# Access to Elite Education, Wage Premium, and Social Mobility: Evidence from 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 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 elite education increases the monthly wage by around 40%. While elite education eligibility does significantly affect mobility, it does not alter the influence of parental background. We also provide suggestive evidence that the wage premium is more likely to be explained by 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; Anelli 2016; Zimmerman 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 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). We are not aware of existing studies using systematic data to support either view and hope to provide evidence to this debate.

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, which admit around 5% of the exam-takers in recent years. 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

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

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 affected by competition – in fact, there is still a lot of uncertainty of being accepted even if one is eligible to apply (we will show these complexities do not invalidate our empirical strategy). 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 six 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: scoring above the elite university cutoffs raises the admission probability by 16 percentage points, about 75% of the mean probability.[3] 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. Exploring this discontinuity, we find that elite education increases the monthly wage by about 40% of the median monthly wage. Our results are robust to employing alternative bandwidths and specifications of the running function,[4] considering missing wages, as well as controlling for the cost of living.

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. 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, 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

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

[3]Note that being above the cutoff only affects the eligibility but not necessarily the acceptance, which explains why the increase is still far from 1. See Section 2.1 for more discussion.

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

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.

We further attempt to understand how elite education eligibility affects 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.

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.[5] 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 that the intergenerational income (or income rank) link is *neutral* to elite education eligibility. In this sense, elite education neither weakens nor strengthens the intergenerational (relative) mobility; elite education and family background play additive roles in determining one's mobility.

Besides wages, we also collect data on other job characteristics such as occupation, industry and employer's ownership for two purposes. First, they help us uncover the variation in wage premium. Second, they also capture some dimensions that are important for a young person's status in China but may not be measured by wage. Given the same wage, for example, a state-owned enterprise is usually preferred to a private one because it is associated with the provision of perks from government monopolies. We find that the wage premium mainly stems from variation within occupation, industry and ownership. Similar to the results on income mobility, we do not find that elite education alters the intergenerational link in terms of occupation, industry and ownership.

To explore why elite education has a wage premium, we consider three potential 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

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

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, our evidence appears consistent with the role of university-related networks and signaling. Given the challenges of measuring all the possibilities of these mechanisms, this part of analysis is merely suggestive.

There are at least two important limitations of our design. First, we conduct our surveys to get data. By the nature of the survey, we are concerned about misreporting and examine it in detail. Second, our survey design only allows us to investigate the wage of the first job for fresh college graduates. To shed light on the impact in the long run, we use another dataset with job histories of around 300,000 individuals from a major recruitment platform and document the importance of the first job for future outcomes.

Our findings contribute to several strands of literature. First, we add to studies estimating the economic returns to elite education mentioned above.[6] A few recent studies use the RD method to estimate the returns to elite education. For instance, Hoekstra (2009) finds the premium of one elite state university in the US is around 20% for white male; Anelli (2016) finds one elite college in Italy has an earning premium of 52%; Zimmerman (2016) documents that admission into two elite colleges in Chile increases the probability of attaining a top 0.1% income by 45%. Two exceptions are Hastings, Neilson and Zimmerman (2013) on the returns by degree programs in Chile and Kirkeboen, Leuven, and Mogstad (2016) on the returns to field of study in Norway.[7] While our estimate on wage premium seems to be in a similar range, our context is different: there are nationally designated elite universities in China, and there are cutoff scores for college admissions of all elite universities as a group. Thus, we could estimate the effect with a large group of elite colleges, which is in contrast to most of the existing literature.[8]

Second, and more importantly, 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 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

[6] 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.

[7] As pointed out by the latter, it is challenging to identify the treatment effect in unordered choice models (such as majors). Our focus is a binary treatment (elite vs. non-elite) as our interest is to understand whether access to elite education changes a young person's fate (including the influence of parental status) rather than estimate the returns to each major. We will discuss the influence of majors when estimating the elite education wage premium.

[8] Unfortunately we cannot estimate the returns for each university. See Sections 2.1 for discussion on this issue and the heterogeneity within the group of elite universities.

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. Our definition of elite colleges is comparable to theirs (i.e., the Ivy League plus Stanford, MIT, Chicago, Duke, and 65 other Tier-1 universities). 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 our approach is that the finding is by design local to those around the elite university cutoff.[9] 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, while elite education does play an important role in one's mobility, it does not significantly change the influence of parental background.

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 mobility. Section 5 presents evidence on the mechanisms for the elite wage premium. Section 6 concludes the paper.

# 2 Background and Data

Section 2.1 describes elite universities in China, explains why we focus on the first-tier cutoff, and summarizes the college admission process. Section 2.2 presents our survey and describes the main variables. We leave the less essential descriptions in the Appendix.

[9]By design, we are studying students who have achieved the scores around the cutoff. In our data, we do observe that students from rural areas and poor families are less likely to be able to achieve these scores. This is clearly an important dimension in social mobility omitted by our RD approach.

## 2.1 Elite Universities and University Admission in China

A total of around 2,300 colleges were registered in 2010 in China and the quality of these colleges varies substantially.[10] All of them recruit students based on the score of the National 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 is only regarded as first-tier in certain provinces but not others.

**Definition of Elite Universities** 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.[11] 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). In our survey, 26 out of 90 universities belong to the elite group defined by the national first-tier criterion: 25 of them belong to the Project-211 group and 21 are under the control of the central government. 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.[12]

There is certainly heterogeneity within the group of elite universities, which can be roughly divided into three categories: top 9 universities (known as the C9 league) that were designated as the first batch of Project-985 universities in May 1998, top 10-39 universities that were added to the Project-985 list later, and top 40-100 universities. We choose to focus on the whole elite group together rather than a narrower subgroup such at the C9 league for two reasons. First, the eligibility cutoff for the whole group is well defined while there exists no similar cutoff for the subgroups. On average, the minimum scores for the C9 group are higher than those for the rest but these minimum scores are endogenously determined by competition. Second, the whole group is already very selective (admitting 5% of the exam-takers). Besides the very top universities, our definition of elite universities

[10] 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

[11] 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.

[12] This ratio also varies greatly across provinces. 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.

also includes the flagship universities that are important for local labor market, which helps us understand the labor market outcomes across Chinese provinces.[13]

**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 an admission cutoff score for each layer and each track (social or natural science, determined at the end of the first year of high school). 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 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.[14] As discussed below, we will compare students around the cutoff within a province-year-(social or natural science) track.

Note that the scores are only comparable within province-year-track for three reasons. 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 six subjects,[15] while the other four provinces

[13]We also check the probabilities of getting into elite universities of different ranks within the 20-point bandwidth in our data. Within this bandwidth, as expected, even for those scoring above the elite cutoff, the probability of going to a top-9 university with a score in this bandwidth is minimal. About 12% of those above the cutoff score went to top 10-39 universities, and 22% went to top 40-100 universities. See Appendix section B for details.

[14]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.

[15]For students in the natural science track, the six subjects are Chinese (with a maximum of 150 points),

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.

**Tuition, Graduation Rates, and Studying Abroad** In Appendix Section A, we present more information on tuition, graduation rates and other characteristics of Chinese universities to show that these factors are not critical for our study. In sum, elite universities in China are public and not expensive (and even slightly less expensive than the non-elite ones); as a system known for "strict entrance, easy out', the probability in graduating is above 95% and varies little between elite and non-elite universities. Appendix Section A also explains why the probability of studying abroad is not essential for this study.

## 2.2 Our Surveys

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), implemented 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

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

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

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 (the numbers of sampled colleges are reported 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 (around 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.

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]

Appendix Figure A.1(a) plots the spatial distribution of the 90 colleges by province. As expected, we surveyed more colleges from regions such as Beijing and Shanghai where there are more colleges. Their students come from all 31 provinces across China (Appendix Figure A.1(a)).

**Response Rates** 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

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

a $p-$value of 0.26). Note that we do not need a 100% response rate for our analysis. Our key identification assumption is that those around the cutoff scores are comparable in all dimensions before entering colleges except for their exam scores. We will test this assumption in Section 3.1. 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.

**College Entrance Exam Score** We collected information on the total exam score for each individual. 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 fall into the 20-point bandwidth centered at the cutoff score. We will use this 20-point bandwidth (roughly 3.3 points per subject), close to the optimal bandwidth from the Imbens-Kalyanaraman method (21), as our baseline bandwidth. For consistency, the summary statistics reported in 1 also refer to this sample, by above and below the cutoff.

**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.[18] We will conduct bounding exercises to deal with the selection of wage availability.

We asked detailed information on job location, industry, occupation, and employer ownership, which will be used for us to understand what drive the wage premium. These variables are described in Appendix Table A.2. A limitation of our survey is that we cannot track an individual once he or she is on the labor market. We will examine the importance of the first job for future outcomes in Section 4.4 with alternative data.

**Other Information** Appendix Section B presents more detailed description on the university characteristics (summarized in Appendix Table A.3), majors, academic performance in college, and parental background. It also discusses repeated exam takers in our data.

[18]To minimize the influence outliers, we exclude 5% of the data (2.5% in both tails of the wage distribution) in our baseline analysis and also present the results using log wage and ranks in our analysis.

# 3 The First Stage: Exam Scores and Access to Elite Education

We describe our research design in Section 3.1, with evidence for the key assumptions, after which we present the impact of exam scores on access to elite education in Section 3.2. We turn to the possible impacts on other dimensions such as major in Section 3.3 and investigate whether strategic choice is a critical concern in Section 3.4 before studying wages.

## 3.1 Research Design

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

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

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. The indicator function $I(Score_i \geq Cut_{p,y,tr})$ equals 1 if the score is above the cutoff.

We focus on a 20-point bandwidth in our baseline and present the results using alternative bandwidths for robustness checks. 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/add quadratic-interaction terms between $(Score_i - Cut_{p,y,tr})$ and $I(Score_i \geq Cut_{p,y,tr})$ , 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.

Our RD design 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. Because the criteria for extra scores are determined before the exam, it is not that one can change them after knowing the score. Thus, this possibility does not create an empirical challenge.

It is also possible, especially for our focused sample, that some students with scores above the cutoff do not get into an elite university. To make sure all colleges can recruit enough students, the cutoff score for each tier (including the elite tier) is set at the level of 105-120% of the admission quota in that tier. Consequently, at least between five to twenty percent of students passing the elite college cutoff score cannot get into elite colleges. This means that for those who just pass the cutoff score, the focus of our RD design, their chance of getting into an elite college is *far below* 100%. Success for them depends on competition of a college/major in their preference form.[19]

If competition is the only reason why some above the cutoff do not get into elite universities, in which case the failure is driven by exogenous factors (e.g., the quality of a cohort in a province), our strategy works well. However, personal preferences about college major and location also matter for the chance of getting into an elite college. For instance, there is a tradeoff between major and university, especially for those around the cutoff score. Within a university, different majors face different demand situations. 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 3.3. We will also check whether personal strategic choice is a critical concern for our results in Section 3.4.

**Validating the Assumptions: Score Distribution and Balance Tests** There are two important assumptions underlying our strategy. The first is no systematic misreporting of the exam scores around the cutoff; the second is that students around the cutoffs are comparable in individual and family characteristics. We examine both in the data.

Following the distribution of all the scores in Figure 1(a), we take a closer look at the score distribution within the 20-point bandwidth in Figure 1(b). As shown, there is no significant discontinuity in the sample frequency for 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

[19]Students could strategize based on historical data, but it is generally very difficult to predict the level of competition given the large dispersed potential choices. Each specific combination of college and major normally only recruits a few students from a province but hundreds of thousands of students are filling in their preferences at the same time.

separately in Figures 1(c)-(d). Consistent with our design, the probability of entering an elite university with a score below the cutoff is small, while the probability is high when the score is above the cutoff. The difference in the probability of going to an elite university between those above and those below the cutoff score is sizable (34% vs. 4%) but still far from 1. This reflects the uncertainty around the cutoff discussed above.

To check whether the students around the cutoffs are comparable in individual and family characteristics, we examine whether there is a discrete jump for a set of individual/family characteristics at the cutoff score. We replace $EliteUniv_{i,p,y,tr}$ with nine different individual and family characteristics in specification (1), and in columns (1)-(9) of Appendix Table A.4 we present the results (including quadratic interactions). As shown, there is no discontinuity for gender, age, being a repeated exam-taker, being in the rural area before college, father's/mother's income, father/mother having a college degree, or whether father/mother being a Communist Party member. In addition, we use these observables to predict the wage outcomes and examine whether the predicted wage exhibits any discontinuity around the cutoff. Again, there is no discontinuity around the cutoff either (column (10)). Appendix Figure A.3 further visualizes such patterns.

## 3.2 The Impact on Access to Elite University

**Baseline Finding** Different from the balance tests regarding individual characteristics, 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 probability of attending an elite university is around 0.04 and is fairly stable across scores; above the cutoff point, the probability of attending an elite university ranges between 0.19 (for score at the cutoff) and 0.43 (for 20 points above the cutoff). The difference between one point above and below the cutoff is about 0.15. Again, this magnitude is consistent with uncertainty of enrollment even conditional on eligibility (determined by scoring 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, we control for province-year-track fixed effects and examine the residuals. To increase the number of observations, we plot the residuals by bins (with 4-point in each bin) in Figure 2(b) (and all the other figures with residuals). As shown, the pattern after controlling for province-year-track fixed effects is very similar to that in Figure 2(a).

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 the first-order polynomial and interaction terms; and column (5) adds the 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 the polynomial and interaction terms.

**Further Checks on Measurement Concern: Placebo Cutoffs** The sharp discontinuity at the cutoff and the smoothness at other points in Figures 2(a)-(b) also confirm that misreporting around the cutoff is unlikely to be critical for our findings. We further conduct placebo tests using values 5-points above and below the actual cutoffs as placebo cutoff scores and find no similar discontinuity. Moreover, we also explore 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, suggesting that it is difficult to predict the actual cutoff. 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.

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. Methodically, 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. Thus, while misreporting could well exist in our data, it does not invalidate our empirical strategy. We will discuss the measurement of wages after presenting the wage premium results.

## 3.3 Majors, University Location, and College Class Ranking

As explained in our research design, 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 a worse 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-Law 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 not always significant. On average, the probabilities of majoring in Economics-Management-Law for those above the cutoff and below the cutoff are 21% and 26% respectively. However, the difference is not always precisely estimated and the magnitude is not large (around 0.03), 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: being above the cutoff increases the probability of attending a university outside the home province by 0.08, around 20% of the mean (0.38). This finding is consistent with the fact that elite universities are concentrated in the 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 (see 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 ranking. This is indeed what we find.

## 3.4 Checking the Importance of Heterogeneous Response

One concern is why some students above the cutoff score ended up in non-elite colleges, while others went to elite colleges. We would hope the difference is all driven by random reasons such as competition. However, it is still possible for strategic choice or personal preferences to matter, in which case the identified effect cannot be inferred for non-compliers.

To address this concern, we examine whether the effect of scoring above the cutoff on going to an elite university differs greatly with individual characteristics (gender, rural

residence, family income as well as risk preferences[20]), and whether individual characteristics affect the probabilities of majoring in Economics-Management-Law, going to an university outside one's home province, and being the bottom 20% in college class. Specifically, we include interactions of $I(Score_i \geq Cut_{p,y,tr})$ and individual characteristics in regressions.

Conditional on scoring above the cutoff, there is no significant heterogeneous response in terms of individual and family characteristics; being above the cutoff or not is the primary determinant of elite education enrollment. These results are reported in Appendix Tables A.5 and A.6 and discussed in Appendix Section C.

In light of these findings, it is reasonable to focus on investigating the average effect of elite education on labor market outcomes.

# 4 The Impacts on Wages and Mobility

We estimate the elite university wage premium in Section 4.1, which speaks to existing studies on the returns to elite education. Then in Section 4.2, we center on income mobility, which has been less studied by the existing literature. We discuss the results on occupation, industry and ownership in Section 4.3, and document the importance of the first job for future outcomes in Section 4.4.

## 4.1 Estimating the Wage Premium

**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 affect the choice to work? We asked students' post-graduation plans in the survey (working in China, going to a graduate school in China, going abroad etc.).

On the extensive margin, we find that those above the cutoff are slightly less likely to search for a job. This difference is mainly explained by the fact that elite university students are slightly more likely to report an unclear plan, which may reflect their higher reservation value. Appendix Table A.7 reports the results on different plans and Appendix Section D discusses the measurement and results.

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 the same table as the balance

[20]To measure risk preferences, we use questions on lottery choices and investment decisions, and describe these questions in detail in Appendix Section C.

test for the first stage (reported in Appendix Table A.4). Similar to the balance tests in panel (a) for the first stage, the individuals with wage information near the cutoff scores are also comparable in all these attributes.

Given these results, we first focus on the sample with wage offers in our analysis. In addition, we conduct a bounding exercise to check the quantitative importance of missing wages for a proportion of the sample.

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

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

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 3 visualizes the mean wage and log wage by scores after isolating province-year-track fixed effects. Similar to that for elite university enrollment, we see a discontinuity around the cutoff values.

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 cutoff 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 such as major and ranking discussed in Section 3.3. We examine how those factors affect our finding on wage premium. For simplicity, we 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 3.3, 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).

Including the major and ranking fixed effects marginally increases the baseline results (reported in Appendix Table A.8). The finding is consistent with our earlier result that the disadvantage in major and ranks exists (recall the effects on major and ranks in Table 3). It also suggests that the effect of such disadvantage is dominated by the benefits of elite education eligibility. Hence, the wage premium reflects an effect of attending different universities rather than that of majors or academic performance.[21]

**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 4(a)-(b), we plot the first-stage and the reduced-form estimates using different bandwidths ranging from 5 (roughly 0.8 points per subject) to 40 points (6.7 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 (visualized in Appendix Figure A.4). 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 the top or bottom) 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 the bottom (top) gives us the lower (upper) bound of the treatment effect of elite education eligibility.

[21] One may also wonder the returns to doing well in college. In our data, for instance, the interaction effect of scoring above the cutoff and being the bottom 20% is weakly negative. But our design is not ideal to study this question, given that scoring above the cutoff also affects the ranking. Thus, we do not focus on these interaction effects but emphasize that the elite education premium is not driven by ranking (or major).

The results are presented in Appendix Table A.9. We focus on the difference in residual log wage after isolating province-year-track fixed effects and find that the bounded estimate ranges from 0.053 to 0.086, not very far from our baseline estimate (0.067). Thus, this selection concern is unlikely to invalidate our approach.

**Cost of Living** Is it possible that our finding on wage premium is mainly driven by difference in the cost of living? Our previous analysis controlling for (home) province-year-track fixed effects has partially dealt with this concern: among those who got job offers, 61% of the best offers come from employers in their home province. Thus, province-year fixed effects account for part of the difference in the cost of living across provinces.

We further address this concern by using a provincial-specific CPI available yearly during 2010-2014 from Brandt and Holz (2006) to calculate real wages,[22] and by controlling for 31 province-of-job fixed effects. Regression results suggest that the wage premium is unlikely to be explained by the cost of living (reported in Appendix Table A.10). If anything, the wage premium appears slightly higher when the potential price effect is controlled for.

**Misreporting of Wages** Misreporting of wages is possible. It cannot explain our findings unless one makes a specific assumption that those above the cutoff over-report their wages but those below the cutoff under-report their wages. We cannot directly test this assumption and would like to make two remarks. First, we design our survey to be anonymous to minimize this concern. The students do not have any benchmark wage information to form a bias toward specific directions. In addition, the same bias would also predict that we should find similar patterns in other aspects such as other job characteristics and performance in college. As evidenced by our earlier finding on ranking and additional results below, this is not the case.

## 4.2 The Impact on Income Mobility

**Two Dimensions of the Question** How does elite education eligibility affect 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 the income distribution.

[22]The CPI information is available annually at http://ihome.ust.hk/~socholz/SpatialDeflators.html, extending from Brandt and Holz (2006). To the best of our knowledge, the information on CPI is only available at the province level.

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 effect. Instead, one may also expect a strengthening effect. We illustrate the two theoretical possibilities in Appendix Figure A.5.

We examine the pattern in the two dimensions in the data, focusing on income in this subsection. 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. 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).

**Nonparametric Description** 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 (with wage information) 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. All the results below are robust to using deciles and a log-log framework.

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.

Before presenting the estimation results, we first present in Figure 5(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 5(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 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 5(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:

$$\begin{aligned} ChildRank_{i,p,y,tr} = \beta_1 I(Score_i \geq Cut_{p,y,tr}) \times ParentRank + \beta_2 ParentRank + \beta_3 I \\ + \theta_1 f(Score_i - Cut_{p,y,tr}) + \theta_2 f(Score_i - Cut_{p,y,tr}) \times I + \lambda_{p,y,tr} + \varepsilon_{i,p,y,tr}, \end{aligned} \quad (3)$$

where $\beta_3$ (together with $\beta_1$) captures the level effect of being above the cutoff on Child's wage rank, $\beta_2$ (together with $\beta_1$) measures the intergenerational link of income rank, and $\beta_1$ 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 5. 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.[23] 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.

[23] As a comparison, using urban household survey in 2004, Chen et al. (2015) examine the correlation between father's and child's education categories and find a correlation between 0.2 and 0.3 for those born in the 1980s.

Different from the finding on absolute mobility, 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 5: 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. We replace $ChildRank$ and $ParentRank$ with $\ln Wage$ and $\ln ParentIncome$ and report results in columns (5)-(8) of Table 5. Again, 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.

**Normative Interpretation?** The previous results imply that the impact of elite education eligibility on wages is neutral with respect to parental status measured by parental income and job characteristics. This neutrality finding also holds with respect to other individual and family characteristics including gender, rural *hukou*, age and whether parents having college degrees and being Party members (reported in Appendix Table A.11). While having rural *hukou* and being female are associated with lower wages and parents being Party members are associated with higher wages, none of the interaction effects is significant.

Is the neutrality good or bad? Generally, ours is a positive study, and any normative interpretation would depends on the starting point. If one expects that elite education "levels the playing field" (i.e., the influence of family background is attenuated by elite education eligibility), these results suggest such an expectation is likely to be an illusion. Although elite education matters for absolute mobility, it does not attenuate the parent-child income link. 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 a scenario where children from richer families benefits disproportionally more. As discussed above, the effect of elite education eligibility on absolute mobility is large.

## 4.3 Beyond Wages: Occupation, Industry and Ownership

In this section, we investigate occupation, industry and employer ownership as outcomes, which is useful in two aspects. First, it helps us to uncover what drives our wage premium statistically. For instance, does the wage premium mainly stem from variation in industries or that within-industries? Second, they capture some dimensions of the job that could be important for a young person's status.

**Occupation/Industry/Ownership** Our survey covers the information on the 18 industries, 12 occupations and three types of employer's ownership. To check the variation in wage premium, we gradually include dummies for occupations, industries and ownership types in the wage premium regression and check whether the premium varies much. Columns (1)-(5) of Table 6 present the results and show that the wage premium cannot be explained by these dummies, implying that the wage premium is mainly driven by variation within these cells. We note that these characteristics are endogenous and consider this analysis as an exercise to unpack the variation in wage premium rather than any identification.

In addition, we can check how these characteristics are affected by elite education eligibility. For this purpose, it should be useful to order these characteristics by their desirability or eliteness so that we can examine whether elite education eligibility enhances one's chance of getting more desirable jobs. Such a measure would also allow us to examine intergenerational link in terms of more desirable jobs.

We try to capture some if not all dimensions on the desirability of jobs in our surveys, by asking students the ideal industry, occupation, and employer ownership they hope to enter (summarized in Table A.2). Intuitively, if a lot of people would like to get some type of job but very few can make it, it is likely to be more desirable. Thus, the realization-hope ratio provides us some useful information. As shown in column (3) of Appendix Table A.2, 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 (i.e., one in five to ten can make it). In contrast, clerks and skilled workers have a realization-hope ratio above 4. We assume the former to be more desirable occupations. This pattern turns out to be similar to the elite class defined based on occupations in the sociological literature (e.g., Erikson and Goldthorpe 1992), suggesting that this measure is meaningful conceptually.

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, manufacturing industries and wholesale have a ratio around 2. Thus, government-related and finance are more desirable industries. As expected, state and foreign ownerships are

desirable/elite ownerships. They have a realization-hope ratio of 0.65, in contrast to a ratio of 2.4 for private ownership.

With this way of ordering job characteristics, we examine how elite education eligibility affects the entry into the more desirable occupation, industry, and ownership. Columns (6)-(8) of Table 6 show that elite education eligibility has no significant impact on the probability of entering more desirable occupations (managerial and administrative positions, business owners, and military/police), industries (finance, culture-education, governments, and other public sectors), or ownership (state-owned and foreign-owned). The coefficients are of different signs and very close to zero in terms of occupation and ownership.

Thus, we find the wage premium cannot be explained by occupation, industry and ownership. Moreover, despite a sizable wage premium, we cannot claim that elite education eligibility necessarily changes one's occupation or industry.

**Occupation/Industry/Ownership Mobility** We also examine the intergenerational links in terms of more desirable occupation, industry, and ownership status (defined in the same way as as above). Once again, results reported in Table A.12 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 a more desirable occupation, industry, and ownership increases the probability of entering such an occupation, industry, and ownership by around 33%, 64% and 24% respectively. 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.12, meaning that elite education eligibility does not change intergenerational mobility.

Together with the findings in Section 4.2, 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 changes the parental-child link in terms of wages and other job characteristics.

## 4.4 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. Recent studies using administrative data in the U.S. suggest that

the first job plays an important role in determining the future job outcomes. For instance, Carr and Wiemers (2016) show a large rank-rank correlation between the first-job wage and that in the future career. Using a different approach, Oreopoulos, Von Wachter, and Heisz (2012) show that a macro shock at the graduating time can also have a persistent effect. However, we are not aware of similar studies in China and attempt to provide suggestive evidence here.

To investigate the importance of the first-job in our context, 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 and future job outcomes.

To match with our main analysis, we focus on the sample of individuals who have four-year college education and employ the following specification to examine the correlation between the first job and the future.

$$Wage_{i,u,t} = \alpha_1 Wage_{i,u,1st} + \alpha_2 Wage_{i,u,1st} \times EliteUni_u + \lambda_u + \gamma \mathbf{X}_{i,t} + \gamma' \mathbf{X}_{i,t} \times EliteUni_u + \varepsilon_{i,u,t}, \tag{4}$$

where $Wage_{i,u,t}$ indicates the wage rank of individual $i$ who graduated from university $u$, $t$ years after the start of the first job and $Wage_{i,u,1st}$ is the wage rank of the first job. We also control for university fixed effects ($\lambda_u$), age and gender, and allow their impacts to vary with elite universities.

The first-job wage rank explains a major part of variation in wage ranks in the future. When we only include the first-job wage rank in the regression without any controls, we get a $R^2$ of 0.623 (reported in Appendix Table A.13). The coefficient shows that a one standard deviation in the first-job wage rank explains 0.73 standard deviation of the wage rank within the next five years. The coefficient remains similar after controlling for age, gender and university fixed effects and it looks slightly stronger for those from elite universities. The pattern remains similar despite being slightly weaker when examining the wage rank in the next 6-10 years.

We can also check the probabilities of remaining in the same industry, occupation, and ownership as the first job. In our data, the probabilities of remaining in the same industry, occupation, and ownership in the next 1-5 years (and 6-10 years) are 0.71, 0.74, and 0.71 (and 0.59, 0.53, and 0.48), receptively. Considering that those who post their resumes on the major job board are likely to be more mobile, our estimates are likely to underestimate

the importance of the first job in determining these characteristics.

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 Mechanisms of Wage Premium

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; MacLeod and Urquiola 2015).[24] 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.

## 5.1 Human Capital

It is likely that students in elite universities accumulate more or better human capital in college. An ideal measure of human capital is the score of some standardized test which every 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 either in the probability of taking the CET-4 (column (1) of Table 7) or in the scores (column (2)) around the cutoff.

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

[24] As explained in Appendix Section A, costs of going to college are not very critical, thus the informational channel is closer to that in MacLeod and Urquiola (2015).

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 scoring above the cutoff is less likely to major in economics and law.

As another proxy for the effort of accumulating human capital, we examine the time allocation to different activities such as going to class, 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 and ranks in college (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. Nevertheless, we note the caveat that our measures do not capture all the dimensions of human capital.

## 5.2 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 who have 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.

It is worth emphasizing that our finding is driven by university-related networks rather

than the status of their own parents.[25] 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 emphasize the role of the university-related networks as "institutional social capital" (in contrast with personal networks such as relatives). It also shares some flavor with a recent study in Chile emphasizing the importance of peers in universities in the business world (Zimmerman 2016).

## 5.3 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 use 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. Once 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

[25] Table 8 shows that (i) scoring above the cutoff is associated with schoolmates of better family background, and (ii) family background of schoolmates matter for one's earnings. To be clear, one's own family background does also matter for one's earnings. But there is no discountability in one's own family background around the cutoff, as evidenced by the balance tests above.

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.

Since networks and signaling are likely to work together, the implication on the long-run effect is ambiguous. Over time, the signaling effect is likely to be less important while the network effect may persist or become stronger. This could be consistent with the suggestive evidence on the persistent pattern discussed in Section 4.4.[26]

### 5.4 Consistency with the Institutional Background

Taken together, these results suggest that the 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 above could be 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 that elite students do not accumulate more human (measured by all the proxies we have). Because almost everyone in college is promised graduation, students are not strongly incentivized to work hard in college.

Together with the results on income mobility, our findings on the mechanisms also suggest that university-related networks and family networks play additive roles in determining income mobility. If university-related networks had replaced (or complemented) family networks, we would have found that individuals from poorer (or richer) families benefit more from elite education. This pattern also partly explains why some emphasize the importance of the exam system for social mobility whereas others observe the importance of family background.

## 6 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

[26] A nice study by MacLeod et al. (2017) finds that the wage effects of college prestige may increase over time in the U.S.. and emphasize the role of skills in their context.

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 social mobility is more subtle: while elite education matters for one's mobility, it does not alter the influence of one's family background. Our findings suggest that elite education and family background play additive roles in elite formation in China.

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 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 the Chinese labor market.

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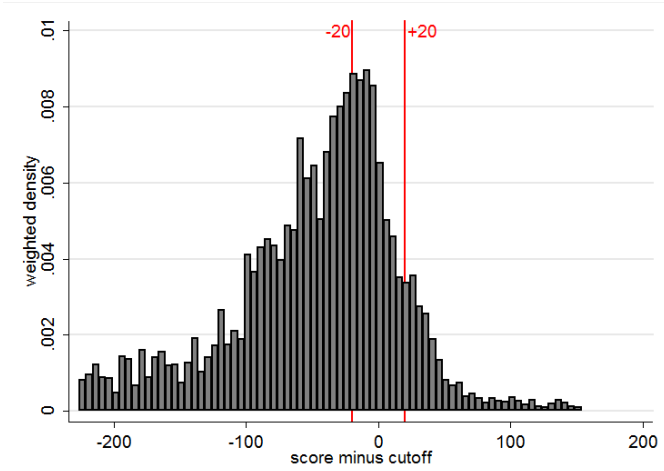
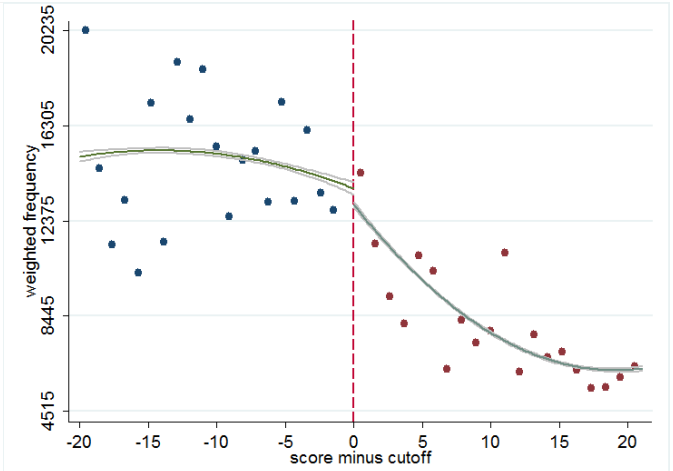
Figure 1: The Distribution of Exam Scores in the Survey Data

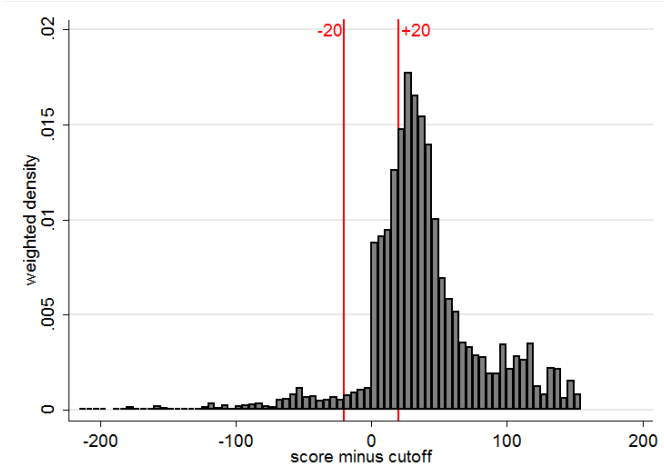
(a) The Whole Sample



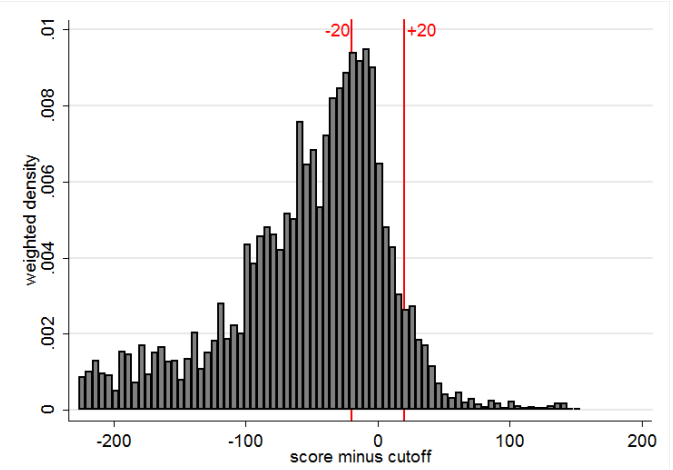

(b) Within the 20-point Bandwidth




(c) Elite Universities



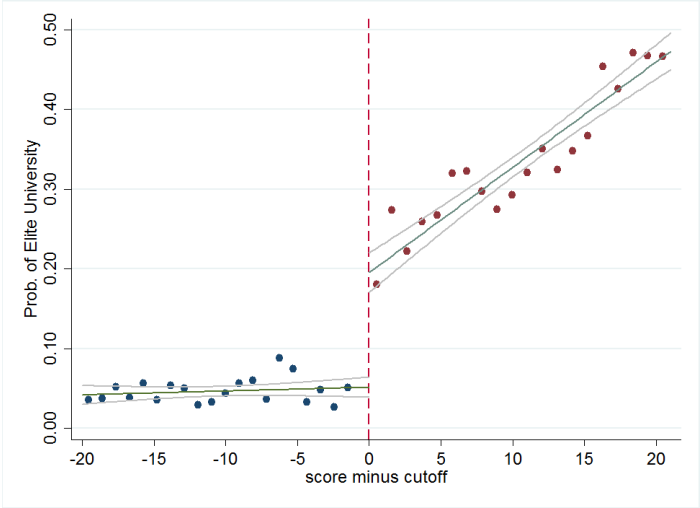

(d) Non-elite Universities



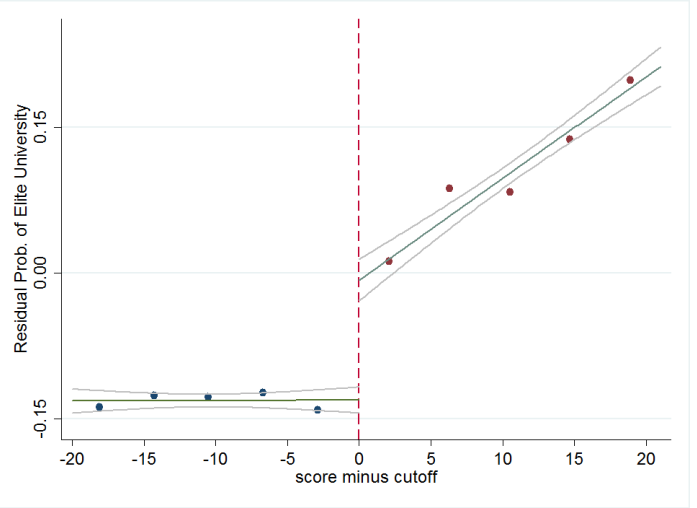

*Notes*: Figure (a) plots the distribution of exam scores in our survey data. Figure (b) takes a closer look at the 20-point bandwidth and shows that there is no significant discontinuity at the elite university cutoff line. Figures (c) and (d) plot the distribution of exam scores for elite universities 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

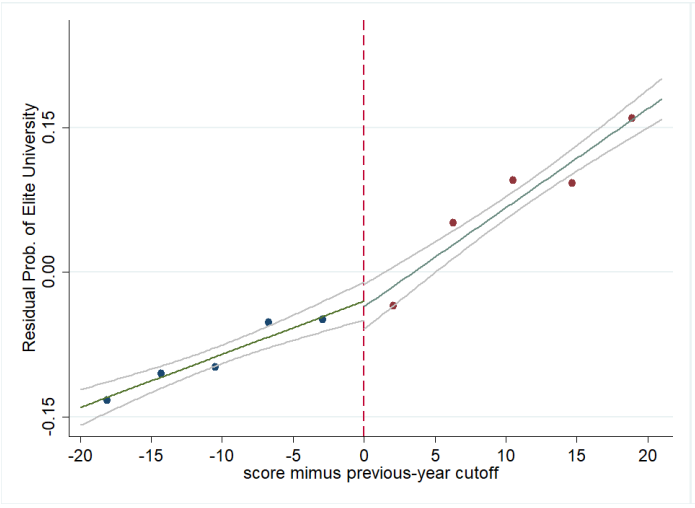
(a) Point-by-Point in the Raw Data



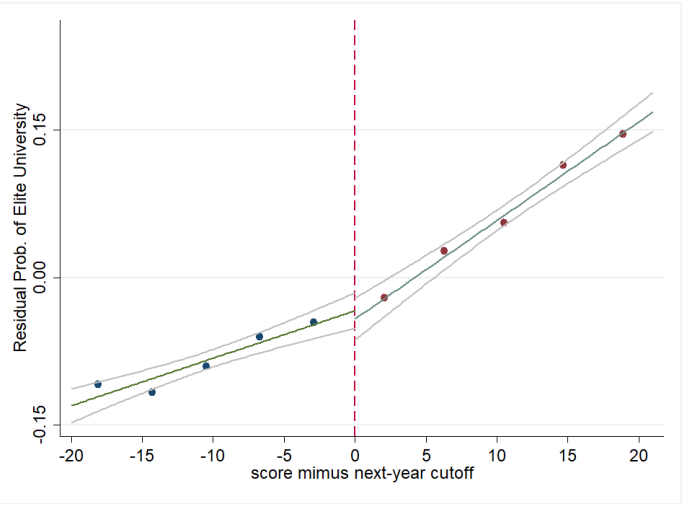

(b) With Province-Year-Track FEs (4-point bins)




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

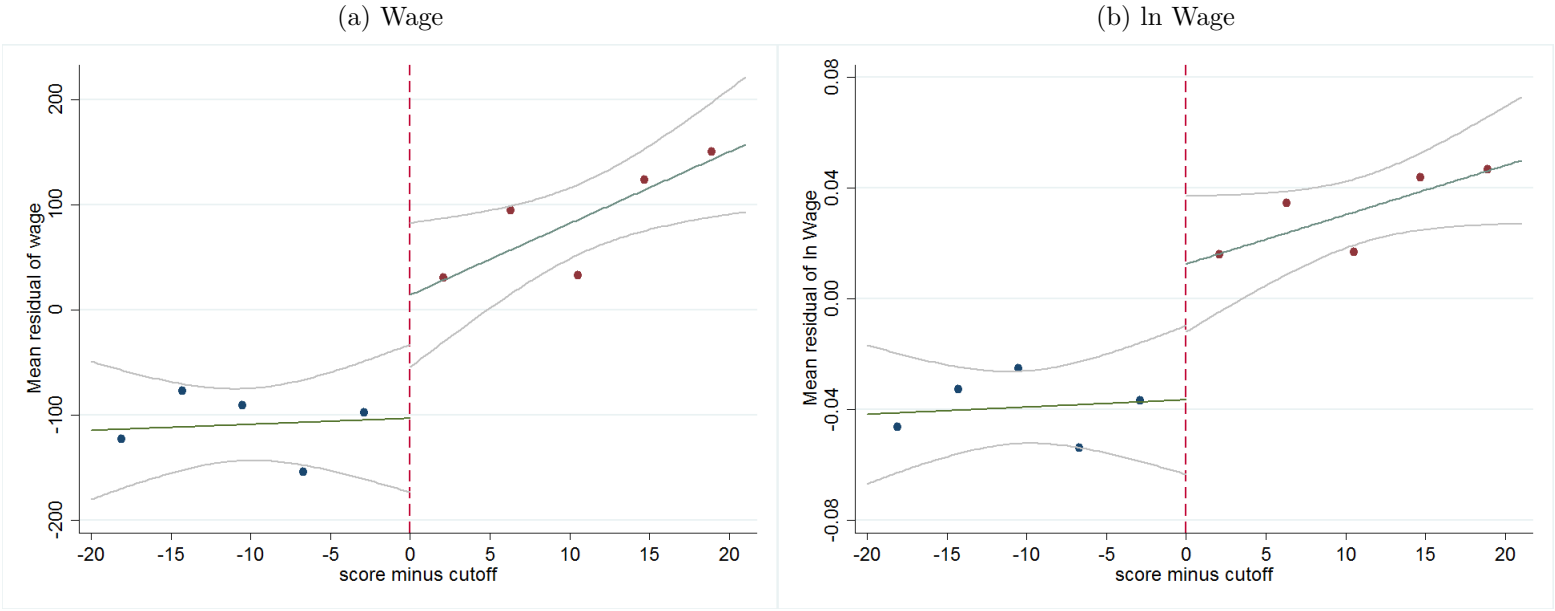



(d) Placebo II: Using next-year cutoffs w. Pr-Ye-Tr FEs




*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 and averages the residuals into 4-point bins. 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.

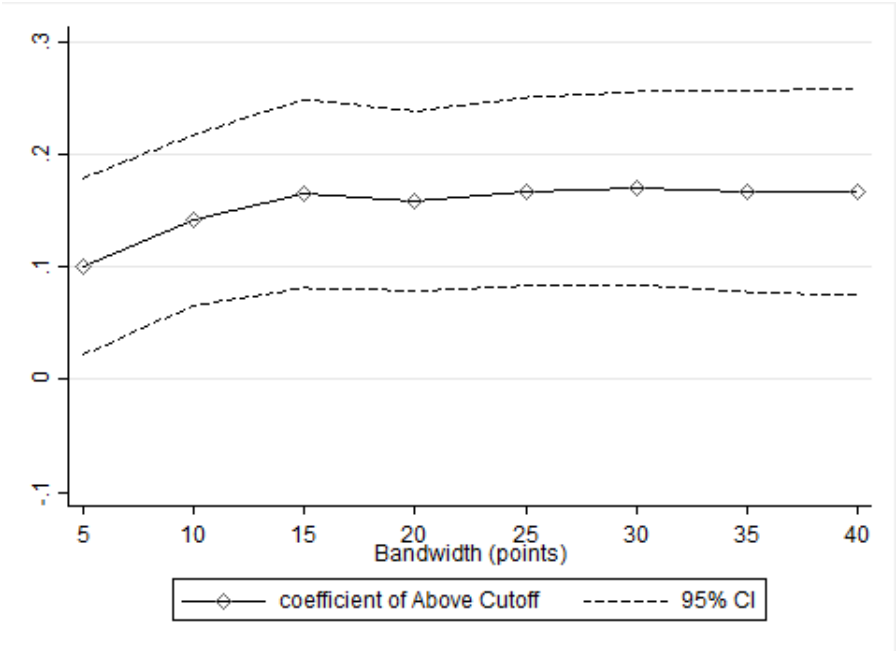
Figure 3: Elite Education and Wage Premium



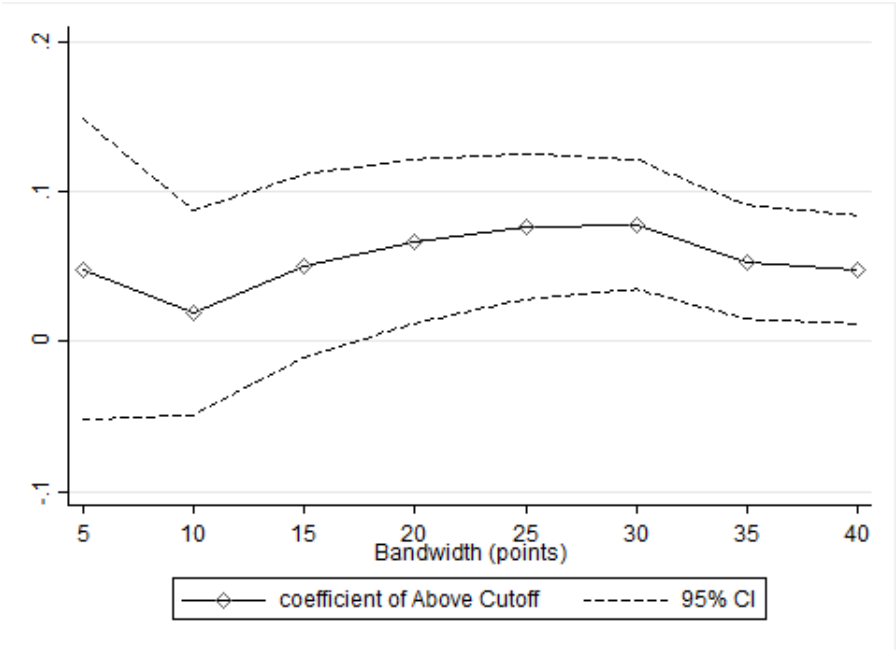

*Notes*: This figure plots the mean wage and ln wage by distance to the cutoff scores (after isolating province-year-track FEs) and shows a notable discountability around the cutoff. Each dot indicates the average residual in a 4-point bin.

Figure 4: Results with Different Bandwidths

(a) First Stage – Scores and Elite Education



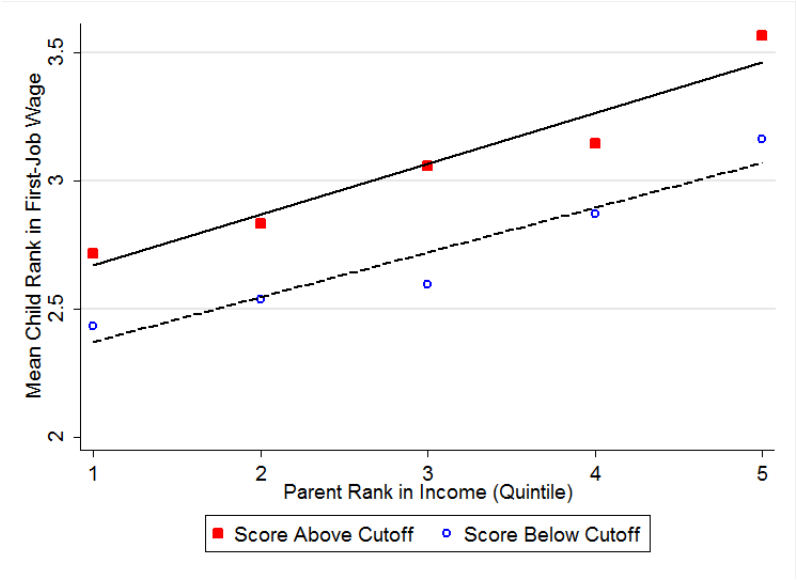

(b) Reduced Form – Scores and Wage Premium



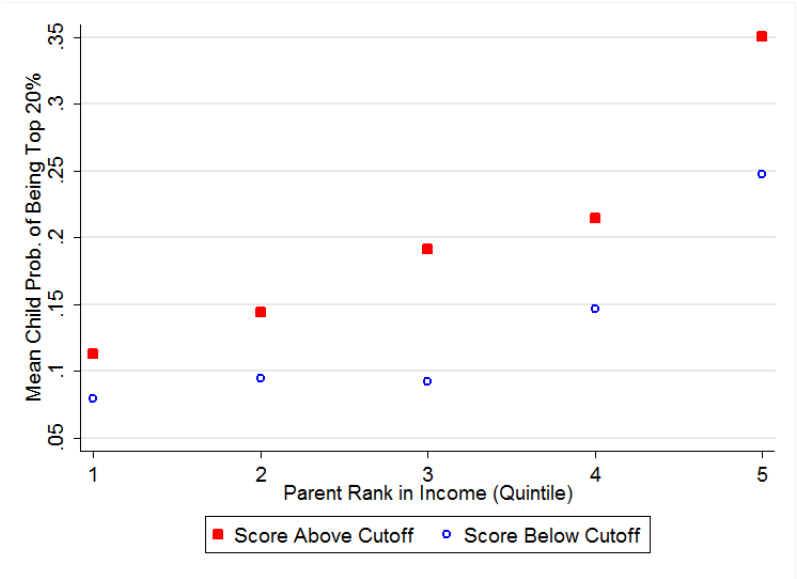

*Notes*: This figure plots the estimates using different bandwidths of scores while controlling for province-year-track FEs and a second-order polynomial and interaction. Panel (a) is for the first-stage results on elite university and panel (b) for the reduced-form estimates on wage premium. The solid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

Figure 5: 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)

| Score-(province-year-track) Cutoff | (1) [0,20] Mean | (2) [0,20] s.d. | (3) [-20,0) Mean | (4) [-20,0) s.d. |
|---|---|---|---|---|
| a) University-related Outcomes | | | | |
| | N=5698 | | N=4637 | |
| Elite Universities | 0.34 | 0.47 | 0.05 | 0.21 |
| Major: STEM | 0.68 | 0.47 | 0.62 | 0.49 |
| Major: Econ-Management-Law | 0.22 | 0.41 | 0.27 | 0.44 |
| Major: Humanity | 0.10 | 0.30 | 0.10 | 0.30 |
| b) Individual and Family Characteristics | | | | |
| Male | 0.59 | 0.49 | 0.56 | 0.50 |
| Age | 23.96 | 1.11 | 23.97 | 1.10 |
| Rural | 0.58 | 0.49 | 0.58 | 0.49 |
| Repeated exam-take | 0.32 | 0.46 | 0.32 | 0.47 |
| Father with College Edu. | 0.09 | 0.29 | 0.08 | 0.27 |
| Mother with College Edu. | 0.06 | 0.24 | 0.05 | 0.22 |
| ln Father's Income | 9.88 | 1.13 | 9.91 | 1.08 |
| ln Mother's Income | 9.35 | 1.20 | 9.41 | 1.16 |
| ln Family (Parental) Income | 10.42 | 1.13 | 10.48 | 1.09 |
| Father being a Party Member | 0.22 | 0.42 | 0.22 | 0.41 |
| Mother being a Party Member | 0.08 | 0.27 | 0.08 | 0.27 |
| Ever Searched for Jobs | 0.71 | 0.45 | 0.76 | 0.42 |
| c) Wages and Job Characteristics | | | | |
| | N=2794 | | N=2286 | |
| Ln (Best Wage Offer) | 7.89 | 0.37 | 7.79 | 0.37 |
| More Desirable Occupation | 0.06 | 0.23 | 0.06 | 0.24 |
| More Desirable Industry | 0.16 | 0.37 | 0.18 | 0.39 |
| Ownership: State or Foreign | 0.57 | 0.50 | 0.51 | 0.50 |

*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 | | 0.38 | | 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 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 6: The Results on Occupation, Industry and Employer Ownership

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Var. | ln Wage | | | | | Occupation | More Disrable Industry | Dsr. Ownership |
| Mean Dep. Var. | | | | | | 0.06 | 0.17 | 0.54 |
| Occupation FEs (12) | | | Y | | Y | | | |
| Industry FEs (18) | | | | Y | Y | | | |
| Ownership FEs (3) | | | | Y | Y | | | |
| Above Cutoff | 0.067** | 0.077*** | 0.071*** | 0.071** | 0.079*** | 0.004 | -0.026 | 0.005 |
| | (0.027) | (0.028) | (0.026) | (0.027) | (0.028) | (0.025) | (0.024) | (0.044) |
| Prov-Year-Track FE | 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 | 5,080 | 4,946 | 5,025 | 5,039 | 4,888 | 4,946 | 5,025 | 5,039 |
| R-squared | 0.273 | 0.283 | 0.301 | 0.279 | 0.315 | 0.111 | 0.203 | 0.118 |

*Notes*: Columns (1)-(5) show that the wage premium cannot be explained by occupation, industry or ownership. Columns (6)-(8) show that scoring above the cutoff does not entail one's entry into more desirable occupation, industry, ownership, or non-wage benefits. The desirability is defined by the scarcity (relative to the demand). See Table A.2 for the specific ratios. 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. We 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%.

# Online Appendix

## A More Background: Tuition, Graduation Rates, and Studying Abroad

**Tuition, Graduation Rates, and Other University Characteristics** Most Chinese 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 most 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).[27] 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%.[28] 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 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.[29] Naturally, they also attract very different students and teachers. We will present several university characteristics in our data in Section 2.2.

**Going Abroad** It is true that some high school students choose to go abroad (especially to the U.S.) 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 it.[30] 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.

[27] 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.

[28] 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%.

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

[30] 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

# B More on Our Survey and Data

**University Characteristics in Our Survey** Appendix Table A.3 presents characteristics of universities in our sample. 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.

We also check the probabilities of getting into elite universities of different ranks within the 20-point bandwidth. Within this bandwidth, as expected, even for those scoring above the elite cutoff, the probability of going to a top-9 university with a score in this bandwidth is almost zero. About 12% of those above the cutoff score went to top 10-39 universities, and 22% went to top 40-100 universities. See Appendix Figure A.2 for detail.

**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 Majors 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 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.

# C More on the Importance of Heterogeneous Response

One concern is why some students above the cutoff score ended up in non-elite colleges, while others went to elite colleges. We would hope the difference is due to random reasons such as competition. However, if outcomes are due to their own strategic choice or preference determined by personal characteristics, then the identified effect cannot be inferred for non-compliers.

To address this concern, we examine whether the effect of scoring above the cutoff on going to an elite university differs greatly with individual characteristics (gender, rural residence and family income), and whether individual characteristics affect the probabilities of majoring in Economics-Management-Law, going to an university outside one's home province, and being the bottom 20% in college class. Specifically, we include interactions of $I(Score_i \geq Cut_{p,y,tr})$ 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)), suggesting that scoring above the cutoff is the most important criterion for elite education recruitment. The possible tradeoff between elite education and major, location and college class ranking as discussed in Section 3.3 does not differ greatly across individual characteristics.

Another related issue is that some unobserved characteristics such as risk preference might affect our results. For example, if, for above-cutoff-score students, those who go to elite colleges are more (or less) risk averse, then our estimates of the effect of scoring above the cutoff score (and have elite education) on labor market outcomes could be a result of risk aversion.

We could test whether risk attitude affects our results by using the data in the year 2011, in which we asked two sets of questions to gauge risk attitudes. The first set is to let students choose between losing (or gaining) 1000 RMB with certainty vs. losing (or gaining) 2000 RMB and 0 with an equal chance. We call a student risk-averse if he or she chooses certainty for both questions. The second set asks them to evaluate the following statement: "If you invest, it is more important to ensure a (lower) return with certainty than to take some risk for the greatest possible return." We call a student risk-averse if he or she agrees or strongly agrees with this statement. We define two dummy variables for risk aversion (1 if risk averse) in both the lottery (former setting) and investment cases. The mean values of

the two variables are 16% and 33% respectively.

Regression results presented in Appendix Table A.6 suggest that risk aversion is not an important factor determining the probability of entering elite universities for students just above the cutoff score. In column (1), we show that even for data of only one year (2011), scoring above the cutoff has a similar impact on the probability of entering an elite university. More importantly, scoring above the cutoff is not systematically correlated with risk attitudes (columns (2)-(3)). In addition, conditional on scoring above the cutoff, risk attitudes are not significantly correlated with elite education enrollment either (columns (4)-(5)). These results should be taken with a grain of salt as we cannot measure the risk attitudes at the time of application.

The results in Appendix Table A.5 and Table A.6 confirm that being above the cutoff or not is the primary determinant of elite education enrollment. Conditional on scoring above the cutoff, there is little heterogeneous response in terms of individual and family characteristics. Thus, it is reasonable to focus on investigating the average effect of elite education on labor market outcomes.

# D More on Different Outcomes after Graduation

Those above the cutoff are weakly less likely to work after graduation (shown in columns (1) and (2) of Appendix Table A.7). What explains this difference?

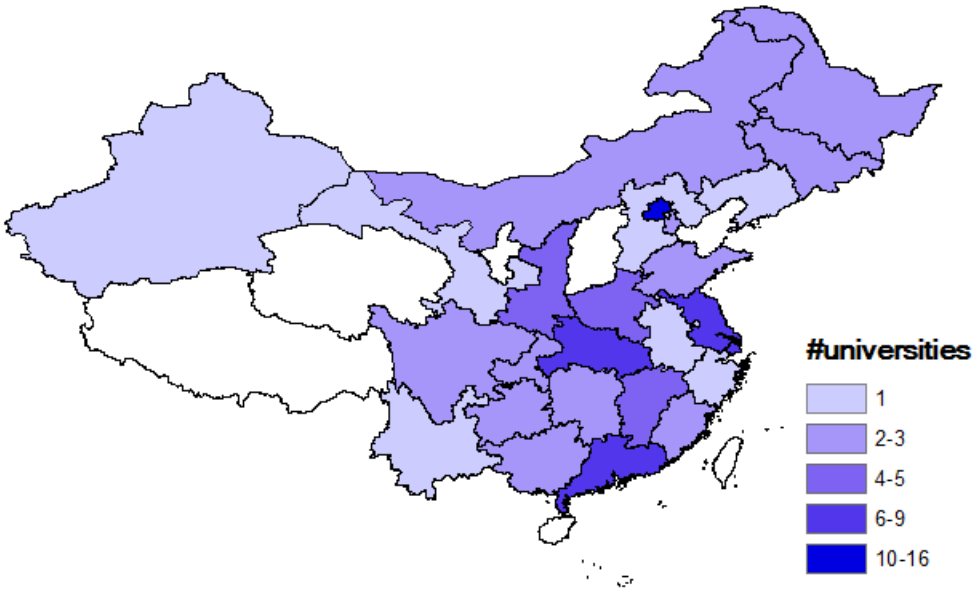
It is not explained by going to the graduate school (with a mean of 19%, columns (3)-(4))). The relationship between enrolling in elite university and going to graduate school is ambiguous. On the one hand, those from a non-elite university may be more likely to pursue a graduate degree in an elite university 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.

Neither is it explained by going abroad either. As reported in reported in columns (5)-(6), the probability of going abroad is small (3%) and it is not different around the cutoff.

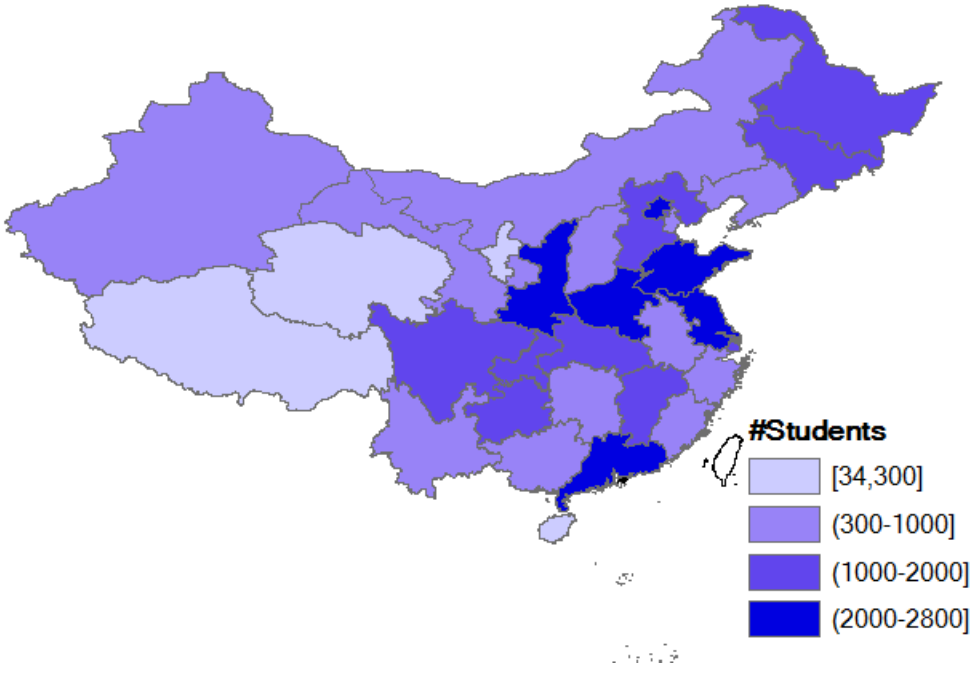
We find that the difference is mainly accounted for by the category of "unclear plan" (columns (7)-(8)). One explanation is that those above the cutoff may have more options or higher reservation wages. Relatedly, column (9) shows that those above the cutoff are weakly less likely to search for a job (3% less likely). Column (10) shows that there is no significant difference in the probability of getting an offer conditional on job search.

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

(a) Distribution of the 90 Universities

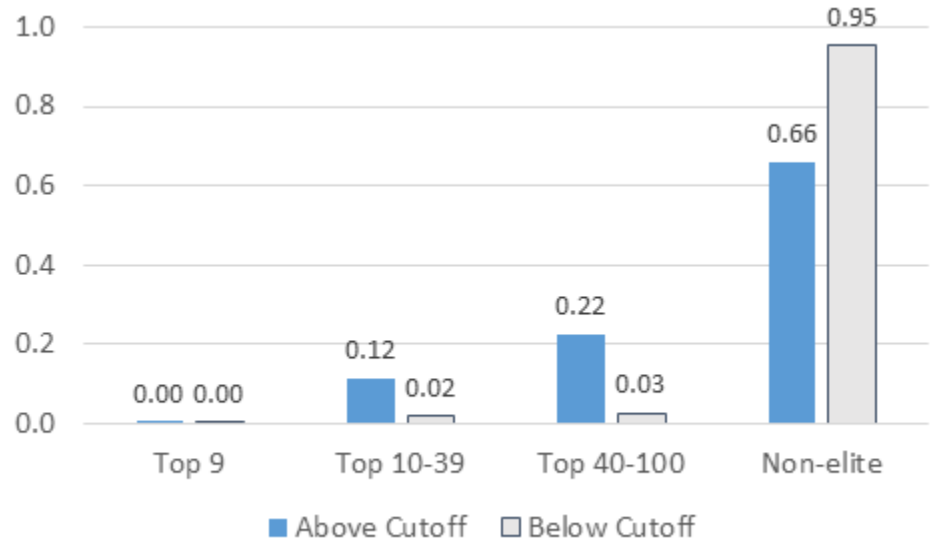



(b) Number of Students by Province of Exam




*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).

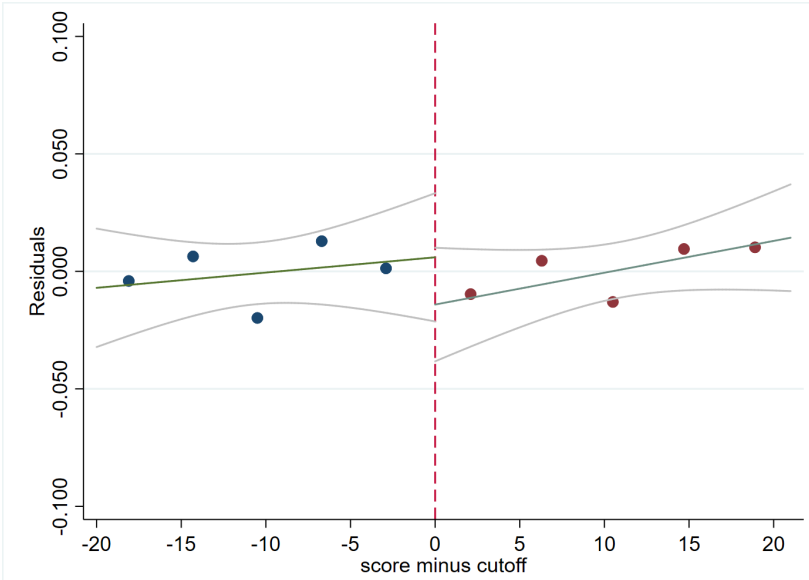
Figure A.2: Composition of Universities within the 20-point Bandwidth



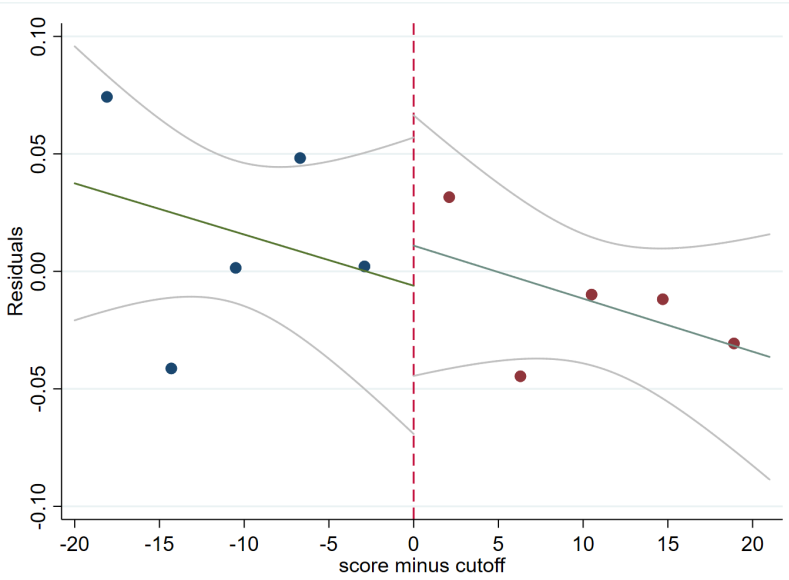

*Notes*: This figure plots the distribution of universities within the 20-point bandwidth. It shows that our elite group comprises the top 40-100 and the top 10-39 and the former is twice likely as the latter. The probability of going to a top 9 university is minimal within the 20-point bandwidth.

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

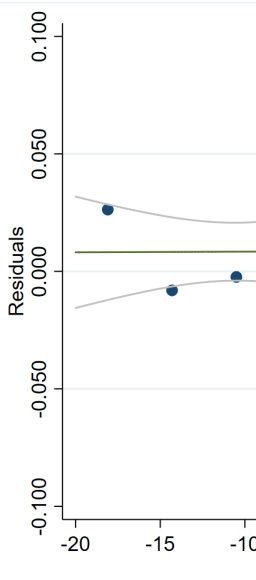
(a) Male



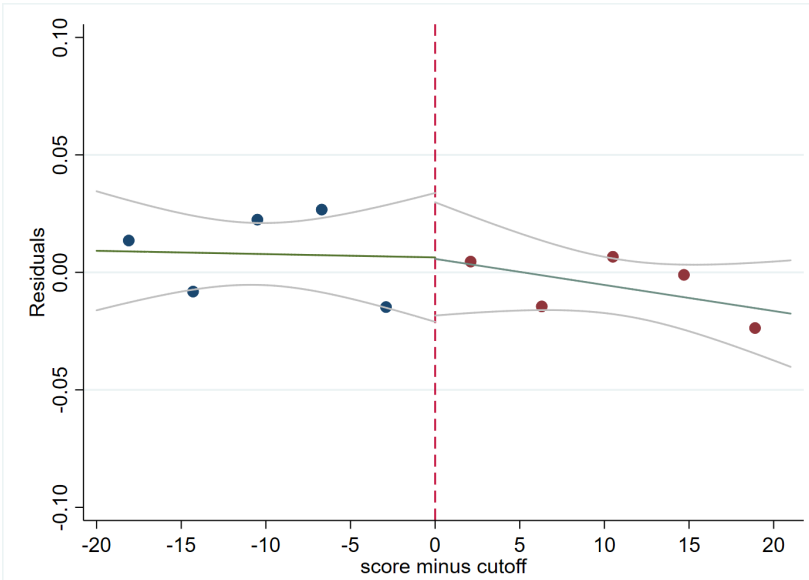

(b) Age



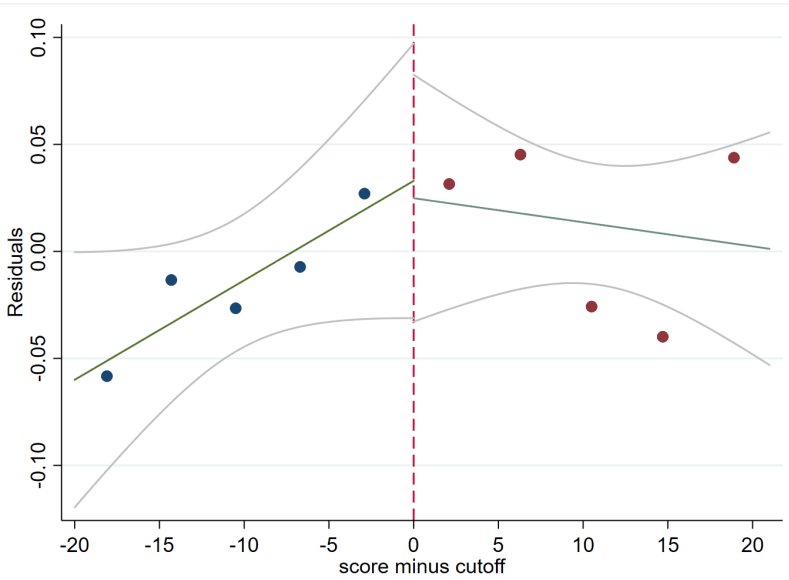

(c




(d) Rural




(e) Ln Father's Income



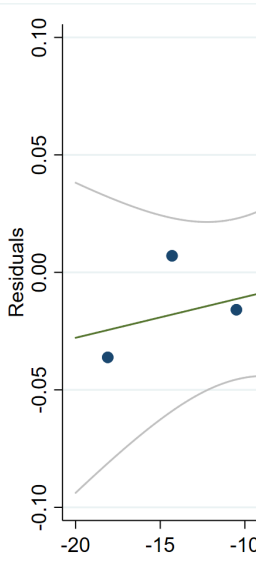
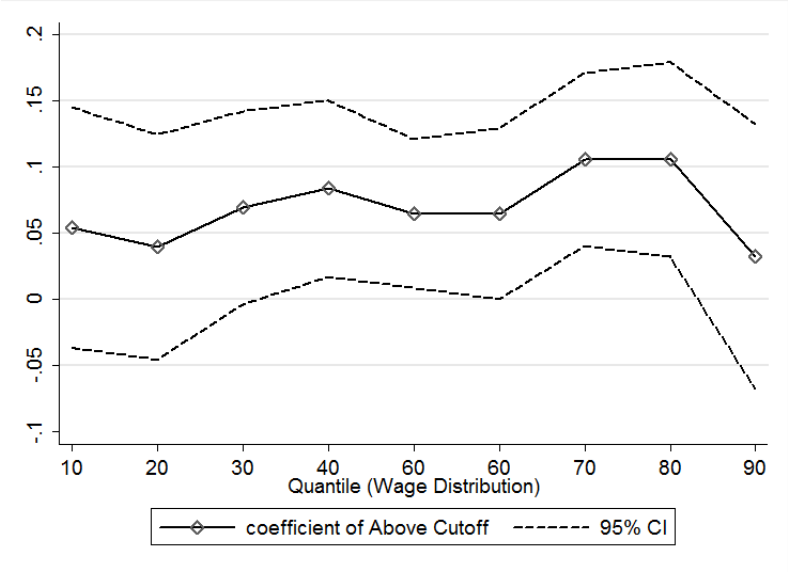



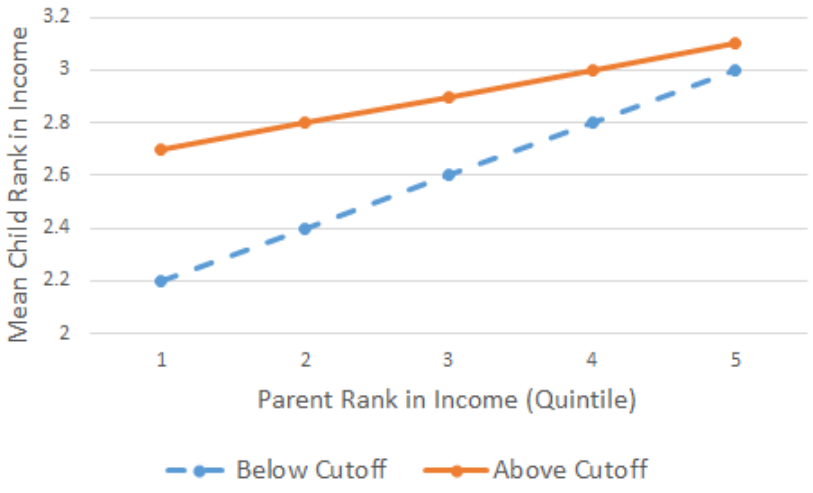
Figure A.4: The Impacts of Elite Education Eligibility on Wage across Wage Distribution



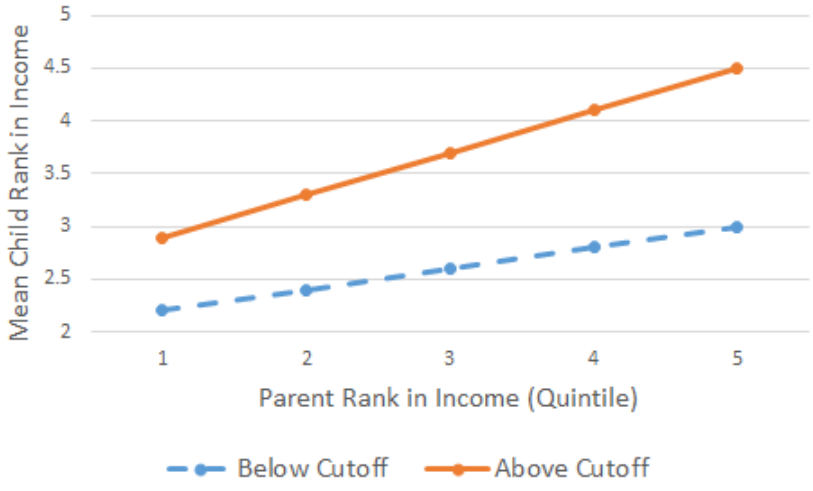

*Notes*: This figure plots the reduced-form estimates across wage distribution (while controlling for province-year-track FEs and a second-order polynomial and interaction). They show that the baseline is not restricted to a very specific segment of the wage distribution.

Figure A.5: 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: Summary of 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 desirability. These categories are also consistent with common understanding of China. We examine how they are affected by exam scores in our analysis.

Table A.3: 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.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 | (9) Parent Party Mem. | (10) Predicted Wage |
|---|---|---|---|---|---|---|---|---|---|---|
| (a) sample within a 20-point bandwidth | | | | | | | | | | |
| Above Cutoff | -0.007 | 0.001 | -0.035 | 0.014 | 0.031 | 0.038 | 0.023 | -0.015 | -0.004 | -0.002 |
| | (0.029) | (0.076) | (0.033) | (0.026) | (0.067) | (0.083) | (0.060) | (0.020) | (0.024) | (0.007) |
| (b) sample with a 20-point bandwidth & with wage offers | | | | | | | | | | |
| Above Cutoff | -0.028 | -0.112 | -0.011 | 0.000 | 0.089 | 0.130 | 0.070 | -0.027 | -0.036 | 0.005 |
| | (0.042) | (0.094) | (0.044) | (0.035) | (0.084) | (0.125) | (0.068) | (0.020) | (0.035) | (0.009) |
| 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 |

*Notes*: This table reports more results from balance tests. Column (10) uses the predicted wage based on the variables in columns (1)-(9). As shown, 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: Difference in Risk Attitudes

| Dependent Var. | (1) Elite University | (2) Risk-averse (lottery) | (3) Risk-averse (investment) | (4) Elite University | (5) Elite University |
|---|---|---|---|---|---|
| Above Cutoff * Risk-averse (lottery) | | | | 0.015 | |
| | | | | (0.032) | |
| Above Cutoff * Risk-averse (investment) | | | | | -0.017 |
| | | | | | (0.033) |
| Above Cutoff | 0.182*** | -0.062 | -0.040 | 0.174*** | 0.188*** |
| | (0.063) | (0.048) | (0.074) | (0.061) | (0.064) |
| Risk-averse (lottery) | | | | -0.005 | |
| | | | | (0.021) | |
| Risk-averse (investment) | | | | | 0.011 |
| | | | | | (0.022) |
| Province-Year-Track FE | Y | Y | Y | Y | Y |
| Linear Interaction | Y | Y | Y | Y | Y |
| Quadratic Interaction | Y | Y | Y | Y | Y |
| Observations | 2,218 | 2,155 | 2,167 | 2,155 | 2,167 |
| R-squared | 0.372 | 0.030 | 0.031 | 0.367 | 0.368 |

*Notes*: This table shows that risk attitudes do not matter much for elite education enrollment conditional on scoring above the cutoff. Risk aversion is measured by two set of questions in 2011. The first set is to let students choose between losing (or gaining) 1000 RMB with certainty vs. losing (or gaining) 2000 RMB and 0 with an equal chance. We call a student risk-averse if he or she chooses certainty for both questions. The second set asks them to evaluate the following statement: "If you invest, it is more important to ensure a (lower) return with certainty than to take some risk for the greatest possible return." We call a student risk-averse if he or she agrees or strongly agrees with this statement. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.7: 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.8: 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.9: 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.10: Considering the Costs of Living (2010-14)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Dependent Var. | Ln Real Wage | | | Ln Wage | | |
| Above Cutoff | 0.076*** | 0.079*** | 0.084** | 0.080*** | 0.075*** | 0.078*** |
| | (0.015) | (0.024) | (0.033) | (0.014) | (0.021) | (0.029) |
| Job Location FE | | | | Y | Y | Y |
| Province-Year-Track FE | Y | Y | Y | Y | Y | Y |
| Linear Interaction | | Y | Y | | Y | Y |
| Quadratic Interact. | | Y | Y | | Y | Y |
| Observations | 4,505 | 4,505 | 4,505 | 4,505 | 4,505 | 4,505 |
| R-squared | 0.201 | 0.201 | 0.201 | 0.306 | 0.306 | 0.306 |

*Notes*: This table presents the results after considering provincial-specific costs of living. Columns (1)-(3) use the provincial CPI provided by Brandt and Holz to calculate real wages, and columns (4)-(6) include province-of-job fixed effects. They show that our baseline finding is unlikely to be explained by the difference in the costs of living. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.11: The Impact of Elite Education Eligibility on Wages by Individual and Family Characteristics
Dependent Var.: ln Wage

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Above Cutoff | 0.064** | 0.072** | 0.084*** | 0.080*** | 0.066** | 0.073*** |
| | (0.027) | (0.029) | (0.029) | (0.029) | (0.027) | (0.028) |
| Above Cutoff * Rural | 0.004 | | | | | |
| | (0.021) | | | | | |
| Above Cutoff * Repeated | | -0.014 | | | | |
| | | (0.015) | | | | |
| Above Cutoff * Male | | | -0.026 | | | |
| | | | (0.018) | | | |
| Above Cutoff * Age | | | | -0.016 | | |
| | | | | (0.011) | | |
| Above Cutoff * College Parent | | | | | 0.024 | |
| | | | | | (0.042) | |
| Above Cutoff * Party Parent | | | | | | -0.023 |
| | | | | | | (0.020) |
| Rural Hukou | -0.028* | | | | | |
| | (0.015) | | | | | |
| Repeated Exam Taker | | -0.008 | | | | |
| | | (0.014) | | | | |
| Male | | | 0.080*** | | | |
| | | | (0.012) | | | |
| Age | | | | 0.008 | | |
| | | | | (0.009) | | |
| Parent w. College Degree | | | | | 0.029 | |
| | | | | | (0.033) | |
| Parent being Party Member | | | | | | 0.048*** |
| | | | | | | (0.016) |
| 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 | 5,080 | 5,080 | 5,080 | 5,028 | 5,080 | 5,080 |
| R-squared | 0.274 | 0.273 | 0.279 | 0.274 | 0.274 | 0.275 |

*Notes*: This table presents more results showing that impact of elite education eligibility on wages is generally neutral with respect to individual and family characteristics. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.12: The Impact of Elite Education Eligibility on Intergenerational Mobility: Occupation, Industry and Ownership

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Desirable Occupation | | | Desirable Industry | | | Desirable Ownership | | |
| Mean | 0.06 | | | 0.17 | | | 0.54 | | |
| Above Cutoff * Parent (Desirable Occ) | | -0.004 | 0.005 | | | | | | |
| | | (0.018) | (0.018) | | | | | | |
| Parent (Desirable Occ) | 0.020** | 0.022 | 0.008 | | | | | | |
| | (0.008) | (0.014) | (0.013) | | | | | | |
| Above Cutoff * Parent (Desirable Industry) | | | | | 0.019 | 0.003 | | | |
| | | | | | (0.046) | (0.041) | | | |
| Parent (Desirable Industry) | | | | 0.109*** | 0.099*** | 0.073** | | | |
| | | | | (0.027) | (0.037) | (0.032) | | | |
| Above Cutoff *Parent (Desirable Ownership) | | | | | | | | -0.045 | -0.014 |
| | | | | | | | | (0.037) | (0.036) |
| Parent (Desirable 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' status with the children's status; (ii) being above the cutoff does *not* promise a more desirable 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 desirability. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.

Table A.13: The Correlation between Wages for the First Job and the Future Jobs
D.V.: Wage Rank (std)

| Year after graduation | 1-5 | | | 6-10 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| First-job Wage Rank(std) | 0.731*** | 0.695*** | 0.682*** | 0.681*** | 0.673*** | 0.651*** |
| | (0.002) | (0.003) | (0.003) | (0.006) | (0.007) | (0.009) |
| First-job Wage Ranks (std) * Elite University | | | 0.034*** | | | 0.045*** |
| | | | (0.005) | | | (0.013) |
| Age, Sex | | Y | Y | | Y | Y |
| University FEs | | Y | Y | | Y | Y |
| Age*Elite, Sex*Elite | | | Y | | | Y |
| Observations | 146,900 | 146,900 | 146,900 | 28,057 | 28,057 | 28,057 |
| R-squared | 0.623 | 0.656 | 0.657 | 0.434 | 0.524 | 0.525 |

*Notes*: This table reports the *standardized* coefficients and shows a strong correlation between the wage rank 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. Standard errors are clustered at the university level. Significance levels: *** 1%, ** 5%, **** 10%.