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Access to Elite Education, Wage Premium, and Social Mobility: The Truth and Illusion of China's College Entrance Exam*

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Abstract

This paper studies the returns to elite education and the implications of elite education on elite formation and social mobility, exploiting an open elite education recruitment system – China's College Entrance Exam. We conduct annual national surveys of around 40,000 college graduates during 2010-2015 to collect their scores at the college entrance exam, job outcomes, and other individual and family characteristics. Exploiting a discontinuity in elite university eligibility around the cutoff scores, we find a sizable wage premium of elite education but elite education eligibility does not necessarily promise one's entry into the elite class (measured by occupation, industry and other non-wage benefits). While elite education eligibility does improve one's income rank, it does not alter the intergenerational link between parents' status and children's status. We also find that the wage premium is more consistent with the role of university-related networks and signaling than that of human capital.

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1 Introduction

Access to education, especially elite education, is believed to be one of the most important channels for elite formation and social mobility in modern societies. For instance, the works of Pierre Bourdieu emphasize how elite education contributes to the maintenance and reproduction of class inequalities, which led to a sociological literature on the social consequences of elite education institutions (Bourdieu and Passeron 1977; Bourdieu 1988). In economics, while there exists a burgeoning literature estimating the economic returns to selective education (e.g., Dale and Krueger 2002, 2011; Black and Smith 2004; and Hoekstra 2009; Hastings, Neilson and Zimmerman 2013; Anelli 2016), few studies investigate how the access to elite education affects elite formation and social mobility.[1] In this paper, we not only estimate the returns to elite education but also attempt to understand the implications of elite education on elite formation and social mobility using a large-scale dataset we collected ourselves in China.

Every year, around 10 million students in China take the National College Entrance Exam – the largest standardized test in the world – in order to get admitted by around 2,300 colleges of different tiers. The exam not only determines whether a young person will attend a Chinese university, but also which one – attending an elite university is perceived to have a crucial bearing on career prospects or to provide a ticket to the elite class (Wong 2012). This perception is not without controversy: due to the importance of family background for the labor market, some argue that it is illusion rather than reality that a better exam performance can provide upward mobility and change one's fate (Bregnbaek 2016).

The exam-based admission of Chinese colleges provides us a Regression Discontinuity (RD) type laboratory to understand the role of elite education. We refer to elite universities as those designated by the Chinese government as the first-tier universities across all provinces in admission. Elite universities have a cutoff score, and students just above and below the cutoff score are similar in most characteristics, but those above are eligible to apply to elite universities. Thus, we could simply compare outcomes (income and other variables) of students who are just below and above the cutoff score, which solves the typical empirical issue that students entering better universities may be different in ability, family background and other characteristics. We should note that even though the score is the main criterion, it is possible that some students with scores below the cutoff get accepted with extra points from minor criteria such as talents in art and sports. It is also possible that some with scores above the cutoff do not go to elite universities since the final admission decision is also

[1] One exception is a concurrent study on the US. (Chetty et al. 2017). We summarize our difference from theirs when discussing our contribution to related literature.

affected by competition and students' preference of majors and location (see Section 2 for discussions). Hence, we have a fuzzy design with a discontinuity in *elite university eligibility* around the cutoff scores.

Because there are no existing data we could draw on, for the purpose of our study, we self-collected systematic data on exam performance and individual outcomes. During 2010-2015, we designed and conducted annual surveys of college graduates, and collected a total sample of 40,916 students from 90 universities.[2] In our survey, we collected the students' scores of the college entrance exam, their first job outcomes as well as detailed individual and parental characteristics. With these data, we are able to examine outcomes of students with scores close to the cutoffs for elite universities.

We find that elite education in China has a sizable return. Our baseline analysis focuses on around 10,335 individuals within a bandwidth of 20 points (out of a maximum of 750 points from four subjects) around the elite university cutoff scores, which is close to the optimal bandwidth (21) using the method by Imbens-Kalyanaraman (2011). There is indeed a clear discontinuity around the cutoff: scores above the elite university cutoffs raise the admission probability by 16 percentage points, about 75% of the mean probability. In contrast, there is no such pattern with respect to (fake) placebo cutoffs; neither is there any discontinuity for our balance tests with all individual and family characteristics. Exam scores above the cutoffs are associated with a wage premium of 150 RMB (USD 25) per month for a fresh college graduate, which is around 6% of the median monthly wage (2,500 RMB). These together imply an estimate of the monthly wage premium of elite education of 1,000 RMB (USD 160), or about 40% of the median monthly wage. Our results are robust to alternative bandwidths and specifications of the running function.[3] To deal with the concern that wages are only observed for those who get job offers, we also present the bounds on the wage effect following the procedure proposed in Lee (2009) and find this concern is unlikely to invalidate our approach.

It is worth pointing out that scoring above the cutoff not only changes the probability of attending an elite university but also other dimensions regarding admission and college life. In our context, the choices of majors and the relative ranking of students in their college classes are particularly important. Within a university, different majors also have different admission scores depending on their popularity. Students often face a tradeoff between universities and majors, especially for those close to the cutoff. If they choose an elite university, they are less likely to major in popular fields because, when it is their turn,

[2]We use "college" and "university" interchangeably throughout the paper.

[3]For instance, Gelman and Imbens (2014) discuss why including higher-order polynomials might bias the estimates.

those majors may have already been all taken by higher score students. Moreover, those just above the cutoffs are likely to be the worse students within their college class. While these dimensions do not affect the internal validity of our empirical strategy (i.e., the wage premium of elite education is indeed a net outcome of different dimensions), they matter for the interpretation of our estimate on wage premium, as one may be only interested in the effect of elite education given everything else equal. When we control for major and relative class ranking in college, we find a marginally higher elite education wage premium. In other words, our baseline estimate is likely to be a conservative estimate of elite education premium.

Market income is only one measure of entering China's elite class, and there are other dimensions of being in the elite class that may not be easily monetized. Many of them are associated with the provision of public goods or perks from government monopolies, such as getting into the banking industry, finding a job in a state-owned enterprise, and obtaining *hukou* (the right to live in a city and enjoy local public goods) of a well-funded municipal. We also design questions to capture job characteristics beyond wage. We construct a statistical measure to proxy elite class, namely the ratio between how many people hope to get into certain occupation (or industry, ownership) and how many actually get into it. The elite status captured by this ratio is consistent with both the general perception in China about elite class and also the elite class defined in the sociological literature (see Erikson and Goldthorpe (1992) for related studies across countries). We find that elite education eligibility does not increase the probability of entering an elite occupation, elite industry, elite ownership, living in an elite city, obtaining *hukou* or any other non-marketized benefit; in contrast, parental characteristics do. In sum, while the elite education eligibility is associated with a wage premium, we find no evidence that it necessarily implies one's entry into the elite club, defined by job characteristics.

A limitation of our study is that our survey design only allows us to investigate the wage of the first job for fresh college graduates and it is unclear how important these initial wages are later in life. To partially address this concern, we supplement our survey data with job histories of around 300,000 individuals from a major recruitment platform and document the importance of the first job for future outcomes.

How does elite education eligibility affect social mobility? The question has two dimensions. The first is whether elite education eligibility can lift one from a low-income status to a higher-income status. Not surprisingly, elite education eligibility increases wages and mobility in this aspect. Moreover, the comparison between the impact of being above the elite college cutoff score and that of having a rich parent helps us to better understand the degree of mobility created by the exam system in the first dimension. On average, the level-

up effect of elite education is large, moving child income rank up to families with parental income rank that is two quintiles higher. However, it cannot move an average child in the bottom quintile (parental) income group to the level of a child from the top quintile income group. For those students from families of the top 20% income level, even if they are not eligible for elite education, their probability of being in the top 20% income group is still higher than those eligible but come from less wealthy families.

The second dimension regards whether elite education eligibility can change the role family background (such as parental income) plays in determining the job market success of a person.[4] In theory, elite education eligibility can increase (or decrease) intergenerational mobility if the children with poorer (or richer) parents enjoy higher returns. Empirically, we find no evidence that the elite education eligibility alters intergenerational mobility, as the intergenerational income (or income rank) link is neutral to elite education eligibility.

Finally, we examine why elite education has a wage premium and consider three explanations: human capital, signaling, and social network. Little empirical evidence exists to disentangle them due to the challenge of measurement. Exploiting the richness of our survey data, we proxy them using as many variables as possible. In particular, the existence of national-level standardized tests in China allows us to have a reasonable proxy for human capital accumulated in college, and we find no evidence supporting the importance of human capital in explaining the elite premium. Instead, suggestive evidence appears consistent with the role of university-related networks and signaling.

Our findings contribute to several strands of literature. First, we add to studies estimating the economic returns to elite education mentioned above.[5] China, as the largest exam country in the world, provides an interesting case: there are nationally designated elite universities, and there are cutoff scores for college admissions of all elite universities as a group. Thus, we could estimate the effect with a large sample of elite colleges, which is in contrast to most of the existing literature. A few recent studies use the RD method to estimate the returns to elite education, but almost all these papers estimate the return of going to one or two specific colleges due to the nature that in most countries each college has its own admission criterion.[6]

[4]These two dimensions are similar to the definition of absolute mobility and relative mobility in Chetty et al. (2014).

[5]In the context of China, the 2010 wave of the present data has been used in Li et al. (2012), where they control for observables and also find a sizable wage premium of elite education. Our study exploits a different empirical strategy that allows us to compare students with similar ability.

[6]Using a RD strategy, Hoekstra (2009) studies the returns of one elite state university in the US, Anelli (2016) on one elite college in Italy focused on economics/business and Zimmerman (2016) on two elite colleges in Chile. In particular, Zimmerman (2016) shows that elite peers in two Chilean universities play an important role in explaining the probability of being a business elite. One exception is Hastings, Neilson and Zimmerman (2013) who investigate the returns by degree programs.

Second, because we designed our own survey and have information that is normally unavailable to researchers, we could study how elite education affects social mobility and shed light on the mechanisms for why elite education matters. Our findings on intergenerational mobility also add to the growing literature on intergenerational mobility in economics (e.g., Solon 1992; Chetty et al. 2014; Chen et al. 2015) and sociology (see Erikson and Goldthorpe 1992, 2002 for related studies). Our approach is complementary to Chetty et al. (2017), who examine how the parent-child income correlation varies across colleges in the US. Compared with their study, the advantage of our approach is that the RD design provides an identification strategy to evaluate elite colleges' causal effects on intergenerational mobility. However, the caveat of this approach is that the finding is by design local to those around the elite university cutoff. Different from their results in the US, we do not find that elite universities successfully "level the playing field" across students with different socioeconomic backgrounds. In our case, even within a university, students with richer parents still have higher earnings.

The College Entrance Exam is probably one of the most important institutions in China, affecting the lives of hundreds of millions of families. A legacy of the imperial exam institution that was used for over 1,300 years as an elite recruitment channel (Bai and Jia 2016), it gives hope to the Chinese people, especially those not so well-off. Probably due to the lack of data, there are not many economic accounts of such an important institution. To the best of our knowledge, ours is the first to systematically study the labor market consequences of the College Entrance Exam by collecting data on exam scores and exploiting the cutoffs in recruitment. Our research design and data can be used to study other social and political implications of elite education.

Section 2 discusses the background and data. Section 3 reports the results on elite university enrollment, after which Section 4 focuses on wage premium and other aspects of entry into the elite class. Section 5 centers on social mobility. Section 6 presents evidence on the mechanisms for the elite wage premium. Section 7 concludes the paper.

2 Background and Data

2.1 Elite Universities in China

A total of around 2,300 colleges were registered in 2010 in China and the quality of these colleges varies substantially.[7] All of them recruit students based on the score of the National

[7]See information from the Ministry of Education on different types of colleges: http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/s4960/201012/113594.html

College Entrance Exam, known as *Gaokao* in Chinese. They are categorized into four tiers based on quality and those belonging to a higher tier are afforded priority in admitting students. A university's tier can differ across provinces. For instance, a very top university belongs to the first-tier in all provinces whereas a middle-ranged university are only regarded as first-tier in certain provinces but not others.

In this paper, elite universities refer to those falling under the first tier in the recruitment process *across all provinces*. Out of all Chinese universities, 96 universities belong to this category in our study period. Our definition of elite universities heavily overlaps with two other definitions often used in the literature (e.g., Carnoy et al. 2013): the so-called Project-211 universities (an abbreviation of the top 100 universities in the 21st century) and the universities under the control of the central government (111 in total). More specifically, there are 26 elite universities defined by the national first-tier criterion in our survey: 25 of them belong to the Project-211 group and 21 are under the control of the central government. About 200 universities are locally first-tier universities (only for certain provinces), which we do not consider as elite since there are no clear cutoffs and they are of less prestige. The advantage of using the national first-tier to define elite universities is that they have clear cutoff scores. In recent years, due to college education expansion in China, over 75% of exam-takers can get college education. However, only around 5% of exam-takers can get into these elite universities. This ratio also varies greatly across provinces.[8]

It is worth noting that most universities, including all elite universities and second-tier universities (the focus of this study) are public. Private universities are not very developed in China and the existing ones are of low quality. Related to their public nature, these universities including both elite universities and second-tier universities charge similar tuition fees, roughly RMB 5,000 a year (USD 750).[9] Thus, in our study, we do not need to worry about tuition fees. In addition, elite universities are of a similar size as non-elite universities in our comparison group.

Another special institutional feature is that the graduation rates are very high across all universities in China, with a mean over 95%.[10] The college education system in China is known for being "strict entrance, easy out". So the probability in graduating varies little between elite and non-elite universities.

What make elite universities distinct from other universities? They clearly have more

[8]Spatial inequality in access to elite education is an important issue but not the focus of this study, since we would like to compare individuals similar to each other in most dimensions including province of origin.

[9]The lowest-quality ones may charge a higher tuition fee for those who score low in the exam but want a college degree, but they are not the focus of this study.

[10]The Beijing-based Mycos Institute estimated in 2011 that China's college dropout rate is 3%, while the Ministry of Education said that year that the rate is 0.75%.

resources and support from the government. For instance, the Project 211 universities account for only 5% in terms of the number of universities but 70% of all scientific research funds.[11] Naturally, they also attract very different students and teachers. We will present several university characteristics in our data.

2.2 The College Entrance Exam and Admission

The Admission Process In our study period, the admission process for most provinces is as follows. All students take the exam in early June in their residence province, which is written and graded by education authorities in their own province. Then, based on the distribution of the scores and provincial quotas assigned by the Ministry of Education, each province announces a cutoff score for each layer and each track (social or natural science).[12] With information of the cutoff scores, and also knowing their own scores, students fill their college preferences for each layer of universities (with universities and majors). Those above the elite college cutoff scores are *eligible* to apply for elite universities. Finally, universities take turn to recruit based on scores of the applicants. In equilibrium, the admission bars (lowest admission scores) for different elite universities are different depending on their popularity among students and competition. First-tier universities recruit first, and the second-tier universities start only after all first-tier universities finish. Once a student is admitted, he/she can either choose to go to this university, or decline it and give up admission to any university for the year.

Across provinces, there are two minor variants of the process: students in Beijing and Shanghai fill the applications before the exam takes place; students in a few provinces fill the applications after the exam but before knowing their scores. In all these cases, the cutoff point is *unknown before the exam*. Over time, the admission mechanism was transferring from the Boston Mechanism to one that is similar to the serial dictatorship mechanism in this period. Again, the exam score is the primary criteria under both mechanisms and the cutoff determines eligibility. Thus, our empirical strategy is valid despite these complexities.[13] As discussed next, we will compare students around the cutoff within a province-year-(social or natural science) track.

It is true that some high school students choose to go abroad (especially to the U.S.)

[11] See the information from the Ministry of Education: http://www.moe.edu.cn/moe_879/moe_207/moe_235/moe_315/tnull_1469.html.

[12] The track was determined in the end of the first year of high school and is exogenous to college admission.

[13] These variations can have different implications on matching quality. For example, Chen and Kesten (2016) provide an interesting theoretical analysis on the serial dictatorship mechanism. But these variants are not essential for our research question, as long as students around the cutoff are comparable for a given mechanism.

for college. However, this possibility is unlikely to be critical for our study. First, the decision is usually made before the exam, partly to avoid the exam.[14] Even if one assumes that those who study abroad also take the exam, the share is small. In our study period, around 0.1 million Chinese students go to the U.S. for college each year, in contrast with around 10 million taking the exam.

Features that Matter for Our Research Design The exam system has two features that are important for our research design.

(i) The scores are only comparable within province-year-track. First, during 2010-2015, 27 out of 31 provinces (except for Jiangsu, Zhejiang, Shanghai and Hainan) use a scale of 0-750 points based on four subjects,[15] while the other four provinces use different scales. Second, the exam papers are written and graded by each province and a point in the score in different provinces means differently. Finally, and importantly, the cutoff points vary greatly across provinces, reflecting spatial inequality in access to elite education. Since we are interested in comparing individuals similar in all other dimensions except for exam scores, we will compare students within the same province. We collect the cutoff scores for each province-year-track from a website specialized for the exam: Gaokao.com. The cutoff score of elite universities for the 27 provinces using a scale of 0-750 points has a median of 540.

In our analysis, we will control for province-year-track fixed effects. This takes care of the four provinces using other exam scales. Our results are also robust to excluding them in the analysis.

(ii) Our regression-discontinuity is fuzzy. It is possible that some students with scores below the cutoff get accepted, due to extra scores from other characteristics such as being an ethnic minority, being a child of a military martyr, or having talents in sports, music and math etc. These extra scores are orthogonal to the actual scores from the exam.

It is also possible that some students with scores above the cutoff do not get into an elite university, mainly due to competitiveness of the exam cohort or personal choices. Some who apply to the first-tier may not be accepted due to the competitiveness of their selected universities and have to go to a non-elite university (that recruits after the first-

[14] See a report on "Applicants say they want to avoid the stress of studying for Chinese college entrance exam": http://www.chinadaily.com.cn/china/2013-06/07/content_16580626.htm

[15] For students in the natural science track, the four subjects are Chinese (with a maximum of 150 points), Mathematics (with a maximum of 150 points), a foreign language (mostly English, with a maximum of 150 points) and a combined subject of Physics, Chemistry and Biology (with a maximum of 110, 100, 90 respectively). For students in the social science track, the four subjects are Chinese (with a maximum of 150 points), Mathematics (with a maximum of 150 points), a foreign language (mostly English, with a maximum of 150 points) and a combined subject of Political Sciences, History and Geography (with a maximum of 100, 100, 100 respectively).

tier). Some who are eligible may choose not to apply due to personal choices. For instance, there is a tradeoff between major and university, especially for those around the cutoff score. Within a university, different majors also have different admission scores depending on their popularity. In recent years, economics (including finance and business), management and law are popular and hence more competitive in recruitment. If students with scores just at or slightly above the cutoff choose an elite university, they are less likely to major in popular fields because, when it is their time to select, those majors may have already been all taken by higher score students. Such argument also applies to preferences for other things such as location of the university.

We will consider these tradeoffs such as major, university location and relative ranking of students within college class in Section 3.2. We will also check whether personal strategic choice is a critical concern for our results in Section 3.3.

2.3 Chinese College Student Surveys (2010-2015)

The main challenge is to collect data on individual exam scores and link them to labor market outcomes. We designed and conducted an annual survey of college graduates for this purpose.

Survey Design and Implementation The data that we use are derived from six waves (2010-2015) of the Chinese College Student Survey (CCSS), conducted by the China Data Center of Tsinghua University directed by one of the authors, in collaboration with the Institute of Higher Education. We randomly selected 100 universities out of all universities in China by stratifying according to locations (Beijing, Shanghai, Tianjin, Northeastern China, Eastern China, Central China, and Western China) and tiers of colleges.[16] We used the number of students as weight for each college, meaning that colleges with more students are more likely to be selected. For the purpose our study, we oversampled elite colleges in order to get enough students near the elite school cutoff points.

Due to budget and management capacity, the survey was rolled out gradually with the number of selected colleges listed in Appendix Table A.1. The target was to have all 100 colleges participate in 2013. In practice, 65 colleges participated that year. Due to an unexpected budgetary cut since 2014, the survey became voluntary, and only those who are willing and can afford the survey (less than 20 colleges) did it in 2014 and 2015. Across the six years of survey, 90 colleges out of the 100 participated in at least one of the years.

[16] In the sampling process, we separate these three metropolises (Beijing, Shanghai, and Tianjin) from the rest of China because these cities have an extremely large concentration of colleges, especially top universities.

For each college, we trained a clerk in the student registration office, who helped us to randomly select a sample of students from the full roaster (population) of the graduating class. The survey was carried out in May and June each year during 2010-2015. In each of the participating colleges, we appointed two to three survey administrators, who normally are in charge of registration, teaching and student affairs. Every year, we trained these survey administrators from all over the country in Beijing with several days of intensive meetings. The survey in each college was administered as such. The administrators gathered all sampled students in a big classroom and let them fill in our paper survey form individually and anonymously. Students were told at the beginning that these surveys are for studying issues of the job market for college graduates, and none of their individual information is disclosed to any party. These filled forms were then coded and mailed to our Beijing office for data entry and cleaning.

Gathering all sampled students of a college in one location and at the same time contributes to a relatively high response rate. For the first year (2010), we targeted on selecting 400 students per college and a college on average collected a sample of 319 students, and our target was cut down to 200 in 2011-2013 due to the rising cost of the survey. For the last two years in 2014 and 2015, participating colleges agreed to survey 400 students in each college.[17] Across six sounds, the response rates for the elite universities and the rest are 71.5% and 76.9% respectively and the difference is not statistically significant (with a $p-$value of 0.26). These six rounds of survey give us a sample of 40,916 students in their graduating year. Among them, 34,733 reported complete information on their College Entrance Exam scores and the provinces where they took the exam.

Appendix Figure A.1(a) plots the spatial distribution of the 90 colleges by province. As expected, we surveyed more colleges from more developed regions such as Beijing and Shanghai where there are more colleges. Their students come from all provinces across China. Appendix Figure A.1(b) plots the number of students with exam scores by the provinces where they took the exam. Note that our strategy is not affected by the selection of colleges (see discussion below on selection and measurement concerns).

We designed the questionnaire collaboratively with experts in other disciplines (sociology and education). One of our aims in the surveys is to gather systematic data on individual performance at the College Entrance Exam and link it to labor market outcomes. Thus, we have detailed information on both. We also collected information on family background and college activities.

[17]Most of these volunteering colleges intended to collect a sample that is large enough to conduct some analysis of their own colleges.

Selection and Measurement Concerns We would like to be clear about sample selection and measurement issues in the survey. Our data on students are not a random sample of all Chinese college students for two reasons. First, we intentionally over-sampled elite colleges to capture enough students with elite education. In our sample, 26 out of the 90 universities belong to the elite tier, in contrast to 5% for the population. Second, due to the nature of voluntary participation for the survey, we do not have 100% compliance from colleges and students. Note that we do not need a random sample of all college students in our study. For our analysis, the identification assumption is that those around the cutoff scores are comparable in all dimensions before entering colleges except for their exam scores. We will check whether this is the case in the data.

Misreporting and in particular over-reporting exam scores is possible. However, this concern is unlikely to be critical for our study. Conceptually, we are focusing on exam scores close to cutoff scores for the elite universities. It is unclear why one would like to misreport performance just around the cutoff. We expect the concern of misreporting to matter more for the very low and very high scores, which are not our focus. Empirically, we also examine the density of reported exam scores. Moreover, a clear discontinuity in the first stage (on how exam scores affect the probability of going to an elite university) around the cutoff is also reassuring. For instance, Battistin et al. (2009) show that a fuzzy design can still be applied to identify the causal effect when the first stage discontinuity exists despite the presence of measurement error in the assignment variable for a subset of observations.

Misreporting of wages is also possible. We exclude 5% of the data (2.5% in both tails of the wage distribution) in our baseline. The results are robust to keeping all the data or excluding slightly different percentages of the tail sample. Another selection concern of wages is that we can observe wages for those who get job offers. To check the importance of this concern, we will examine the outcomes without job offers and will also estimate the bounds of the wage effect.

University Characteristics in Our Survey Appendix Table A.2 presents several university characteristics in our survey. Consistent with the discussion above, elite universities are slightly smaller in terms of the number of students but the difference is not significant. Elite universities clearly have more foreign students and a much larger share of students from other provinces – consistent with the fact that they attract talents from outside their own regions.

As expected, there is a big difference in terms of students' exam scores. The median score for the elite group is 590 whereas that for the non-elite group is 491. Moreover, the median first-job wage is about 35% higher for graduates of elite universities.

Data on the College Entrance Exam Scores We collected information on the total exam score and the score for each subject. Figure 1(a) plots the distribution of the difference between the reported total scores and the actual cutoffs for elite universities, where the cutoffs are defined for each province-year-track. The density is weighted by the sampling weight of universities. Among the 40 thousand graduating students in our surveys, 10,335 of them falls into the 20-point bandwidth centered at the cutoff score. We will use this 20-point bandwidth (roughly 5 points per subject), close to the optimal bandwidth from the Imbens-Kalyanaraman method (21), as our baseline bandwidth. 21% of the sample within the 20-point bandwidth have college education (reported in Table 1 of summary statistics). For consistency, the summary statistics reported on job outcomes also refer to this sample.

We take a closer look at the sample within the 20-point bandwidth in Figure 1(b). As shown, there is no significant discontinuity in the reported scores around the cutoff values, suggesting systematic misreporting around the cutoff is not an important concern. We further plot the distribution of scores for elite universities and non-elite universities separately in Figures 1(c)-(d). Consistent with the discussion in the background, the probability of entering an elite university with a score below cutoff is small, while the probability is high when score is above the cutoff. These figures also suggest that compliance is not 100%, and thus we have a fuzzy RD design.

Repeated Exam Takers Due to the importance of the exam, some high school students take it more than once to improve their scores. The share of repeated exam-takers is 30% in our sample of a 20-point bandwidth. In Section 3, we find that there is no discontinuity in the probability of being a repeated exam-taker around the cutoff. Moreover, our results are robust to restricting the sample to the first-time exam-takers.

Data on University, Major and College Academic Performance The survey also covers information on 13 majors broadly defined. We categorize them into three groups: STEM (science, engineering, agriculture, medicine and college), Economics (including finance and business)-Law-Management, and Humanity (philosophy, literature, history, art). As shown in Table 1, they account for 65%, 24%, and 10% of the students respectively.

The survey also includes questions on the activities and performance of students in college. We will use these data to shed some light on what elite education brings to students. For example, performance at the national-level standardized tests in college provides us some information on human capital acquired in college. In addition, we also ask their perception about their relative ranking within their college class. We will also examine how it affects our finding on wage premium.

Data on Job Outcomes Our surveys are conducted in May and June, the last two months in college for the graduating class. Thus, most of them already have a plan after graduation. Around 50% of the sample report the best monthly wage offer they get (around 74% of the sample searched for jobs). The mean and median monthly wage are 2,733 and 2,500 RMB respectively.

We ask detailed information on job location, industry, occupation, and employer ownership, which will be used for us to understand what drive the wage premium. Column (1) of Table A.3 presents the distributions of occupation and industry. As shown, the top two occupations are professionals (49%) and clerks (28%); the top two industries are manufacturing (including construction and mining, 25%) and IT broadly defined (15%, including information, computer and software industry).

A limitation of our survey is that we cannot track an individual once he or she is on the labor market. However, the importance of the first job in lifetime earnings has been documented by recent studies using administrative data. For instance, Carr and Wiemers (2016) show a large rank-rank correlation between the first-job wage and that in the future career. No similar administrative data with job histories are available in China. We collect job histories of around 300,000 individuals with wages from a major job search platform (zhaopin.com) and examine the importance of the first job for future outcomes in terms of wages and elite status of the industry, occupation and ownership.

Data on Parental Characteristics Our survey covers detailed personal and family characteristics including age, gender, residency, parents' economic and political status etc. We will check whether students are similar in these characteristics around the cutoffs.

With information on parents, we are also able to link parents' income and job characteristics (occupation, industry and ownership) with children's income and job characteristics. We expect to see intergenerational links in income and job characteristics. Our interest is to examine whether this intergenerational link gets altered by the exam performance (and elite education). Related to the literature on intergenerational mobility, we employ both a rank-rank strategy (examining how the parent income rank affect child wage rank) and a log-log strategy (estimating the correlation between log parental income and log child income).

3 Exam Scores and Access to Elite Education

We present the impact of exam scores on access to elite education in Section 3.1, with balance tests of individual and family characteristics. We turn to the possible impacts on other dimensions such as major in Section 3.2 and discuss whether strategic choice is a

critical concern in Section 3.3.

3.1 The Impact on Access to Elite University

To examine how an individual's exam score affects elite university enrollment, we use the following specification:

$$EliteUniv_{i,p,y,tr} = \alpha_E 1(Score_i \geq Cut_{p,y,tr}) + \theta_1 f(Score_i - Cut_{p,y,tr}) + \theta_2 f(Score_i - Cut_{p,y,tr}) \times 1 + \lambda_{p,y,tr} + \varepsilon_{i,p,y,tr}, \quad (1)$$

where $EliteUniv_{i,p,y,tr}$ is a dummy indicating whether individual i in province p, year y and (natural or social science) track tr attends an elite university. $Score_i$ indicates individual i's exam score. The cutoff score for elite universities ($Cut_{p,y,tr}$) varies by province-year-track.

We include a function $f(Score_i - Cut_{p,y,tr})$ for the running variable $(Score_i - Cut_{p,y,tr})$, namely the distance between a student's score and the cutoff score To make sure our results are not driven by certain functional form of f, we employ both the local linear non-parametric method and the parametric method for this function. In the parametric case, we also allow the function to differ across the cutoff score by including the linear-interaction or quadratic-interaction terms between $(Score_i - Cut_{p,y,tr})$ and $1(Score_i \geq Cut_{p,y,tr})$, and control for province-year-track fixed effects ($\lambda_{p,y,tr}$). All standard errors are clustered at the university level in the presented results, which are also robust to clustering at the province level or the score level.

Not surprisingly, there is an obvious discontinuous jump in the probability of admission to elite universities around the cutoff score. Figure 2(a) plots the probability of attending an elite university against the running variable by each point of the score in the raw data, focusing on the range of 20 points below and above the cutoff. The figure shows a notable discontinuity around the cutoff point: below the cutoff point, the average probability of attending an elite university is around 0.04 and is fairly stable across scores; above the cutoff point, the average probability of attending an elite university ranges between 0.19 (for score at the cutoff) and 0.43 (for 20 points above the cutoff).

Since the cutoff score varies by province-year-track, the effect of one point above the cutoff in Beijing is not necessarily the same as one point above the cutoff in Shandong. To allow for such differences, Figure 2(b) controls for province-year-track fixed effects, and the pattern remains similar.

Regression results confirm the graphical illustrations. In Table 2, we present the empirical estimates of the impact of being above the cutoff score on entering an elite college

using different methods. Column (1) reports the results from the local linear non-parametric method. Columns (2)-(5) report the results from the parametric method: columns (3) adds province-year-track fixed effects; column (4) also controls for a first-order polynomial and interaction terms; and column (5) adds a second-order polynomial and interaction terms. As shown, the non-parametric estimate is 0.165 while the parametric estimate is 0.159 after controlling for polynomial and interaction terms.

Results Using Placebo Cutoffs The sharp discontinuity at the cutoff and the smoothness at other points in Figures 2(a)-(b) already suggest that misreporting around the cutoff is unlikely to be critical for our findings. Naturally, if we conduct placebo tests using values 5-points above and below the cutoffs, we find no similar discontinuity. Moreover, we plot the patterns using the previous-year and the next-year cutoff scores in Figures 2(c)-(d). The difference between the actual cutoff and the previous-year cutoff has a mean of -4.5 and a standard deviation of 30.4. As shown in Figures 2(c)-(d), there is no discontinuity when replacing the actual cutoff score with either the previous-year cutoff or the next-year cutoff. These results validate our empirical strategy and also suggest that misreporting near the cutoff is unlikely to be an important concern.

Balance Tests in Individual and Family Characteristics The underlying assumption of our strategy is that individuals around the cutoffs are comparable in individual and family characteristics. To check whether this is the case, we examine whether there is discrete jump for a set of individual/family characteristics at the cutoff score.

As visualized in Figure 3, which uses the same specification as in Figure 2(b), there is no discontinuity for gender, age, being a repeated exam-taker, being in the rural area before college or father's/mother's income. We also conduct the same balance test for other attributes including whether father/mother having a college degree, and whether father/mother being a Communist Party member. Results presented in Appendix Table A.4 show no discontinuity around the cutoff for these characteristics as well.

3.2 Majors, University Location, and College Class Ranking

As explained in the background, being above cutoff makes a student eligible to apply to an elite university but he or she still needs to compete with other eligible students in the admission process. As a result, a student faces tradeoffs such as the choice of university vs. major, and needs to choose which province to go to college. We examine three important factors that might also affect wages.

Those slightly above the cutoff are in the worst position for the selection of majors in the recruitment process of elite universities, while those below the cutoff are in the better position for non-elite universities. This implies that they are likely to sort into different majors. For instance, Economics-Management majors are known to be popular in recent years. Those above the cutoff but are ranked lowest among elite university applicants are less likely to get into these majors.

Scoring above the cutoff is indeed weakly correlated with college majors, but the correlation is insignificant. On average, the probabilities of majoring in Economics-Management-Law for those above the cutoff and below the cutoff are 21% and 26% respectively. In Appendix Figures A.2 (a)-(c), we plot the difference in the probability of majoring in Economics-Management-Law, STEM and Humanity. The figures suggest that being above the cutoff is less likely to major in Economics-Management-Law, which are the most popular majors in recent years. However, the difference is not always precisely estimated, as shown in columns (1)-(6) of Table 3.

Scoring above the cutoff also increases the probability of going to a college outside the home province, as shown by Appendix Figure A.2(d). This pattern is confirmed by the estimation results in columns (7)-(8) of Table 3: being above the cutoff increases the probability of attending a university outside the home province by 0.07, around 20% of the mean (0.34). This finding is consistent with the fact that elite universities are concentrated in a few cities often located outside one's home province.

It is conceivable that students who are just above the cutoff are likely to be worse in terms of academic performance in their class, and this academic ranking might adversely affect their job outcomes. In the survey, we asked about the ranking within their college class as perceived by students. There is a systematic upward bias in perception: over 46% of the students claim to be the top 20% in their class whereas only 5% claim to be the bottom 20% in their class. Even with the bias, there is a systematic difference around the cutoff: those above the cutoff are less (or more) likely to perceive themselves as the top 20% (or bottom 20%) in class (shown in Figure A.2 and columns (9)-(10) of Table 3).

We will consider how these factors affect our findings on wage premium in Section 4. Conceptually, both major and class ranking are likely to bias our estimate of the return to elite education downward. Thus, the effect of elite education is likely to be larger once we consider majors and relatively ranking. This is indeed what we find.

3.3 Checking the Importance of Heterogeneous Response

The results in Section 3.2 raise a question on those scoring above the cutoff yet attending a non-elite university. If the reason for them to attend a non-elite university is due to competition of their cohort, this is not a concern for our study since their outcome is likely to be exogenous to their own choice. However, if the reason is due to their own strategic choice, we need to know whether they are systematically different from those scoring above the cutoff and attending an elite university. To do so, we examine whether the effect of scoring above the cutoff on going to an elite university differs greatly with individual characteristics such as gender, rural residence and family income, and whether individual characteristics affect the probabilities of majoring in Economics-Management-Law, going to an university out of one's home province, and being the bottom 20% in college class. Specifically, we include interactions of $1(Score_i \geq Cut_{p,y,tr})$ and individual characteristics in regressions.

As shown in Appendix Table A.5, we find no significant heterogeneity conditional on elite education eligibility (columns (1)-(3)), showing that scoring above the cutoff is the most important criterion in elite education recruitment. The possible tradeoff between elite education and major, location and college class ranking as discussed in Section 3.2 does not differ greatly across individual characteristics. Given these results, it is reasonable to start with investigating the average effect of elite education on labor market outcomes.

4 Wage and Elite Formation

We estimate the elite university wage premium in Section 4.1, which speaks to existing studies on the returns to elite education. Then, to better understand the implications of elite education, we come to other dimensions of elite formation that are important in the Chinese context but may not be captured by wage *per se* in Section 4.2. We further document the importance of the first job for future outcomes in Section 4.3.

4.1 Estimating the Wage Premium

We first estimate the reduced-form impact of being above the cutoff score of elite universities on the best wage offer for the first job and evaluate the wage premium of elite education. Then, we discuss the implications on elite formation of our finding and document the importance of the first-job for future jobs. Before presenting the results on wages, we discuss whether missing wage information poses a serious selection issue for our estimations.

Who Works? In our data, around 74% of the graduating cohorts have ever searched for a job. Among those who searched for a job, 74% got at least one offer. As a result, we have wage information for around half of our sample.

How does being above the cutoff affects the choice to work? We asked students' post-graduation plans in the survey. As shown in columns (1) and (2) of Appendix Table A.6, those above the cutoff are weakly less likely to work after graduation (4% less likely). This difference is not explained by going to the graduate school (with a mean of 19%) (columns (3)-(4))[18] or going abroad (with a mean of 3%) (columns (5)-(6)). Instead, it is explained by the category of "unclear plan" (columns (7)-(8)). One explanation is that those above the cutoff may have more options or higher reservation wages. Relatedly, column (9) shows that those above the cutoff are weakly less likely to search for a job (4% less likely). Column (10) shows that there is no significant difference in the probability of getting an offer conditional on job search.

Thus, on the extensive margin, we find that those above the cutoff are slightly less likely to search for a job. To check whether the selection is critical for our comparison around the cutoff, we conduct another set of balance tests by restricting the sample to those who have jobs (and within a 20-point bandwidth). These results are presented in panel (b) of Appendix Table A.4. Similar to the balance tests in panel (a), the individuals are comparable in all these attributes. Our results below focus on the sample with wage offers. In addition, we conduct a bounding exercise to check the quantitative importance of unobserved wages.

The Elite Education Wage Premium The reduced-form specification for wages is as follows:

$$(\ln)Wage_{i,p,y,tr} = \alpha_W 1(Score_i \geq Cut_{p,y,tr}) + \theta_1 f(Score_i - Cut_{p,y,tr}) + \theta_2 f(Score_i - Cut_{p,y,tr}) \times 1 + \lambda_{p,y,tr} + \varepsilon_{i,p,y,tr}, \quad (2)$$

where the variables are defined in the same way as in equation (1).

There is indeed a discontinuity of log wage at the cutoff score. Figure 4 visualizes the mean wage and log wage by scores after isolating province-year-track fixed effects. The pattern on wages is noisier than that for elite university recruitment. Still, we see a notable discontinuity around the cutoff values.

[18]The relationship between enrolling in elite university and going to graduate school is ambiguous. On the one hand, those from a non-elite university may be more likely to pursue a graduate degree in an elite university to improve their job prospects. On the other hand, it is easier for those from an elite university to continue their graduate studies within the same university. Empirically, we find no discontinuity in going to graduate schools around the elite university cutoff.

The graphical results are confirmed by regressions reported in panel (a) of Table 4. Columns (1) presents the estimate from the local linear non-parametric estimate of the impact of being above the cutoff score on wage, which shows that having a score above the cutoffs raises the monthly wage by 122 RMB. When we add province-year-track fixed effects (column (2)), the first-order polynomial and interaction terms (column (3)), and the second-order polynomial and interaction terms (column (4)), the effect increases to be 156 RMB (USD 25), around 6% of the median monthly wage (2,500 RMB). This pattern is confirmed by the results using log wage as the dependent variable in columns (5)-(8).

Panel (b) presents the first-stage results using the same sample with wage information, which are comparable with the results in Table 2: being above the cutoff increases the probability of attending an elite university by around 0.15. The F-statistics are above 27 across specifications, showing that weak instrument is unlikely to be a concern. Algebraically, the IV estimate is simply the ratio of the reduced-form estimates and the first-stage estimates, around 1,000 RMB (USD 160) per month, or 40% of the median wage. This finding is confirmed by the IV estimates reported in panel (c) of Table 4 that range from 33% to 46%. Of course, one caveat of this IV strategy is the confounding factors of major and ranking discussed in Section 3.2. We examine how those factors affect our finding on wage premium and focus on the reduced-form results.

The Impacts of Major, University Location and Relative Ranking To see how our finding on wage premium is affected by other changes incurred by scoring above the cutoff point as discussed in Section 3.2, we include 13 major fixed effects, 26 university location-province fixed effects and five within-class ranking fixed effects in the estimation of equation (2).

Columns (2) and (4) of Table A.7 show that including the major and ranking fixed effects only marginally increases the baseline finding. This is consistent with the fact that those above the cutoff have disadvantages in the choice of major and class ranking. Column (3) shows that including university location marginally decreases the baseline finding, because elite universities are more likely to be located in more developed provinces. Column (5) further shows that our baseline findings increase marginally after we control for all sets of dummy variables.

Finally, column (6) presents the results including university fixed effects. Now, the effect on wage premium disappears. This finding confirms that the wage premium reflects an effect of attending different universities.

Results by Bandwidth and by Quartiles We use a bandwidth of 20 points of the score in our main analysis. A narrower bandwidth implies that individuals are more comparable but there is more noise in estimation due to a smaller sample size. In Figures 5(a)-(b), we plot the first-stage and the reduced-form estimates using different bandwidths ranging from 5 (roughly 1.25 points per subject) to 40 points (10 points per subject), controlling for province-year-track fixed effects and a quadratic polynomial and interaction terms. As shown, the results are close to the baseline estimates, suggesting that our findings are not driven by the IK-optimal bandwidth used in the baseline estimations.

We further check the impacts across the wage distribution. Appendix Figure A.3 plots the reduced-form results. While the estimates are lower at the tails, the impact is similar across a large part of the distribution (from the 30th to the 80th percentiles), suggesting that our finding on the wage premium is not driven by a very limited part of the wage distribution.

Estimating the Bounds on the Wage Effect As discussed above, we can only observe wages for those who get job offers and those above the cutoff are slightly less likely to be observed with wage information. To check how important this selection concern is, we conduct a bounding exercise following Lee (2009). In our context, the intuition of this method is to trim the sample below the cutoff (either from above or from below) so that the share of observations with observed wage information is equal for those above the cutoff and those below the cutoff. Trimming the sample below the cutoff from below (above) gives us the lower (upper) bound of the treatment effect of elite education eligibility.

The results are presented in Appendix Table A.8. We focus on the difference in residual log wage after isolating province-year-track fixed effects. Column (1) presents the results from OLS and columns (2)-(3) present the results with the lower and upper bounds. The bounded estimate ranges from 0.053 to 0.086, not very far away from our baseline estimate (0.067). Thus, this selection concern is unlikely to invalidate our approach.

4.2 Other Dimensions of Elite Formation

In the context of China, market income is only one measure of entering the elite class. There are other important dimensions of being in the elite class that may not be easily monetized, many of which are associated with the provision of public goods or perks from government monopolies, such as getting into the banking industry, finding a job in a state-owned enterprise, and obtaining *hukou* (the right to live in a city and enjoy local public goods) of a well-funded municipal. We next investigate whether elite education eligibility

affects the entry into elite occupation/industry/ownership and whether it affects non-wage benefits associated with the job.

For simplicity, we focus on the reduced-form results where the estimates can be interpreted as the impact of elite education eligibility (defined as scoring above the cutoff). To get a sense of the (IV) impact of elite education, one can divide the estimates by the first-stage effect (around 0.15). Given a strong first stage shown in Table 4, if the reduced-form estimate is significant (insignificant), it mechanically follows that the IV estimate is significant (insignificant).

Elite Occupation, Industry and Ownership We first need to define the elite occupation, industry and ownership in China. *Ex ante*, we could define elite occupation, industry and ownership by the general perception in China. For instance, a job in management is perceived as an elite occupation; banking is known as an elite industry; and government-related industries are commonly considered as elite industries. Other than these seemingly arbitrary definitions, our data in fact allow us to statistically capture these perceptions.

In our survey, we not only asked the actual industry, occupation, and employer ownership of the first job offers, but also asked students to report their perceived ideal industry, occupation, and employer ownership (summarized in column (3) of Table A.3). We call the ratio of the realized job over the ideal job as the realization-hope ratio, which gives us a useful measure of the elite status. For instance, if a lot of people hope to work in an industry but very few can reach it, this industry is likely to be in the elite club.[19]

The pattern documented from our data is actually consistent with the general perception in China about elite occupations, industries and ownership, as well as the elite class defined in the sociological literature. As shown in Appendix Table A.3, occupations like managerial and administrative positions (in both public or private organizations), business owners, and military/police, have a realization-hope ratio around 0.1-0.2. In contrast, clerks and skilled workers have a realization-hope ratio above 4. We define the former group as elite occupations.[20]

[19] One caveat of the measure is that the questions on ideal jobs were asked after students have found a job, and thus the answers might be biased by *ex post* rationalizations. However, this concern does not matter for our finding unless there is a discontinuity in the bias at the cutoff score, which seems to be a strong assumption.

[20] In an influential book on class mobility, Erikson and Goldthorpe (1992) categorize social classes into seven groups (including farmers and manual workers which are not important in our context), where the top tier refers to "administrators and managers, higher-grade technicians, professionals, supervisors of non-manual workers" and partly coincides with our definite of elite occupation. A nuanced difference is whether higher-grade technicians and professionals (whose ratios are 1.4 and 1.3 in our data) should also be included in the elite class in our context. In our analysis, we focus on the narrow definition of elite occupation (whose ratio is around 0.1-0.2). Scoring above the cutoff weakly decreases the probability of being technicians and professionals in our data.

Similarly, government-related industries have a realization-hope ratio of 0.13; the finance industry and the education-culture industry have a ratio around 0.4-0.6. In contrast, mining/manufacturing/construction industries and wholesale/retail have a ratio around 2. Thus, government-related and finance are reasonable elite industries. As expected, state and foreign ownerships are elite ownerships. They have a realization-hope ratio of 0.65, in contrast to a ratio of 2.4 for private ownership.

With these definitions, we examine how elite education eligibility affects the entry into elite occupation, industry, and ownership. Columns (1)-(3) of Table 5 show that elite education eligibility has no significant impact on the probability of entering into elite occupations (managerial and administrative positions, business owners, and military/police), elite industries (finance, culture-education, governments, and other public sectors), or elite ownership (state-owned and foreign-owned). The coefficients are of different signs and very close to zero in terms of elite occupation and elite ownership. Later in Section 5 on intergenerational mobility, we show that, in stark contrast, parental elite status (defined the same way) does have a strong influence on the entry into these occupations, industries and ownerships.

Non-Wage Benefits Another measure of elite class is the non-wage benefits on the job. For instance, the *hukou* status is an important social indicator for big cities because *hukou* is associated with access to public goods such as education, health care, pension etc. Another example is that some privileged jobs may get more housing-subsidies, which are important given the rising housing price in China.

Results reported in columns (4)-(7) of Table 5 show that elite education eligibility does not necessarily bring more job-related benefits. We examine whether the job provides a local *hukou* status, whether the job provides housing-subsidy and insurance, and whether the job is located in major metropolitan cities (Beijing/Tianjin/Shanghai). Once again, the coefficients are insignificant and of different signs, implying that no systematic impact on these benefits.

Together with the results on occupation, industry and ownership, these findings suggest that while elite education eligibility increases wages, it does not promise more benefits in other dimensions important for the elite class. Section 5 provides more related discussion when we compare the influence of family background with that of exam performance.

4.3 The Importance of the First Job

In our survey, we only observe the first-job outcomes, but we cannot trace students once they are on the labor market. To investigate the importance of the first-job, we collect the job histories of 304,021 individuals from a major online recruitment platform (zhaopin.com).

Individuals there report their monthly wage for each job they have ever had by five categories (1 for below 1000 RMB, 2 for 1000-2000 RMB, 3 for 2001-4000 RMB, 4 for 4001-6000 RMB, and 5 for 6000 RMB and above) and information on industry, occupation and employer's ownership. With this information, we can examine the correlation between first job characteristics with future job outcomes. Specifically, we focus on the sample of individuals who have four-year college education and employ the following specification:

$$Job_{i,u,t} = \alpha_1 Job_{i,u,1} + \alpha_2 Job_{i,u,1} \times EliteUni_u + \lambda_u + \gamma \mathbf{X}_{i,t} + \gamma' \mathbf{X}_{i,t} \times EliteUni_u + \varepsilon_{i,u,t}, \quad (3)$$

where $Job_{i,u,t}$ indicates job-related characteristics of individual i who graduated from university u in t years after the start of the first job and $Job_{i,u,1}$ are the characteristics of the first job. We also control for university fixed effects (λ_u), age and gender, and allow their impacts to vary with elite universities.

The characteristics of the first job are strongly correlated with those in future years. Columns (1) (and (2)) of Appendix Table A.9 report the correlation between the first job wage rank and the wage rank 1-5 years (and 6-10 years) after the start of the first job. Columns (3)-(8) present the correlations in terms of elite industry, occupation, and ownership. In all cases, the correlations are large and significant. For instance, if one starts in an elite industry, the probabilities for him or her to stay in an elite industry in the next 1-5 or 6-10 years are 0.61 and 0.47. Therefore, these results suggest that our findings on the first job also matter for the future. The correlation appears stronger for those from elite universities in terms of wage rank. But we find no systematic difference between those from elite universities and the rest in terms of industry, occupation and ownership.

These results suggest that our findings on the first job are also likely to matter for the future. Of course, these results are not causal since we do not have exogenous variation in the first job and elite education for this analysis.

5 The Impact on Social Mobility

5.1 Two Dimensions of the Question

How does elite education eligibility affect social mobility? This question has two dimensions. The first is whether and by how much access to elite education can rasise one's socioeconomic status. Our previous findings already suggest the answer: access to elite education increases wage income and also the rank across income distribution.

The second dimension of this question is less clear: does elite education eligibility attenuate or strengthen intergenerational mobility? If one believes that elite education in

China levels the playing field and decreases the influence of parental influence, one would expect to see an attenuation effects. Instead, one may also expect a strengthening effect if elite education is employed to strengthen the influence of parental income.

Appendix Figure A.4 illustrates the two theoretical possibilities, where the x-axis indicates parental income rank and the y-axis indicates expected child's income rank. In both cases, being above the elite college cutoff increases the intercept, indicating a positive mobility in the first dimension. The change in slopes captures the second dimension: being above the cutoff decreases the intergenerational slope and hence increases the intergenerational mobility in case (a) and vise versa in case (b).

Below, we examine the pattern in the two dimensions in the data. We measure socioeconomic status in terms of income and other important job-related status such as occupation, industry, and ownership. Following the literature, we use both the rank-rank (e.g., Chetty et al. 2014) and log-log specifications (e.g., Solon 1992) when examining income mobility. Again, we focus on the reduced-form estimates, and a significant (insignificant) reduced-form estimate implies a significant (insignificant) IV estimate, given a strong first stage in Table 4.

5.2 Income Mobility

We first use a rank-rank approach by dividing parental income into five quintiles and rank it from 1 to 5, with 1 meaning the lowest 20% in the parental income distribution in the whole sample while 5 the top 20%. The median annual parental income for the top 20% is around 135,000 RMB, more than 10 folds of that for the bottom 20% group (around 9,000 RMB). Similarly, we divide child wage into five quintiles and rank it from 1 to 5. Then, we employ a log-log approach as an additional check. The correlation between parental income rank and child wage rank, corr(Child Rank, Parent Rank), captures the intergenerational mobility. Comparing the correlation for students above the elite university cutoff and that below can capture the role of elite education eligibility in altering intergenerational mobility.

Nonparametric Description Before presenting the estimation results, we first present in Figure 6(a) a nonparametric description for students above and below the cutoff score separately. For each value (1 to 5) of the parental rank in the x-axis, we plot the mean of child rank using the same subsample as in the wage premium estimation (i.e., a bandwidth of 20 points).

Some interesting patterns appear in Figure 6(a). First of all, as expected, there is a strong and positive correlation between parental rank and child rank for both groups. Moreover, the correlations are similar, with a slope around 0.2 for both groups. These

results suggest that the correlation between parental rank and child rank is not altered by scoring above the cutoff point of elite universities, or entering an elite university does not change intergenerational mobility as measured by the generational income link.

The difference lies in the intercept: the group above the cutoff has a higher intercept (around 0.25 higher). In other words, having a score above the cutoff helps an individual to move up in the wage ladder by 0.25 quintile and this level-up effect is the same across parental income rank groups. This level-up effect is large, which is roughly equivalent to the increase of parental income by about two quintiles. For example, scoring above the cutoff score can move the child income rank from the first quintile families (the bottom quintile group of parental income) to the third quintile families (the middle group). However, the level-up effect is not large enough to move an average child in the bottom group of families to the top group. For those from the top 20% parental income families, even if they have scores below the cutoff, their average wage rank is still higher than that of all those above the cutoff but from families in the other four income groups.

To further shed light on the magnitude, we plot the average probability of getting the top 20% wage for children by parental income ranks in Figure 6(b). It shows that being above the cutoffs increases the probability of becoming the top 20% wage earnings among college graduates across all parental ranks. However, once again, for those from the top 20% families, even if they score below the cutoff, their probability of earning the top 20% wage is higher than that of those above the cutoff but from less wealthy families.

Regression Results We can use the following specification to quantify the pattern:

$$\begin{aligned} ChildRank_{i,p,y,tr} = \beta_1 1(Score_i \geq Cut_{p,y,tr}) \times ParentRank + \beta_2 ParentRank + \beta_3 1 \\ + \theta_1 f(Score_i - Cut_{p,y,tr}) + \theta_2 f(Score_i - Cut_{p,y,tr}) \times 1 + \lambda_{p,y,tr} + \varepsilon_{i,p,y,tr}, \end{aligned} \quad (4)$$

where β_3 (together with β_1) captures the level effect of being above the cutoff on Child's wage rank, β_2 (together with β_1) measures the intergenerational link of income rank, and β_1 captures the difference in the correlation between parental rank and child rank.

There is indeed a strong intergenerational correlation between parental income rank and child wage rank, as shown by results reported in Table 6. Column (1) shows that the correlation between parental rank and child rank is around 0.18. Even though the magnitude is meaningful, one cannot assume that it captures the broad intergenerational mobility in China: we are studying a selected sample where even those blow the cutoffs attended a university. Column (2) shows that the impact of elite education eligibility is 0.34, which is comparable to the effect of an increase in parental income by about 1.8 quintiles. This

impact is sizable but not large enough to lift a child from a bottom 20% family to a top 20% wage group.

Elite education eligibility does not change the intergenerational correlation, as the coefficient for the interaction term of above cutoff and parental rank is not statistically significant in column (3). Column (4) adds province-year-track fixed effects and quadratic polynomial interactions. As expected, the correlation between parental rank and child rank becomes smaller. The main result on the interaction effect remains small and insignificant. These estimation results confirm the nonparametric pattern in Figure 6: the wage premium of elite education eligibility does not vary much with respect to parental income rank; or put differently, elite education eligibility does not alter the intergenerational mobility measured by the correlation between parental income rank and child income rank.

The results from log-log specification imply the same pattern as in the rank-rank specification. In addition to the rank-rank approach, we also employ a log-log approach by replacing $ChildRank$ with $\ln Wage$, and $ParentRank$ with $\ln ParentIncome$. The log-log estimation results presented in columns (5)-(8) of Table 6 are similar. The correlation between log parent income and log child wage in a simple regression (column (5)) is around 0.07, and being above the cutoff is associated with a wage premium but does not change the intergenerational wage correlation (column (7)). The impact of being above the cutoff is comparable to doubling parental income. When we add province-year-track fixed effects and quadratic polynomial interactions in column (8), the results are very similar except that the intergenerational correlation deceases.

5.3 Occupation/Industry/Ownership Mobility

We also examine the intergenerational links in terms of elite occupation, industry, and ownership status (defined in the same way as in Section 4.2). Once again, results reported in Table A.10 illustrate the importance of parental background in determining the job outcomes of children. As shown, the parental status is significantly correlated with child status in all three dimensions. The impact of parental background is large compared with mean probability: having a parent working in an elite occupation, industry, and ownership increases the probability of entering the elite occupation, industry, and ownership by around 33%, 64% and 24% respectively (columns (1),(4),(7) of Table A.10). These are larger than the mobility in terms of income found earlier. Similar to the results using income, elite education eligibility does not change the intergenerational correlations in these job-related characteristics. As shown, the interaction term is insignificant throughout Table A.10, meaning that elite education eligibility does not change intergenerational mobility.

Together with the findings in Section 4, these results help us to better understand the degree of mobility created by elite education eligibility. Elite education eligibility does have a sizable impact on wage income, which is roughly comparable to that of an increase in parental income by one quintile (around 1.5-2 folds increase in parental income). However, no evidence suggests that it increases the probability of entering an elite occupation, elite industry, or a state-owned enterprise, living in an elite city, obtaining *hukou* or any other non-marketized benefits; in contrast, parental characteristics do.

The finding that intergenerational link of wage and job characteristics is neutral with respect to elite education illustrates both the limitation and the merit of the exam system. It is an illusion to assume that elite education "levels the playing field" (i.e., the influence of family background is attenuated by elite education eligibility). However, it is also too pessimistic to think that the elite status only gets strengthened by the access to elite education. The exam system is better in promoting social mobility than an alternative system that creates scenario (b) in Figure A.4.

6 Understanding the Mechanism

In this section, we explore potential mechanisms through which elite education has a wage premium. In theory, there are typically three explanations: human capital (e.g., Becker 1993), social network (e.g., Bourdieu and Passeron 1977), and signaling (e.g., Arrow 1973; Spence 1973). As expected, it is challenging to really pin down each mechanism, our humble attempt is to use as many proxies as possible and see which mechanisms are more consistent with data.

6.1 Human Capital

It is likely that students in elite universities accumulate more or better human capital in college. An ideal measure is some standardized test which every college student takes in college and is graded nationally so that we can compare the score across universities. If those above the cutoff accumulate more or less human capital in college, we would expect to see some difference in their performance in such tests.

One test close to being ideal is the national College English Test (known as CET-4 with a maximum score of 710 points), which is a basic criterion for job search and is usually presented in one's resume. In our data, over 88% of the sample have taken this test. There is indeed a positive correlation between the CET-4 score and wages in the data: on average, a 20-point increase in CET-4 is associated with a 4% increase in wages, suggesting that the

score is a reasonable proxy for human capital that is rewarded by the labor market. We are interested in whether there is any discontinuity in this proxy around the cutoff. However, we do not find any difference in the probability of taking the CET-4 around the cutoff (column (1) of Table 7) or in the scores (column (2)).

We also examine other national tests that offer professional certificates to college students. One caveat is that only a selected group take such tests for certificates. Columns (3)-(6) examine dummy variables of certification in computer skills, expertise (e.g., CPA (Certified Public Accountant), the BAR license to practice law), vocational skills (awarded by the National Occupational Skill Testing Authority) and driving. In none of these credentials do those above the cutoffs perform better. If anything, they are less likely to get certificates in CPA and BAR. This is consistent with that those scoring above the cutoff are less likely to major in economics and law, who tend to have such certificates.

As another proxy for the effort of accumulating human capital, we examine the time allocation to different activities such as time going to class, time studying English and others in columns (7)-(10) of Table 7. Once again, we find no systematic difference in time allocation around the cutoff.

Together with the results on majors (that cannot explain our wage premium), we find no evidence for the role of human capital in explaining wage premium around the cutoff. We do not find any difference in the effort of accumulating human capital (measured by time allocation) around the cutoff either.

6.2 Social Networks

It is also likely that students in elite universities get to know other elite students and build up important connections with schoolmates, which in turn help them in getting a better-paid job. We use information on the parents of schoolmates to measure connections. In particular, for each individual, we first examine whether elite education eligibility is associated with a higher share of schoolmates (excluding oneself) whose parents are in the Communist Party or have a college degree. Then, we check whether such shares correlate with wages.

Elite education eligibility is indeed associated with a higher share of schoolmates (excluding oneself) with parents in the Communist Party or with a college degree, as reported in columns (1)-(2) of Table 8. A higher share of schoolmates with parents in the Communist Party is associated with a higher wage (column (4)) and the correlation is robust to controlling for one's own parental background (column (5)). A similar pattern exists for schoolmates with parents with a college degree (columns (6)-(7)).

Social networks can indeed partially explain the wage premium associated with elite

colleges, but the premium remains large even after we include our measures of social networks. The baseline estimate (column (3)) decreases by about 12 to 16% once the two measures of networks are included in columns (4) and (6). This estimate, it should be noted, is a lower bound of the impact of social networks, as there are other dimensions of networks that are unmeasured.

Note that our finding is driven by university-related networks rather than parental status – there is no discontinuity in parental status around the cutoff (recall the balanced tests in Section 3.1). This finding is also consistent with the argument in an earlier sociological study on elite university graduates in South Korea (Lee and Brinton 1996), where the authors coin the university-related networks as institutional social capital (in contrast with personal networks such relatives and friends).

6.3 Signaling

While we have some relatively good proxies for human capital and social networks, it is almost impossible to have tangible measures of signaling in observational data. Here, we provide some suggestive evidence using information on job search.

Job Search Channels In the survey, we ask the channels of job search. This information is useful for us to understand factors that are important in job search. Students employ multiple channels: off-campus/on-campus job fairs, information from teachers, job search websites or informal social networks.

We report the impacts of elite education eligibility on different job search channels in Table 9. Among these channels, the only significant difference is that those above cutoff are more likely to make use of on-campus job fairs (column (3)). The finding is consistent with an interpretation of signaling: the reputation of universities attracts more employers to campus. On-campus job fairs may also indicate alumni networks. One again, the networks are institutional (university-related) rather than personal: there is no discontinuity in the probability of relying on relatives and friends (column (5)).

Discrimination in Job Search Our survey questions on various types of perceived discrimination can also help to shed light on mechanisms. We asked in the survey yes/no questions on whether students have experienced discrimination in terms of gender, *hukou*, accent and physical appearance in job search. Meanwhile, we also asked an open question for them to describe any type of discrimination they have encountered. Around 10% of students answered this open question. Among them, the top three types of discrimination are the university rank or type of degree (36%), major (14%), and lack of experience (6%).

We examine whether being above the cutoff score affects different types of discrimination. Columns (1)-(4) of Table 10 show that there is no significant difference in terms of gender, *hukou*, accent or physical appearance. When coming to the answers to the open question, we have a much smaller sample and do not have precisely estimated coefficients. Nevertheless, column (6) shows that students eligible for elite education are much less likely to feel discriminated regarding university rank or degree. Once again, this finding shows that the reputation of the university is important for the labor market.

6.4 Summary

Taken together, these results suggest that the wage premium is unlikely to be explained by the role of human capital and that networks within universities and the reputation of universities are important in explaining the wage premium. The "strict entrance, easy out" in the college entrance-graduation system discussed in the background is important for understanding these findings. Due to the strict entrance rule, it is reasonable for employers to infer information on students' unobserved characteristics based on the tier of universities. It may also partly explain our finding on the lack of human capital accumulation around the cutoff. Almost everyone in college is promised graduation. As a result, students are not strongly incentivized to work hard in college.

7 Conclusion

The College Entrance Exam in China is often considered as a test that determines the course of life. It also provides an ideal laboratory to examine the role of elite education. Yet little is known whether a better exam performance really changes a young person's fate. In this study, we endeavor to collect systematic data on exam performance and link it to the access to elite education as well as labor market outcomes. We document that the exam system does play an important role in elite university recruitment: there exists a clear discontinuity in the probability of entering elite university around the cutoff scores. The discontinuity also matters for the job market outcomes in terms of wages. However, the impact of elite education (eligibility) on elite formation and intergenerational mobility is mixed. We find no evidence that it entails one's entry into the elite occupation or industry. It does not alter the influence of family background either.

Our findings make a useful contribution to the growing literature on elite education. Besides estimating the returns, our study contributes to understanding how the access to elite education affects elite formation and social mobility, which also opens new avenues of

research on other elite education institutions. They also uncover the relative importance of elite education eligibility and family background in determining wages and other outcomes – a central, yet understudied issue in Chinese labor market.

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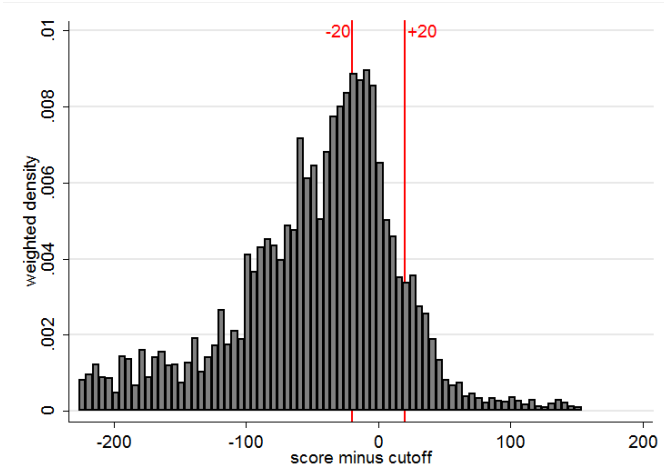
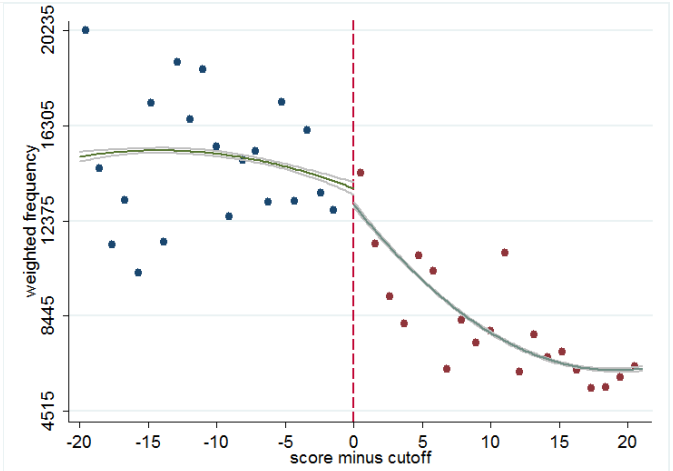
Figure 1: The Distribution of Exam Scores in the Survey Data

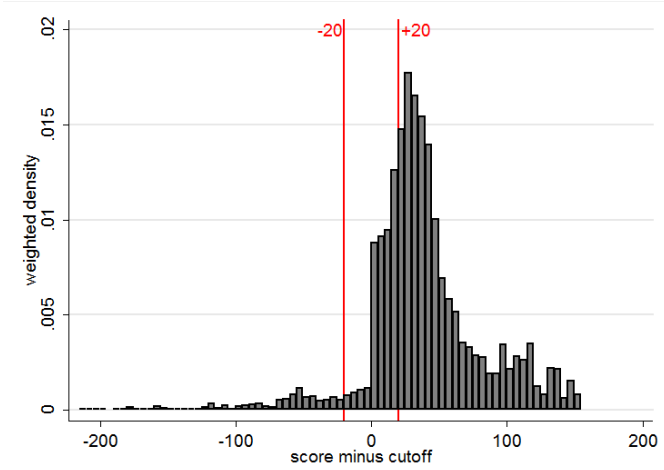
(a) The Whole Sample



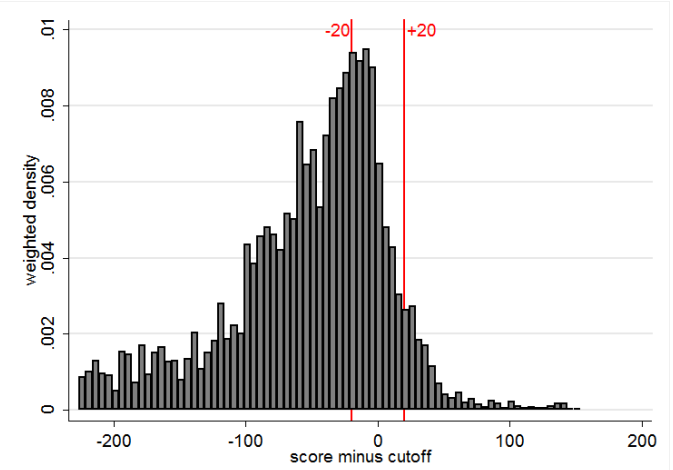
(b) Within the 20-point Bandwidth



(c) Elite Universities



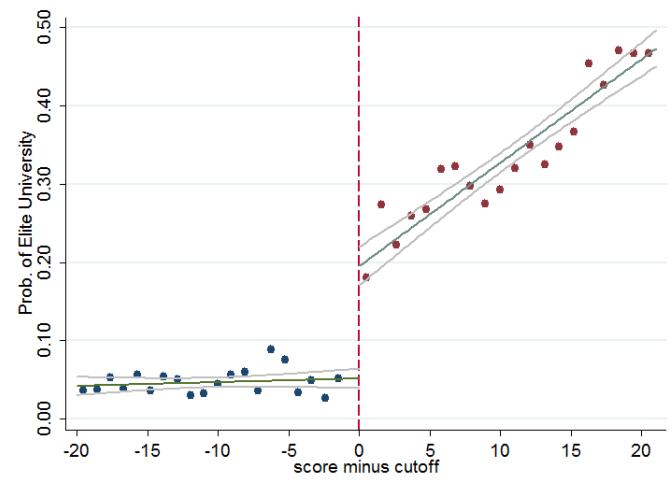
(d) Non-elite Universities



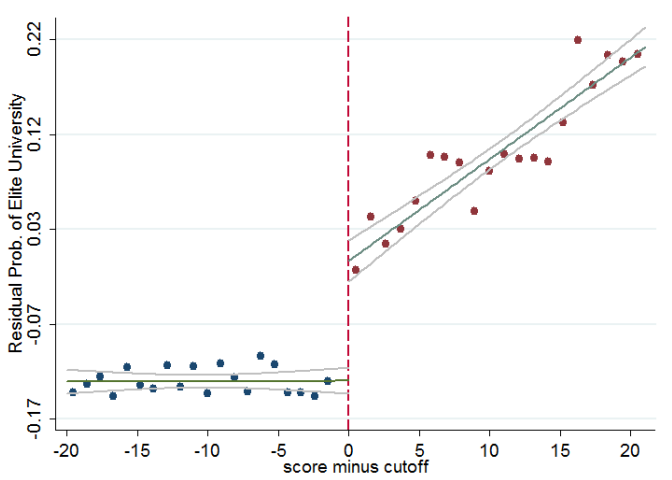
Notes: Figure (a) plots the distribution of exam scores in our survey data. Figure (b) takes a closer look at the 20-point bandwidth and shows that there is no significant discontinuity at the elite university cutoff line. Figures (c) and (d) plot the distribution of exam scores for elite universities and non-elite universities respectively. Since we intentionally oversampled elite schools, the density and frequency are weighted by the sampling weight of schools. Note that the scores are not necessarily comparable across province-year-track. We make comparison within province-year-track in our analysis.

Figure 2: Exam Scores and Elite (the First-Tier) University Enrollment

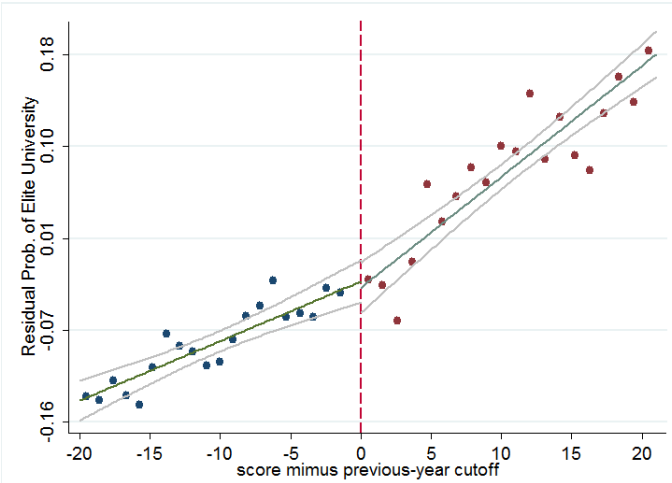
(a) Pattern from the raw data



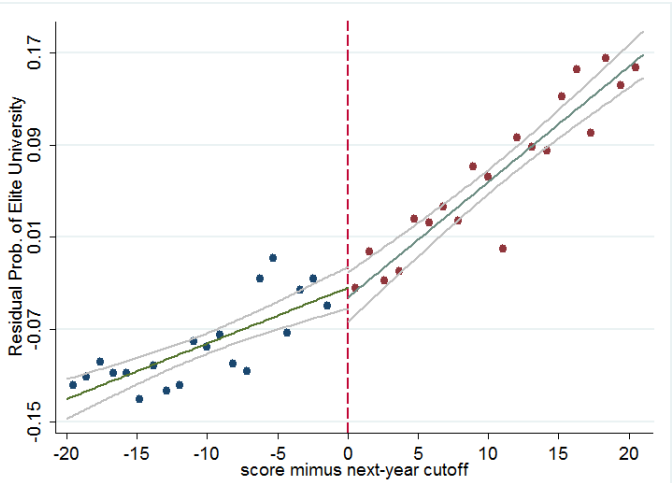
(b) Pattern with Province-Year-Track FEs



(c) Placebo I: Using previous-year cutoffs w. Pr-Ye-Tr FEs

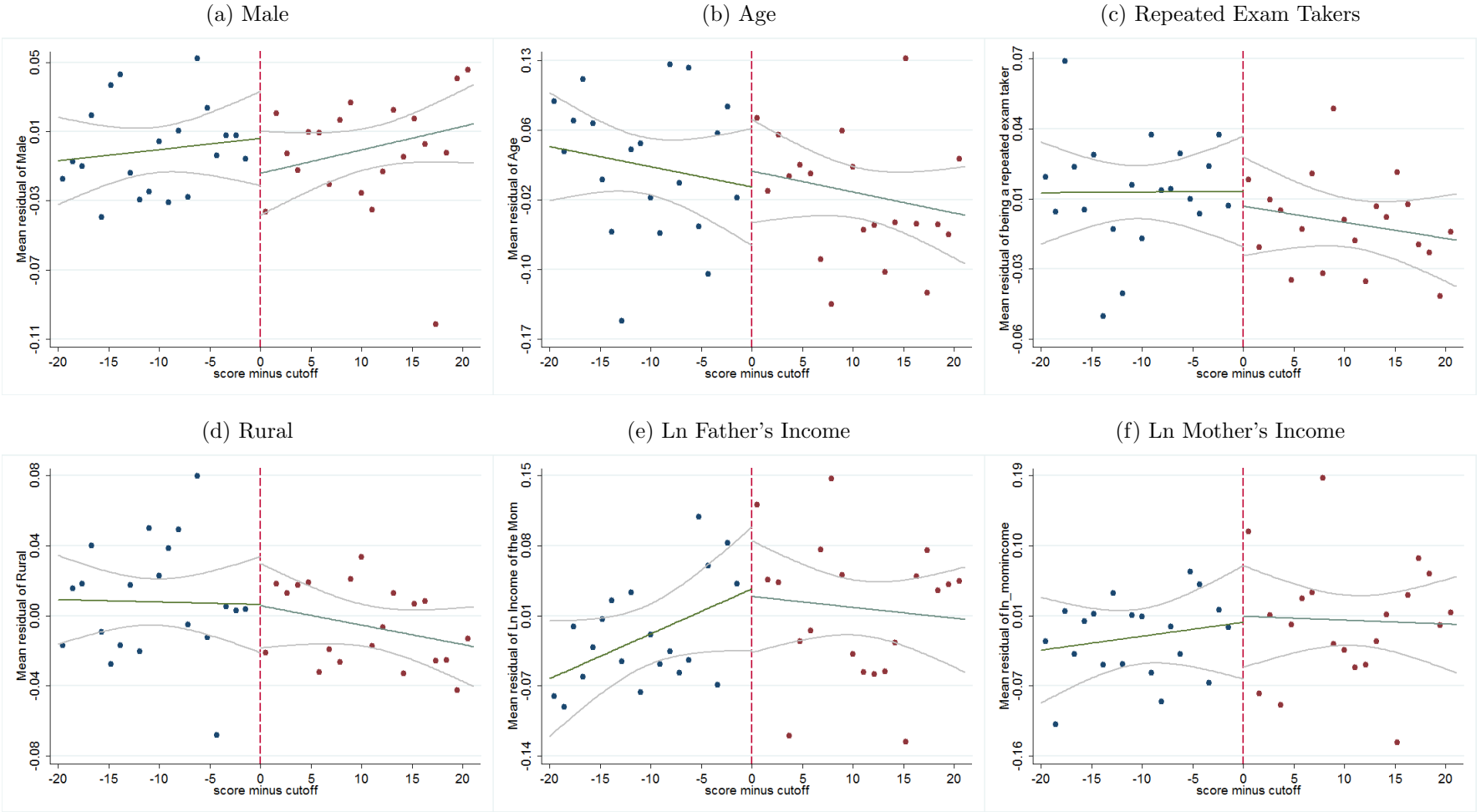


(d) Placebo II: Using next-year cutoffs w. Pr-Ye-Tr FEs



Notes: This figure plots the probability of attending an elite university by distance to the cutoff scores (that vary by province-year-track). Figure (a) is based on raw data and Figure (b) controls for province-year-track FEs. They show a notable discontinuity in the enrollment probability around the cutoff value. Figures (c) and (d) show no discontinuity when using the cutoff scores in the previous or the next year.

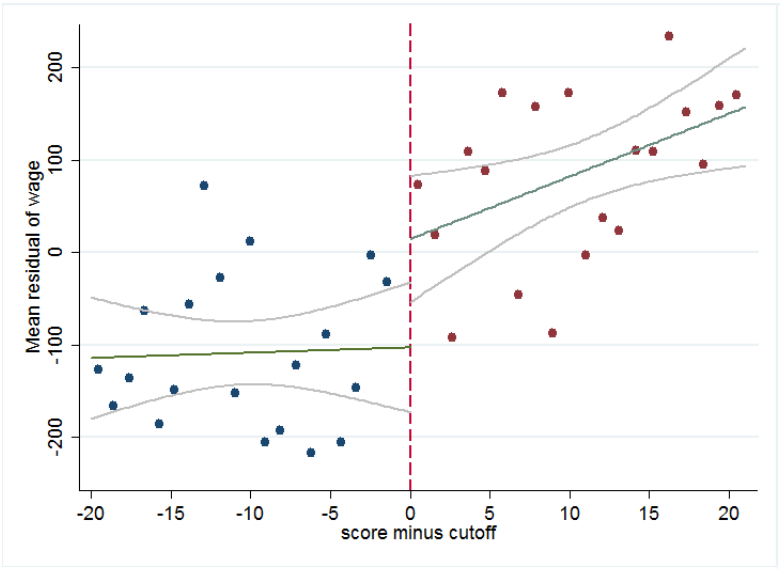
Figure 3: Balance Tests of Individual and Family Characteristics (More in Appendix Table A.4)



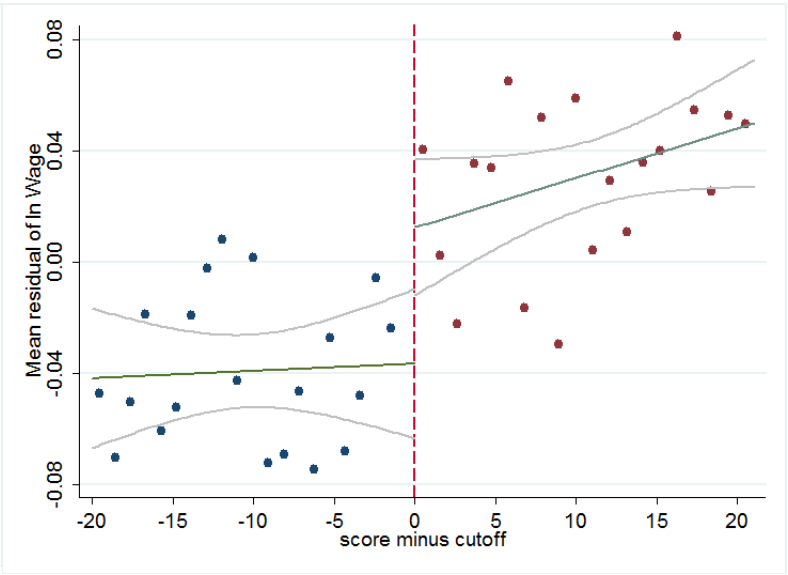
Notes: This figure shows that there is no similar discontinuity in many individual characteristics around the cutoff. Province-year-track FEs are controlled for in these figures. Appendix A.4 presents more related results.

Figure 4: Elite Education and Wage Premium

(a) Wage



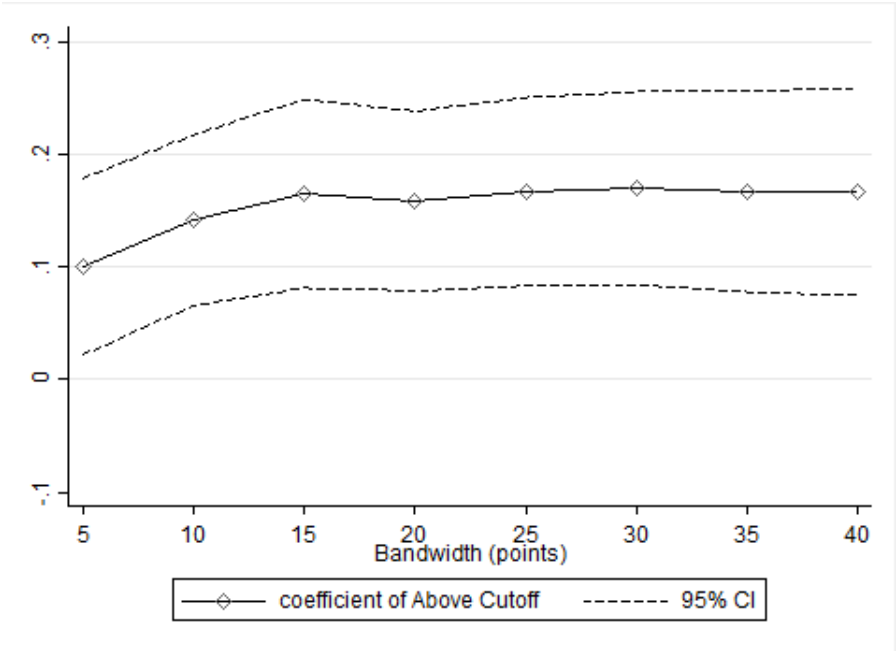
(b) ln Wage



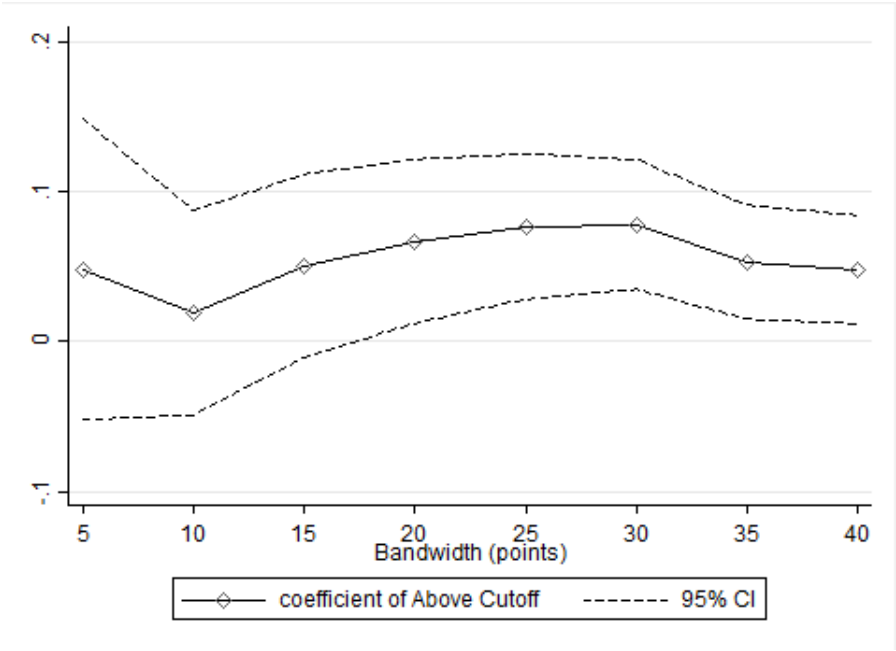
Notes: This figure plots the mean wage and ln wage by distance to the cutoff scores (after isolating province-year-track FEs) and shows a notable discountability around the cutoff.

Figure 5: Results with Different Bandwidths

(a) First Stage – Scores and Elite Education



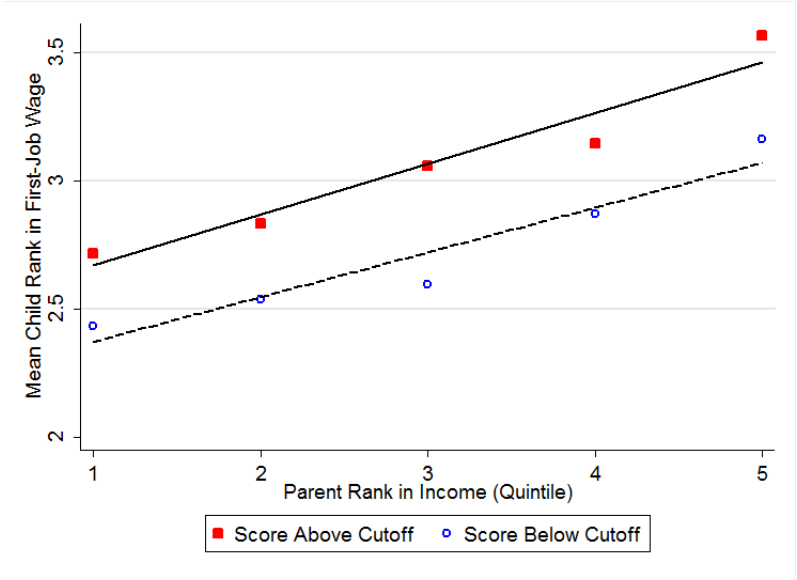
(b) Reduced Form – Scores and Wage Premium



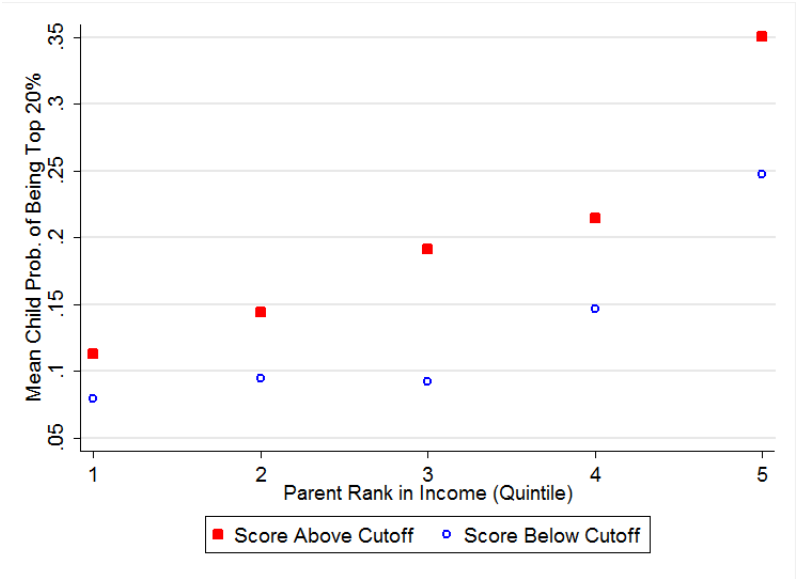
Notes: This figure plots the estimates using different bandwidths of scores while controlling for province-year-track FEs and a second-order polynomial and interaction. Panel (a) is for the first-stage results on elite university and panel (b) for the reduced-form estimates on wage premium. The solid line connects the estimates and the dashed lines connect the 95% confidence intervals where the standard errors are clustered at the university level.

Figure 6: Intergenerational Mobility By Exam Performance

(a) Child Wage Rank Against Parental Income Rank



(b) Probability of Being Top 20% by Parental Income Rank



Notes: Figure (a) presents the non-parametric binned scatter plot of the relationship between child and parent income ranks. It shows a strong and positive correlation between child and parent income ranks. An exam score above the cutoff score for elite universities raises the income rank of the child but does not change the correlation between child and parent income ranks. Using the same method, Figure (b) plots the probability of being the top 20% by parental income rank.

Table 1: Summary Statistics
(20-point bandwidth centered at the elite university cutoff)

Variable	Mean	Std. Dev.	Obs
(a) Exam Scores and Elite Education			
Elite Universities	0.21	0.41	10,335
Above Cutoff for Elite University	0.55	0.50	10,335
Scores to Cutoff	0.76	11.81	10,335
Major: STEM	0.65	0.48	10,314
Major: Econ-Business-Finance	0.24	0.43	10,314
Major: Humanity	0.10	0.30	10,314
(b) Individual and Family Characteristics			
Male	0.57	0.49	10,335
Age	23.97	1.11	10,200
Rural (before college)	0.58	0.49	10,335
Han	0.91	0.28	10,335
Father with College Edu.	0.09	0.28	9,835
Mother with College Edu.	0.06	0.23	9,821
ln Father's Income	9.89	1.11	8,674
ln Mother's Income	9.38	1.18	7,840
ln Family (Parental) Income	10.44	1.11	9,383
Father being a Party Member	0.23	0.42	9,840
Mother being a Party Member	0.08	0.28	9,822
(c) Job-related			
Ever Searched for Jobs	0.74	0.44	10,179
Best Wage Offer (for the first job)	2733	1008	5,080
ln Wage	7.85	0.37	5,080
Elite Occupation (defined in Table A.3)	0.06	0.24	4,946
Elite Industry (defined in Table A.3)	0.17	0.38	5,025
Elite Ownership (defined in Table A.3)	0.54	0.50	5,039
Job: providing Hukou	0.39	0.49	5,026
House Subsidy	0.54	0.50	3,940
Insurance (5 types)	0.51	0.50	5,080

Notes: This table presents the summary statistics for the key variables. We focus on this sample within a bandwidth of 20 in our baseline analysis and presents results from additional bandwidths for robustness checks. The data come from six rounds of annual surveys on college graduates conducted by the authors.

Table 2: The Effect of Elite Education Eligibility on the Prob. of Elite University Admission (Dependent Var.: Elite University=1/0 (Mean: 0.21))

	(1)	(2)	(3)	(4)	(5)
Method	Local Linear	Parametric			
Above Cutoff	0.165***	0.294***	0.283***	0.155***	0.159***
	(0.013)	(0.074)	(0.061)	(0.048)	(0.040)
Province-Year-Track FE			Y	Y	Y
Linear Interaction				Y	Y
Quadratic Interaction					Y
Observations	10,335	10,335	10,335	10,335	10,335
R-squared		0.129	0.326	0.344	0.344

Notes: This table reports the impact of exam scores on the probability of attending an elite university. Column (1) reports the results from the nonparametric method and columns (2)-(5) from the parametric method. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 3: The Effect of Elite Education Eligibility on Major, Univ. Location and Relative Ranking in College

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Major		Major		Major		University location		Reported to be	
	Econ-Manage.-Law		STEM		Humanity		Out of Home Province		btm 20% in college class	
Mean	0.24		0.65		0.10		0.34		0.06	
Method	Local Linear	Parametric	Local	Parametric	Local	Parametric	Local	Parametric	Local	Parametric
Above Cutoff	-0.034*	-0.041	-0.006	0.025	0.040***	0.018	0.079***	0.071**	0.033***	0.047***
	(0.018)	(0.029)	(0.020)	(0.029)	(0.013)	(0.012)	(0.020)	(0.032)	(0.010)	(0.015)
Province-Year-Track FE		Y		Y		Y		Y		Y
Linear Interaction		Y		Y		Y		Y		Y
Quadratic Interaction		Y		Y		Y		Y		Y
Observations	10,314	10,314	10,314	10,314	10,314	10,314	10,335	10,335	10,059	10,059
R-squared		0.240		0.515		0.322		0.524		0.053

Notes: This table shows that those above the cutoff are (i) weakly less likely to major in Econ-Management-Law, (ii) more likely to attend an university out of one's home province, and (iii) are more likely to perceive themselves at the bottom 20% in college class. We will examine how these factors affect our finding on wage premium. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 4: The Effect of Elite Education (Eligibility) on Wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Method	Local Linear	Parametric	Parametric	Parametric	Local Linear	Parametric	Parametric	Parametric
(a) Reduced-Form								
Dependent Var.	Wage				Ln Wage			
Above Cutoff	122.2**	247.0***	146.0**	155.8**	0.053**	0.089***	0.059***	0.067**
	(60.965)	(42.358)	(56.928)	(73.176)	(0.023)	(0.015)	(0.021)	(0.027)
(b) First-Stage								
Dependent Var.	Elite University				Elite University			
Above Cutoff	0.162***	0.283***	0.155***	0.147***	0.162***	0.283***	0.155***	0.147***
	(0.018)	(0.010)	(0.019)	(0.028)	(0.018)	(0.010)	(0.019)	(0.028)
F-statistics		779.9	68.66	27.06		779.9	68.66	27.06
(c) IV Estimates								
Dependent Var.	Wage				Ln Wage			
Elite University	754.6**	872.6***	939.5***	1,061.5*	0.328**	0.325***	0.380***	0.456**
	(383.148)	(98.830)	(340.458)	(548.457)	(0.145)	(0.037)	(0.126)	(0.205)
Province-Year-Track FE		Y	Y	Y		Y	Y	Y
Linear Interaction			Y	Y			Y	Y
Quadratic Interaction				Y				Y
Observations	5,080	5,080	5,080	5,080	5,080	5,080	5,080	5,080

Notes: This table reports the impact on the starting monthly wage. Panel (a) presents the estimates for the reduced-form results, panel (b) for the first-stage, and panel (c) for the IV estimates of the elite education wage premium. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 5: The Impacts of Elite Education Eligibility on Other Dimensions of Elite Class

	(1) Elite Occupation	(2) Elite Industry	(3) Elite Ownership	(4) Provide Hukou	(5) Housing Subsidy	(6) 5-type Insurance	(7) Beijing/TianJin /Shanghai
Mean	0.06	0.17	0.54	0.39	0.54	0.51	0.19
Above Cutoff	0.004	-0.026	0.005	0.029	-0.039	0.048	-0.027
	(0.025)	(0.024)	(0.044)	(0.057)	(0.057)	(0.040)	(0.029)
Province-Year-Track FE	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y	Y
Observations	4,946	5,025	5,039	5,026	3,940	5,080	4,888
R-squared	0.111	0.203	0.118	0.182	0.094	0.295	0.515

Notes: This table shows that being above the cutoff does not entail one's entry into elite occupation, industry, ownership, or non-wage benefits. The elite status is defined by the scarcity (relative to the demand). See Table A.3 for the specific ratios. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 6: The Impact of Elite Education Eligibility on Intergenerational Mobility: Income Rank and Log Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Child Rank (1-5)				lnWage			
Above Cutoff * Parent Rank			0.024	0.005				
			(0.035)	(0.023)				
Rank of Parent Income	0.184***	0.187***	0.174***	0.087***				
	(0.025)	(0.024)	(0.026)	(0.019)				
Above Cutoff * Ln Parental Income							0.001	-0.002
							(0.012)	(0.009)
Ln Parental Income					0.072***	0.074***	0.073***	0.038***
					(0.010)	(0.009)	(0.009)	(0.008)
Above Cutoff		0.339***	0.275**	0.303***		0.100***	0.100***	0.085***
		(0.076)	(0.123)	(0.113)		(0.024)	(0.024)	(0.028)
Prov-Year-Track FE				Y				Y
Linear Interaction				Y				Y
Quadratic Interaction				Y				Y
Observations	4,696	4,696	4,696	4,696	4,696	4,696	4,696	4,696
R-squared	0.043	0.062	0.062	0.268	0.043	0.061	0.061	0.285

Notes: This table shows that (i) there is a significant correlation between parents' income with the children's income, (ii) being above the cutoff does increase the income rank, and (iii) the intergenerational link is *not* changed by exam performance around the cutoff. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 7: Human Capital: The Impact of Elite Education Eligibility on Human Capital Accumulation in College

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Certificates/Licenses from Exams Taken in College						Weekly Hours by Activity (Last Year)			
	Col. English Test Taking 0/1	CET4 Score	Computer	Field (CPA/BAR)	Vocation.	Driving	In Class	Study oneself	Study English	Sport
Mean	0.88	461	0.56	0.15	0.21	0.35	24.7	13.9	6.3	5.7
Above Cutoff	-0.014	-2.453	0.022	-0.090**	-0.003	-0.013	-0.571	1.437	-0.953	0.381
	(0.034)	(2.834)	(0.041)	(0.040)	(0.041)	(0.039)	(1.523)	(1.239)	(0.634)	(0.594)
Prov-Year-Track FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	5,080	4,446	4,542	4,542	4,542	4,542	3,785	3,886	4,705	4,616
R-squared	0.099	0.277	0.193	0.130	0.107	0.139	0.097	0.110	0.131	0.083

Notes: This table shows that those above cutoff are not better in human capital proxied by national standardized tests in college. The finding in column (4) is consistent with the previous result on majors – those major in Econ-Management-Law are more likely to get certificates of CPA and BAR. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table 8: Networks: The Impact of Elite Education Eligibility on Background of Schoolmates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	% schoolmates w. parents						
	Party	college			ln Wage		
Mean	27.1	12.3					
Above Cutoff	0.883**	0.973**	0.067**	0.059**	0.060**	0.056**	0.057**
	(0.410)	(0.372)	(0.027)	(0.026)	(0.026)	(0.025)	(0.025)
% schoolmates w. parents in the party				0.009***	0.009***		
				(0.001)	(0.001)		
Own parents in the party					0.031**		
					(0.013)		
% schoolmates w. parents w. college						0.011***	0.011***
						(0.001)	(0.001)
Own parents with college degree							0.025
							(0.022)
Prov-Year-Track FEs	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y	Y
Observations	5,080	5,080	5,080	5,080	5,080	5,080	5,080
R-squared	0.617	0.576	0.283	0.283	0.284	0.287	0.287

Notes: This table shows that those above cutoff do have better connected schoolmates, which partly explains our finding on wage premium. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.A

Table 9: Signaling/Networks: The Impact of Elite Education Eligibility on Job Search Channels

	(1)	(2)	(3)	(4)	(5)
	Off-campus fairs	Teacher	On-campus fairs	Website	Personal networks
Mean	0.41	0.57	0.77	0.57	0.26
Above Cutoff	0.022	0.041	0.061**	0.032	-0.019
	(0.051)	(0.045)	(0.025)	(0.043)	(0.040)
Prov-Year-Track FEs	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y
Observations	5,063	5,063	5,063	5,065	5,063
R-squared	0.096	0.080	0.148	0.117	0.078

Notes: This table presents the difference in the channels of job search around the cutoffs. There is no evidence that they employ the networks channel more. We also find that those above the cutoff are more likely to get information from on campus job affairs, consistent with the interpretation that the reputation of colleges attract employers. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

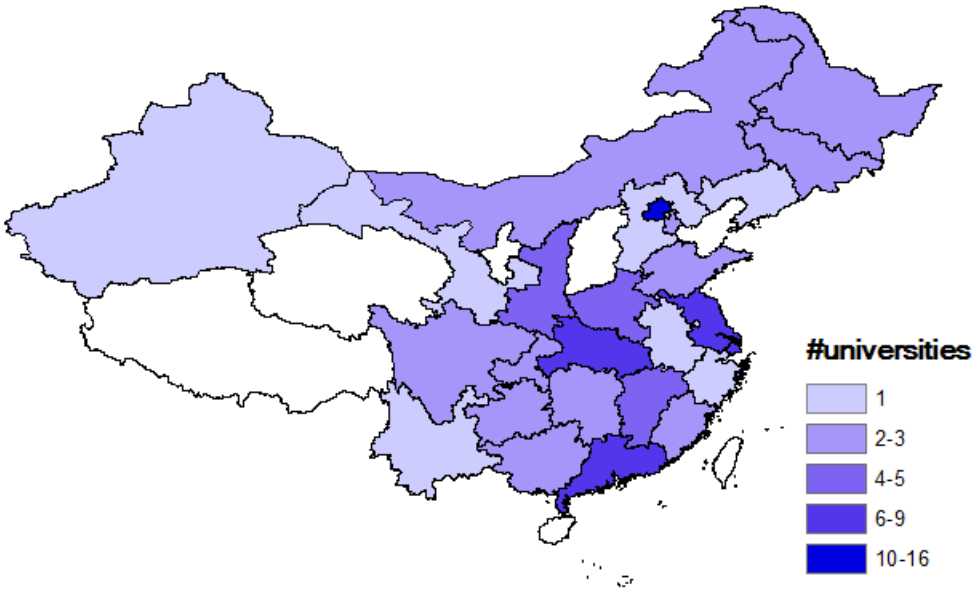
Table 10: Signaling: The Impact of Elite Education Eligibility on Discrimination in Job Search

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Yes/No Question					Open Question		
Discrimination	Gender	Look	Accent	Rural	Hukou	University	Major	Experience
Mean	0.25	0.15	0.08	0.08	0.26	0.36	0.14	0.06
Above Cutoff	0.018	-0.021	-0.005	0.003	-0.029	-0.279	-0.045	0.054
	(0.038)	(0.029)	(0.028)	(0.027)	(0.034)	(0.184)	(0.126)	(0.072)
Prov-Year-Track FEs	Y	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y	Y	Y
Observations	4,593	4,410	4,260	4,250	4,519	388	388	388
R-squared	0.109	0.111	0.096	0.089	0.129	0.481	0.399	0.554

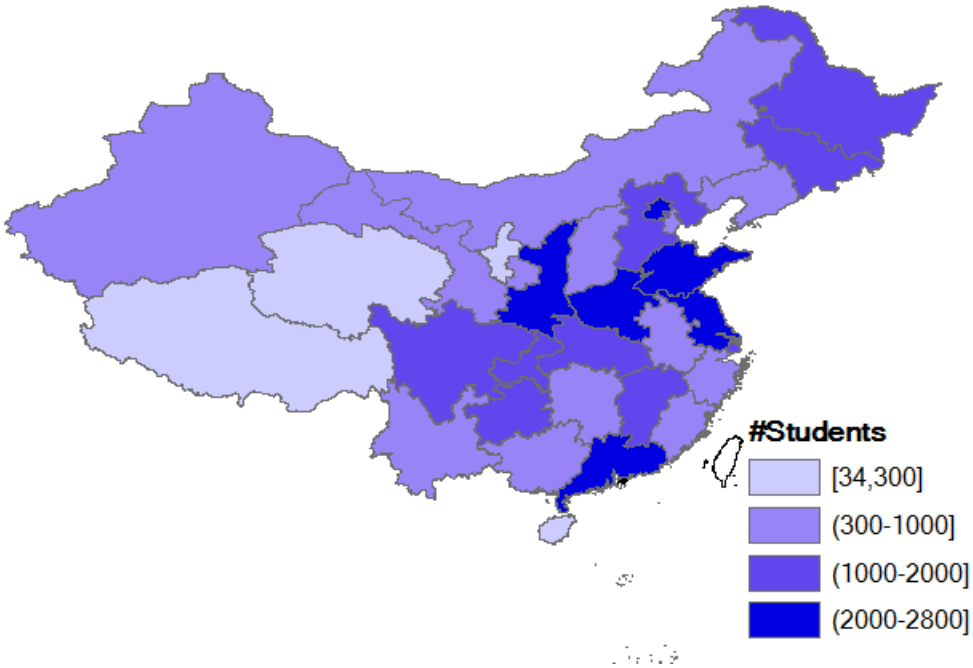
Notes: This table presents the results on reported discrimination in job searching around the cutoff. The place that exhibits a large (but not very precisely estimated) discontinuity is discrimination of universities, which is also consistent with the signaling effect of elite universities. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Appendix

Figure A.1: The Distribution of Universities and Students in Our Survey



(a) Distribution of the 90 Universities

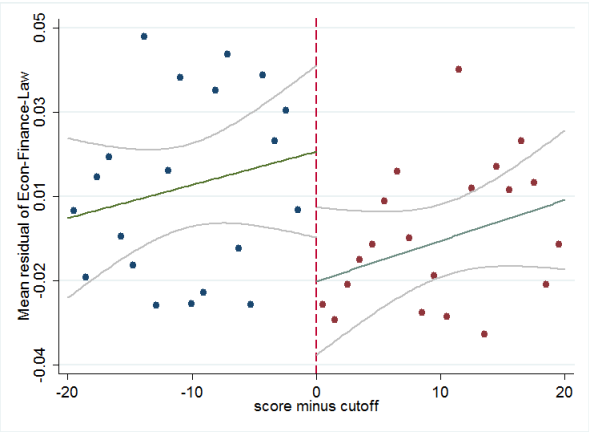


(b) Number of Students by Province of Exam

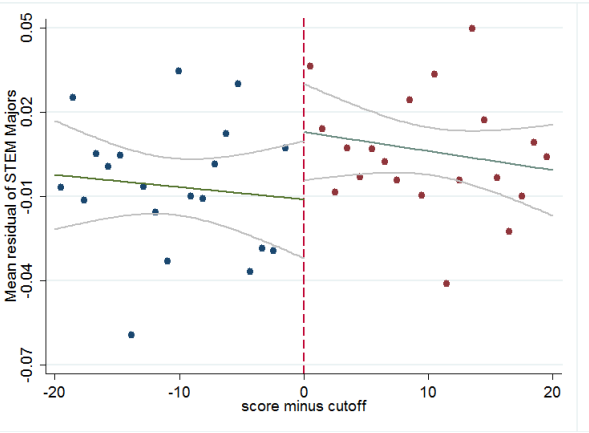
Notes: Figure (a) plots the distribution of the 90 universities in our survey by provinces. Their students come from all provinces across China. Figure (b) plots the number of students by the province of origin (where they took the exam).

Figure A.2: The Impacts on Major, Location and Relative Rank in College

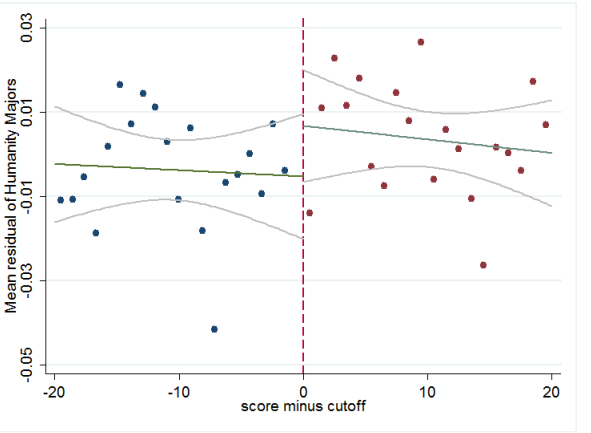
(a) Major: Econ-Mangement-Law



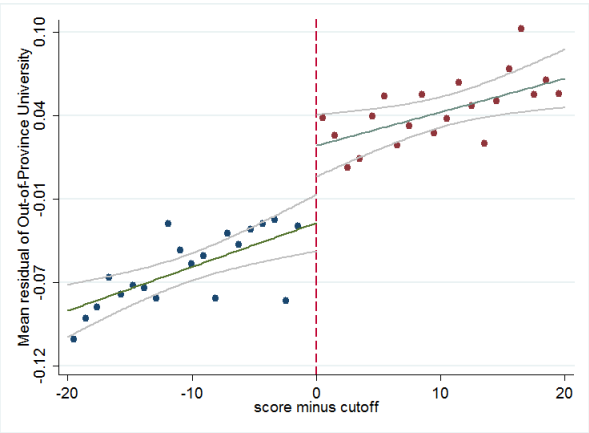
(b) Major: STEM



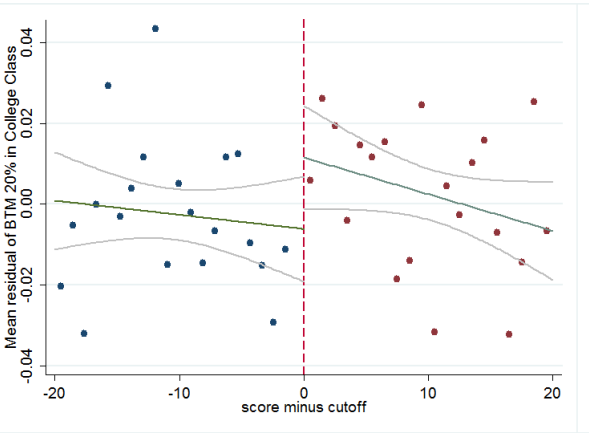
(c) Major: Humanity



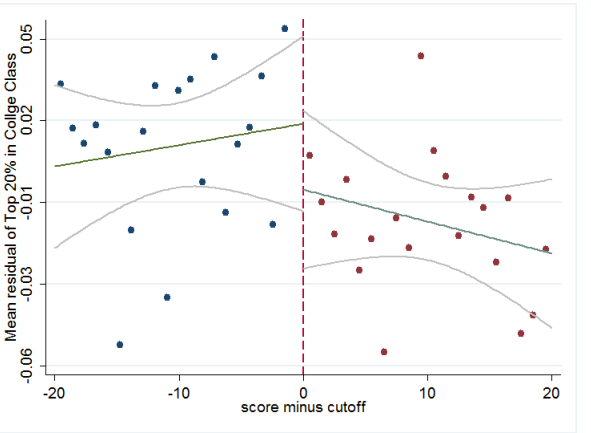
(d) University Out of Home Province



(e) Perceived Ranking in College Class: btm 20

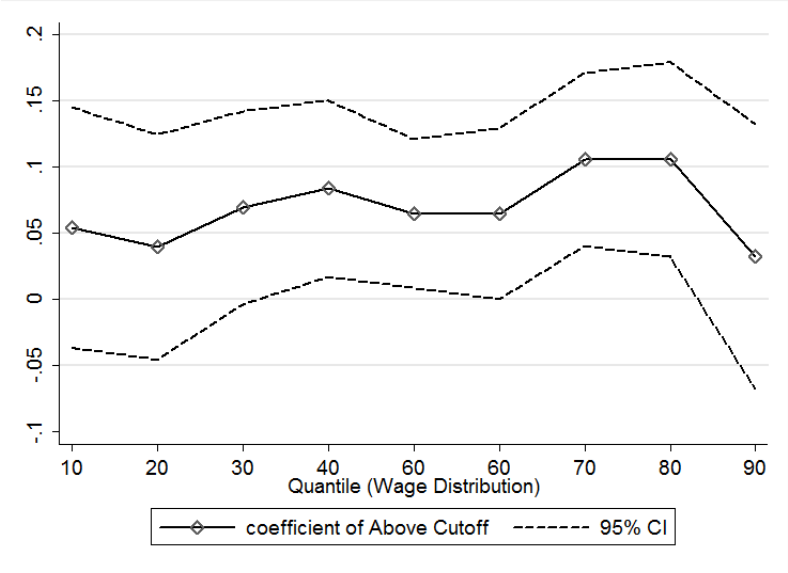


(f) Perceived Ranking in College Class: top 20



Notes: This figure plots the discountability pattern for major, university location and ranking in college class. The estimation results are presented in Table 3.

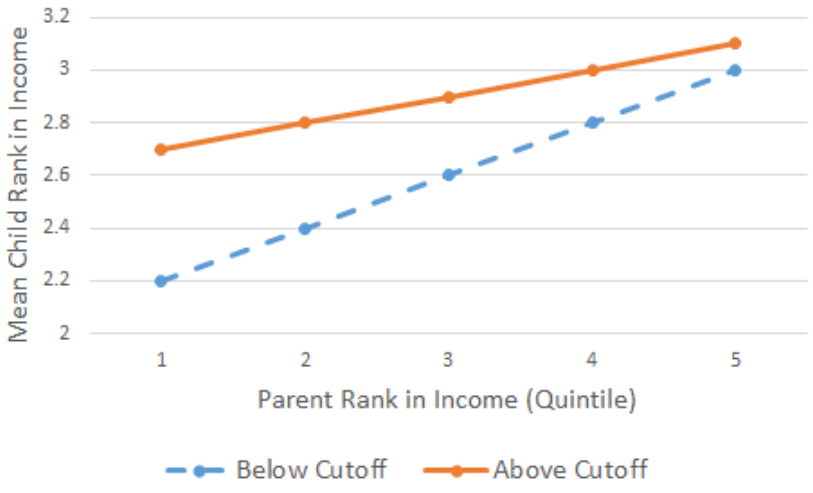
Figure A.3: The Impacts of Elite Education Eligibility on Wage across Wage Distribution



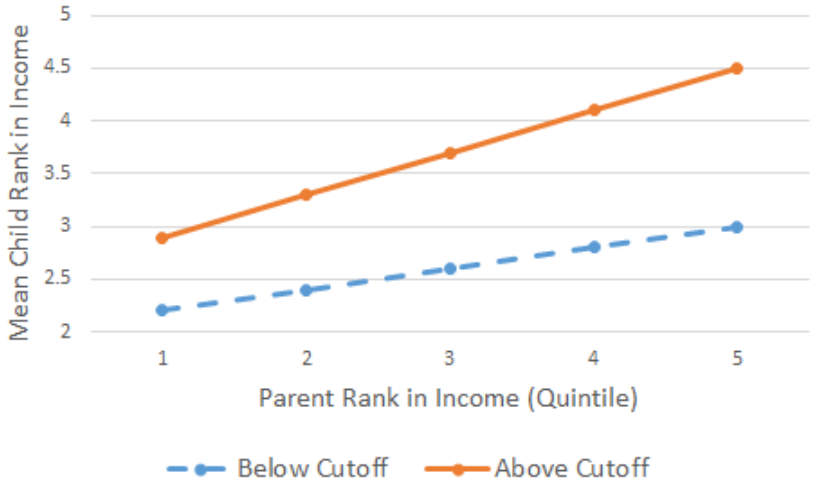
Notes: This figure plots the reduced-form estimates across wage distribution (while controlling for province-year-track FEs and a second-order polynomial and interaction). They show that the baseline is not restricted to a very specific segment of the wage distribution.

Figure A.4: Two Hypothetical Scenarios on Intergenerational Mobility

(a) An Attenuation Effect



(b) An Strengthening Effect



Notes: This figure plots two hypothetical scenarios. In both cases, access to elite education increases one's wage rank. However, it increases the intergenerational mobility in case (a) but decreases the intergenerational mobility in case (b).

Table A.1: Roll-out of Surveys 2010-15

	#Universities	#Students Per University	Total #Students
2010	19	319	6,060
2011	50	164	8,176
2012	50	173	8,650
2013	65	164	10,679
2014	17	212	3,607
2015	13	288	3,744
Total	90		40,916

Notes: This table reports the number of universities and the number of students in survey year. The selection of schools, however, is unlikely to affect our strategy exploring individual-level information on exam performance.

Table A.2: University Characteristics in Our Survey

	(1) 26 elite universities	(2) 64 non-elites	(3) Difference
# All students (Median)	19,380	18,655	724
	(9,712)	(14,632)	(3,270)
# Graduate students (Median)	4,733	4,598	135
	(2,418)	(3,392)	(769)
# Foreign students (Median)	590	182	408***
	(653)	(344)	(114)
Median Tuition	5,020	6,196	-1,176*
	(443)	(3,444)	(680)
Share of Students from Other Provinces	0.64	0.31	0.33***
	(0.24)	(0.24)	(0.05)
Median Exam Score	590	491	98***
	(26.3)	(71.6)	(14.5)
Median Wage	3,271	2,423	848***
	(818.6)	(636.9)	(161.8)

Notes: This table shows the difference between elite universities and non-elite universities in our survey. As discussed in Section 2, the elite universities are public in China. They are not small in scale and do not charge higher tuition fees. But they do have very different students.

Table A.3: Defining Elite Occupation, Industry, Ownership

	(1) Share(%) realized job	(2) Share (%) hoping to get a job in:	(3) Realized/Hope
(a) Occupation			
1 Mid-senior management personnel	3.65	22.08	0.17
2 Junior management personnel	1.24	11.83	0.10
3 Clerks	28.43	7.07	4.02
4 Professional	49.26	37.21	1.32
5 Technical staff	2.36	1.67	1.41
6 Foreman / group leader in factories	0.98		
7 Service personnel	4.08	1.53	2.67
8 Business Owner/Self-Employed	1.36	13.94	0.10
9 Skilled workers	6.65	1.51	4.40
10 Manual workers	0.44	0.4	1.10
11 Military / Police	0.4	2.3	0.17
12 Others	1.14	0.48	2.38
(b) Industry			
1 Ag, forestry, husbandry and fishery	2.51	2.23	1.13
2 Mining / Manufacturing / Construction	24.89	10.18	2.44
3 Electricity, gas and whose production and supply	5.08	4.32	1.18
4. Transport, storage and postal	3.99	2.11	1.89
5 Information, computer and software industry	15.45	11.35	1.36
6 Wholesale and retail trade	5.35	2.76	1.94
7 Accommodation and catering industry	1.98	2.25	0.88
8 Financial industry	9.17	14.08	0.65
9 Real estate	4.24	3.55	1.19
10 Rental and business services	1.85	1.07	1.73
11 Education	5.2	8.5	0.61
12 Health industry	5.27	3.62	1.46
13 Cultural, sports and entertainment	3.41	7.64	0.45
14 Scientific and technical services	4.97	6.56	0.76
15 Public Facilities Management	1.91	1.97	0.97
16 Residents and other services	1.75	1.9	0.92
17 Governments / public organizations	1.99	14.83	0.13
18 Others	0.99	1.09	0.91
(c) Ownership			
State-owned	41.67	63.85	0.65
Foreign-owned	10.78	16.26	0.66
Private-owned	47.55	19.89	2.39

Notes: This table lists the occupation, industry and ownership in our survey. Those underscored are those occupation/industry/ownership in which many people hope to work but few manage to, which indicates the elite status. These categories are also consistent with common understanding of China. We examine how they are affected by exam scores in our analysis.

Table A.4: More Results from Balance Tests

	(1) Male	(2) Age	(3) Repeated	(4) Rural	(5) Ln(Father Income)	(6) Ln(Mother Income)	(7) Ln(Family Income)	(8) Parent College Edu	(9) Parent Party Mem.
(a) sample within a 20-point bandwidth, n=10,335									
Above Cutoff	-0.007	0.001	-0.035	0.014	0.031	0.038	0.023	-0.015	-0.004
	(0.029)	(0.076)	(0.033)	(0.026)	(0.067)	(0.083)	(0.060)	(0.020)	(0.024)
(b) sample within a 20-point bandwidth & with wage offers, n=5,080									
Above Cutoff	-0.028	-0.112	-0.011	0.000	0.089	0.130	0.070	-0.027	-0.036
	(0.042)	(0.094)	(0.044)	(0.035)	(0.084)	(0.125)	(0.068)	(0.020)	(0.035)
Prov-Year-Track FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table reports more results from balance tests. There is no notable discontinuity in terms of observed individual characteristics and family background. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.5: Response by Individual Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Elite University			Major: econ-manage.-law			Univ: out of home province			Reported rank in college: btm 20%		
Above Cutoff*Rural	-0.018			0.014			0.015			0.001		
	(0.033)			(0.023)			(0.019)			(0.009)		
Above Cut*Female		0.019			0.024			0.022			-0.009	
		(0.024)			(0.021)			(0.021)			(0.009)	
Above*ln H Income			0.009			-0.005			-0.001			-0.004
			(0.017)			(0.009)			(0.009)			(0.003)
Above Cutoff	0.169***	0.151**	0.158***	-0.049	-0.051	-0.031	0.063**	0.062*	0.070**	0.047***	0.052***	0.049***
	(0.038)	(0.053)	(0.040)	(0.034)	(0.031)	(0.026)	(0.031)	(0.035)	(0.032)	(0.016)	(0.015)	(0.014)
Rural	-0.019			-0.015			-0.043***			-0.000		
	(0.017)			(0.015)			(0.016)			(0.007)		
Female		-0.013			0.035**			-0.035**			-0.059***	
		(0.012)			(0.017)			(0.015)			(0.007)	
ln HH Income			0.011			0.026***			0.009			0.003
			(0.009)			(0.006)			(0.007)			(0.003)
Prov-Year-Track FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quadratic Interact.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10,335	10,335	9,383	10,314	10,314	9,363	10,335	10,335	9,383	10,059	10,059	9,154
R-squared	0.345	0.344	0.340	0.240	0.243	0.244	0.525	0.525	0.527	0.053	0.069	0.058

Notes: This table shows there is no significant heterogeneity across individual background in attending an elite university once one is above the cutoff. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.6: Post-graduate Plan and Job Searching

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Post-Graduate Plan								Job Search/Offer			
	Work in China		Graduate Study		Abroad		Unclear		Searched for Jobs		Offer after search	
Mean	0.70		0.19		0.03		0.05		0.74		0.74	
Method	Local	Parametric	Local	Parametric	Local	Parametric	Local	Parametric	Local	Parametric	Local	Parametric
Above Cutoff	-0.028	-0.050*	-0.001	0.007	0.004	0.005	0.020**	0.028**	-0.034*	-0.055	-0.035	-0.042
	(0.019)	(0.026)	(0.017)	(0.021)	(0.007)	(0.007)	(0.009)	(0.014)	(0.019)	(0.034)	(0.022)	(0.033)
Prov-Year-Track FE		Y		Y		Y		Y		Y		Y
Linear Interaction		Y		Y		Y		Y		Y		Y
Quadratic Interact.		Y		Y		Y		Y		Y		Y
Observations	10,335	10,335	10,335	10,335	10,335	10,335	10,335	10,335	10,179	10,179	7,265	7,265
R-squared		0.080		0.095		0.051		0.050		0.084		0.080

Notes: This table reports the results on the post-graduate plan and whether one has searched for a job. It suggests that the wage premium in our baseline results is unlikely due to different search effort of students around the cutoffs. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.7: The Effect of Elite Education Eligibility on Wages: Including Other Dimensions
Dependent Var.: ln Wage

	(1)	(2)	(3)	(4)	(5)	(6)
Major FEs (13)		Y			Y	
Univ. Province FEs (26)			Y		Y	
College Class Rank FEs (5)				Y	Y	
University FEs (82)						Y
Above Cutoff	0.067**	0.070**	0.059**	0.082***	0.075***	0.029
	(0.027)	(0.027)	(0.027)	(0.026)	(0.027)	(0.026)
Province-Year-Track FE	Y	Y	Y	Y	Y	Y
Linear Interaction	Y	Y	Y	Y	Y	Y
Quadratic Interaction	Y	Y	Y	Y	Y	Y
Observations	5,078	5,075	5,080	4,994	4,991	5,080
R-squared	0.273	0.290	0.290	0.275	0.309	0.320

Notes: This table shows that including majors and relative ranking in college marginally increases our baseline finding, consistent with the fact that those just above the cutoffs are worse compared with their peers. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.8: Using the Method in Lee (1999) to Estimate the Bounded Wage Effect

Dependent Var.	(1)	(2)	(3)
	Residual log wage (isolating province-year-track FEs)		
	OLS	Lower bound	Upper bound
Above Cutoff	0.067***	0.053***	0.086***
	(0.009)	(0.024)	(0.025)
Observations	5,080	10,335	10,335

Notes: This table presents the bounds of the wage effect following the procedure in Lee (1999). Given these results, the concern that we only observe wages for those who get job offers is unlikely to invalidate our approach. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.9: The Correlation between Wages for the First Job and the Future Jobs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Wage Rank		Elite Industry		Elite Occupation		Elite Ownership	
Years after post job	1-5	6-10	1-5	6-10	1-5	6-10	1-5	6-10
First Job	0.818***	0.782***	0.611***	0.468***	0.683***	0.440***	0.626***	0.342***
	(0.004)	(0.011)	(0.005)	(0.016)	(0.005)	(0.011)	(0.004)	(0.010)
First Job*Elite Uni.	0.041***	0.054***	0.000	-0.026	0.017**	-0.034**	0.011	-0.008
	(0.006)	(0.016)	(0.009)	(0.025)	(0.008)	(0.016)	(0.008)	(0.014)
Age, Age*Elite	Y	Y	Y	Y	Y	Y	Y	Y
Sex, Sex*Elite	Y	Y	Y	Y	Y	Y	Y	Y
University FEs	Y	Y	Y	Y	Y	Y	Y	Y
Observations	146,897	28,058	146,897	28,058	146,897	28,058	146,897	28,058
R-squared	0.657	0.525	0.451	0.375	0.454	0.326	0.447	0.258

Notes: This table shows that there is a strong correlation between the characteristics of the first job and the outcomes in the future. The data come from a major online job search platform. Wages are reported in categories: 1 for below 1000 RMB, 2 for 1000-2000 RMB, 3 for 2001-4000 RMB, 4 for 4001-6000 RMB, and 5 for 6000 RMB and above. Elite industry/occupation/ownership are defined the same way as in Table A4. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.10: The Impact of Elite Education Eligibility on Intergenerational Mobility: Occupation, Industry and Ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Elite Occupation			Elite Industry			Elite Ownership		
Mean	0.06			0.17			0.54		
Above Cutoff * Elite Parent (Occ)		-0.004	0.005						
		(0.018)	(0.018)						
Elite Parent (Occ)	0.020**	0.022	0.008						
	(0.008)	(0.014)	(0.013)						
Above Cutoff * Elite Parent (Industry)					0.019	0.003			
					(0.046)	(0.041)			
Elite Parent (Industry)				0.109***	0.099***	0.073**			
				(0.027)	(0.037)	(0.032)			
Above Cutoff * Elite Parent (Ownership)								-0.045	-0.014
								(0.037)	(0.036)
Elite Parent (Ownership)							0.130***	0.156***	0.082***
							(0.023)	(0.028)	(0.029)
Above Cutoff	-0.005	-0.004	0.003	-0.020	-0.023	-0.027	0.054*	0.065**	0.004
	(0.008)	(0.008)	(0.025)	(0.022)	(0.022)	(0.027)	(0.028)	(0.030)	(0.044)
Prov-Year-Track FEs			Y			Y			Y
Linear Interaction			Y			Y			Y
Quadratic interaction			Y			Y			Y
Observations	4,946	4,946	4,946	5,025	5,025	5,025	5,039	5,039	5,039
R-squared	0.001	0.001	0.112	0.011	0.011	0.207	0.011	0.016	0.122

Notes: This table shows that (i) there is a significant correlation between parents' elite status with the children's elite status; (ii) being above the cutoff does *not* promise an elite industry, occupation or ownership, and (iii) the intergenerational link is *not* changed by exam performance around the cutoff. See Table A4 for the definition of elite status. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.