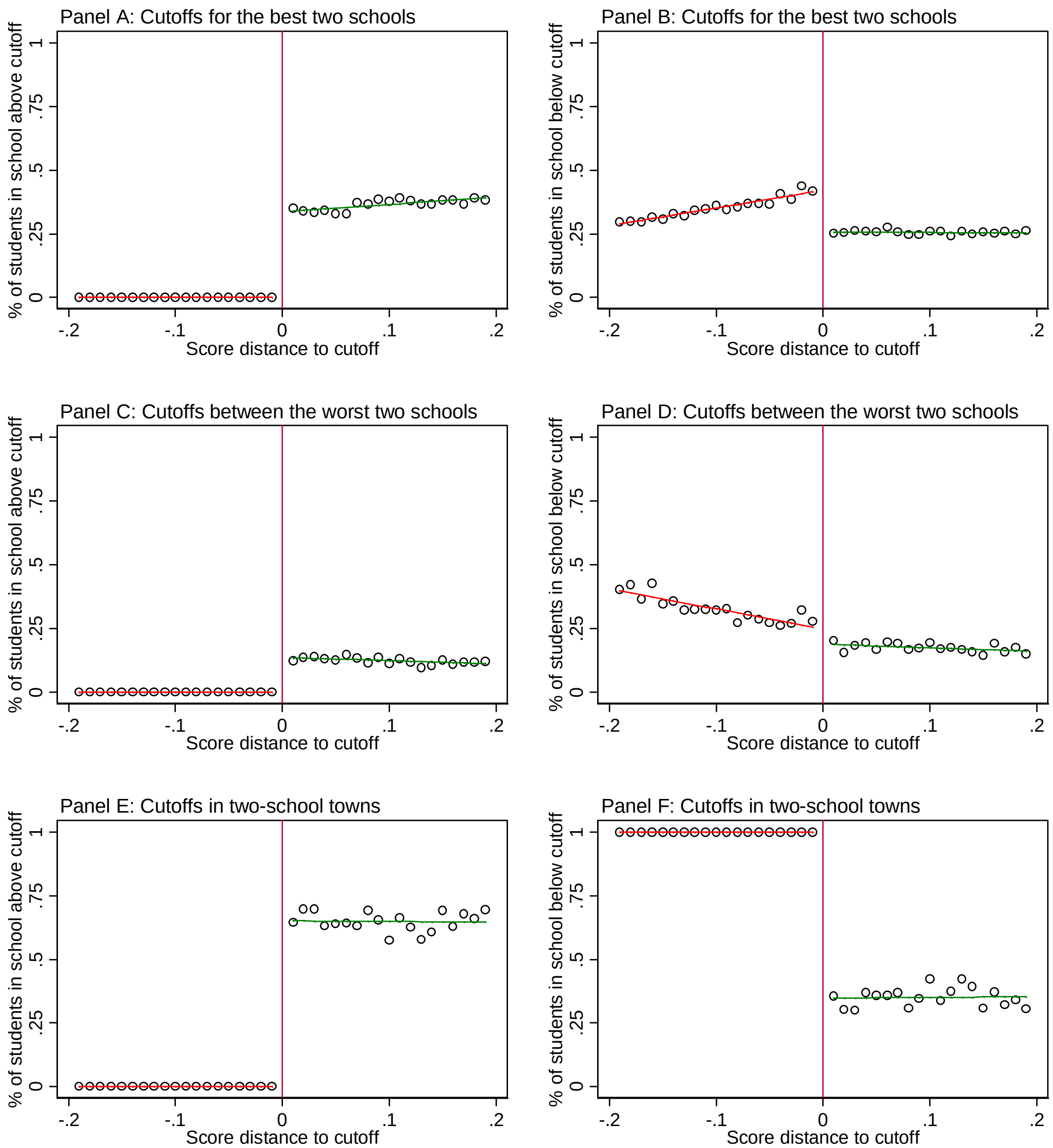
Note: All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by transition score is greater than or equal to zero; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Table 10: Between school cutoffs in towns with two schools.

	Full sample	Students with scores within 0.5 points of cutoff:	and within 20 ranks	and within 5 ranks	and within 1 rank
	(1)	(2)	(3)	(4)	(5)
Panel A: Avg. school grade; reduced form					
1{Grade≥Cutoff}	0.614 ***	0.567 ***	0.548 ***	0.517 ***	0.560 ***
	(0.009)	(0.015)	(0.019)	(0.031)	(0.081)
Effect size	0.76	0.70	0.68	0.64	0.69
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.710	0.666	0.643	0.630	0.710
N	33,236	12,076	5,197	1,421	292
Panel B: Std. dev.; reduced form					
1{Grade≥Cutoff}	0.080 ***	0.060 ***	0.061 ***	0.049 ***	0.046 **
	(0.003)	(0.004)	(0.005)	(0.008)	(0.021)
Effect size	0.50	0.38	0.38	0.31	0.29
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.669	0.634	0.644	0.659	0.768
N	33,236	12,076	5,197	1,421	292
Panel C: Bacc. grade; reduced form					
1{Grade≥Cutoff}	0.177 ***	0.161 ***	0.158 ***	0.105 *	0.148
	(0.019)	(0.031)	(0.040)	(0.065)	(0.191)
Effect size	0.19	0.17	0.17	0.11	0.16
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.565	0.415	0.386	0.474	0.828
N	23,416	7,607	3,063	815	167
Panel D: Bacc. grade; "IV" specification					
Average school grade	0.271 ***	0.258 ***	0.266 ***	0.191 *	0.223
	(0.029)	(0.048)	(0.067)	(0.117)	(0.291)
Effect size	0.23	0.22	0.23	0.16	0.19
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
N	23,416	7,607	3,063	815	167
Panel E: Bacc. taken; reduced form					
1{Grade≥Cutoff}	0.023 **	0.034 **	0.033	0.029	0.135 *
	(0.010)	(0.017)	(0.021)	(0.033)	(0.072)
Effect size	0.05	0.08	0.08	0.07	0.31
Quadratic in grade dist.	Yes	Yes	Yes	Yes	No
R^2	0.101	0.090	0.116	0.205	0.591
N	33,236	12,076	5,197	1,421	292

Note: All regressions are clustered at the student level and include cutoff fixed effects. Panels A, B, C, and E present reduced form specifications where the key independent variable is a dummy for whether a student's transition score is greater than or equal to the cutoff (normalized to zero); Panel D presents an "IV" specification where the school-level average transition score students experience is instrumented by a dummy for whether their own transition score is greater than or equal to zero. In panels A, B, C, and E the effect size indicates the proportion change in the dependent variable (measured in standard deviations) induced by a transition score that is greater than or equal to the cutoff; in Panel D it describes the change induced by a one standard deviation increase in schools' average transition score. The regressions in columns 1-4 include a quadratic in students' transition score distance to the cutoff score; Column 5 includes only a linear term.

Figure A.1: Top and bottom cutoffs in towns with 3 or more schools; 2-school towns



Note: Panels A and B describe cutoffs that determine access to the best school in towns that contain at least three schools. Panels C and D refer to the lowest cutoffs in such towns. Panels E and F describe the cutoffs in two-school towns. All panels are restricted to individuals with a transition score within 0.2 points of a cutoff. The left hand panels plot (0.01 point) transition cell means of the proportion of students who attend the school above the cutoff; the right hand side ones the proportion of students who enroll in the school below. The solid lines plot fitted values of residuals from regressions of the dependent variable on a linear trend in the transition score, estimated separately on each side of the cutoff.