Did Better Colleges Bring Better Jobs? Estimating the Effects of College Quality on Initial Employment for College Graduates in China

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The unemployment problem of college students in China has drawn much attention from academics and society. Using the 2011 College Student Labor Market (CSLM) survey data from Tsinghua University, this paper estimated the effects of college quality on initial employment, including employment status and employment unit ownership for fresh college graduates. The propensity score matching method was employed to account for the potential endogeneity of elite college attendance. The empirical evidence suggested that students who attended Project 985 colleges were more likely to find jobs immediately after college graduation. Moreover, students graduated from Project 211 universities gained a competitive edge by entering into public working sectors, such as the government or state-owned enterprises (SOEs), compared with students from non-elite colleges. The results imply the students who graduated from non-elite universities faced labor market segmentation. They not only had obstacles in finding jobs, but also ended up in the secondary labor market.

Introduction

Over the past several years, unemployment has become a troubling issue for a considerable number of fresh college graduates and their families in China. Although this unemployment dilemma did not solely appear in China, it was more prominent in mainland China and drew much attention from academia and Chinese society. Several factors combined together may play dominant roles in explaining the sources of severe unemployment problems that lasted for years. First, the Chinese Central Government initiated the higher education expansion policy in 1999. The expansion began as an attempt to alleviate the economic crisis and became the fastest expansion in human history (Levin, 2010). The expansion sharply increased the unemployment rate among young

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college[1] graduates (S. Li, Whalley & Xing, 2014). Meanwhile, the economic downturn and staggered industry development greatly decreased the demand to absorb labor forces, especially those who newly entered the labor force with limited work experience and unguaranteed productivity(Bai, 2006). Moreover, the unified college course curriculum and low-quality university training that produced graduates with limited capacity gains and skill accumulation during their college education may deteriorate youth unemployment. Under these circumstances, finding employment immediately after college graduation has become a big challenge for many students, not to mention those who never predicted fierce initial job market competition and were seriously underprepared. Even for those who were lucky enough to locate jobs after college graduation, they may end up with secondary labor market jobs with unsecured future prospects and a low salary.

By weighing the costs and benefits of attending college, some senior high school students chose not to take the National College Entrance Examination (NCEE). For those who still wish to pursue higher education domestically, it is crucial for them to choose where to attend a university. Therefore, admission into better–quality universities is viewed as the path to ensure college returns for human capital investment. However, there is limited empirical evidence in China that estimates the impact of college quality on initial employment. In addition, it is essential for higher education institutions (HEIs) to clarify the impact of college quality on fresh graduates' employment, and to improve institutional effectiveness and efficiency. In addition, obtaining an answer to the research question of whether attending better colleges brought better jobs would be illuminating for higher education policymakers who conduct an evaluation and appraisal of large and costly national college quality enhancement programs, such as Project 985 and Project 211.

Project 985 and Project 211 involved the Chinese government's initiatives for strengthening and establishing world-class universities. Given the widespread recognition that higher education is a major driver of a nation's economic growth and cultivates the future labor force, higher education quality upgrading has become an important national education strategy. Specifically, Project 985 was named after its announcement date on May 4, 1998, and designed to build world-leading universities. It fulfilled tasks in five aspects, including mechanism innovation, team building, platform construction, condition support, and international communication. Project 211 universities refer to about 100 key Chinese universities in the 21st century. The development of Project 985 and Project 211 universities was the priority of the Chinese

[1] In this paper, "college" and "university" are used interchangeably.

higher education quality upgrade plan, and additional resources and massive funding from the central government were allocated to these HEIs. Project 985 universities consist of 39 universities selected from the Project 211 universities and enjoy even higher appropriation for building world-class universities. Although no official university ranking exists in terms of higher education quality, the universities on the Project 985 and Project 211 lists represent the best in China. Essentially, these national projects served as stratification tools to concentrate the nation's resources—professors, student body, equipment, and facilities, etc. to a few top universities to gain a competitive edge in the global higher education competition. Thus, the returns to college quality could be manifested partly by better jobs obtained, and a greater contribution of their students after graduation. Meanwhile, we also observed the construction and rise of independent colleges, which were private and non-governmental HEIs that were considered to be relatively poor-quality HEIs. Considering the enormous public expenditure of supporting Project 985 and Project 211 universities while substantially fewer investments were made in other regular HEIs and independent colleges, the relevant evaluations of economic returns to college quality is rare.

How does the labor market respond to fresh college graduates of various quality types of universities? This study suggest two testable hypotheses for analyzing the returns to college quality under the circumstances of Chinese higher education: the first hypothesis to be tested is that higher quality colleges offer more employment opportunities for their students, and the other is that higher quality colleges bring more jobs in the public sector to their students.

Literature Review

Current literature relies heavily on human capital theory to explain the impact of college quality on future labor market outcomes. According to this theory, human capital refers to knowledge, skills, attitudes, aptitudes, and other acquired traits that enhance the productive capacity of individuals accumulated through education (Becker, 1964;). Therefore, education is an important investment of time, expenditure, and foregone earnings for a higher rate of either economic or non-economic return in later periods (Becker, 1964; Schultz, 1961). Education in high-quality colleges will accelerate the speed of knowledge and skill accumulation through various channels, such as positive peer effects, intensive and extensive faculty and student interactions, better study environment, and equipment support, etc. Graduates from high-quality colleges with a higher stock of human capital will be rewarded by the labor market with faster and better job offers since they are favored by employers.

A wealth of literature has documented the positive correlation between college education and future incomes since the late 1960s in the United States. Most of the papers have been covered by the summary and comments by Pascarella and Terenzini (1991) and Zhang (2005). However, there are relatively scarce existing research concentrated on education quality to portray the causality between the higher education quality and labor market outcomes. The majority of previous research in the US has focused on the effect of college quality on personal wage, and used multiple identification strategies to circumvent the endogeneity problem. Nevertheless, far from getting closer to the convergence on how large the college quality impact was, the recent empirical evidence yielded mixed results (Black & Smith, 2004; Brewer, Eide, & Ehrenberg, 1999; Dale & Krueger, 2002, 2011; Hoekstra, 2009; Long, 2008; Thomas, 2000). Zhang (2012) further examined the impact of college education on the odds of unemployment during the first 10 years after college graduation and found although college graduates of high-quality private institutions enjoyed the highest earning premium among all quality types of HEIs, they were also more likely to be unemployed.

Although the unemployment of college graduates has also been a problem in the US, it has been of paramount concern to the Chinese government and society in the era of mass higher education, and it is in some aspects unique to China's circumstances and requires attention. Numerous empirical studies have focused on the unemployment problem of college graduates after the start of the higher education expansion. For example, Chen and Tan (2004) selected a sample of college students from South Central China and regarded employment as an occupational attainment. They concluded college prestige, which was measured by whether the student has graduated from a key university, had no significant impact on either employment status or starting wage.

Yue, Wen, and Ding (2004) found the initial employment rate was the highest in public colleges, followed by private independent colleges and private colleges. However, the authors did not detect a higher chance of employment for Project 211 university students than for students in regular HEIs. In contrast, Min, Ding, Wen, and Yue (2006) showed the probability of finding a job right after college graduation was higher for graduates from Project 211 universities than from other types of universities. The higher the degree, the greater the probability for obtaining employment. Using data from multiple years, Li and Yue (2009) reported the employment rate had dropped since 2005. Based on the 2007 national survey, college quality type or prestige was a key factor for job seeking. The probability of employment for Project 211 university students was higher than for students from regular HEIs, whereas three-year college students were more likely to find jobs than four-year college students.

Xie and Zhao (2009) collected the 2008 employment status, starting salary level, and employment sector data for some college and university graduates in Nanjing to quantify the impacts of human capital as well as social capital on employment outcomes. When Project 985 college students were used as the reference group, the probability of employment for students from Project 211 colleges, regular HEIs and private colleges were significantly lower as reported in the probit model. The authors split the employment sector into three categories, namely, public sector, state-owned sector, and competitive sector (including foreign and private companies). The results revealed graduates from regular HEIs were less likely to find jobs in the public sector than their Project 985 university counterparts.

Du and Yue (2010) examined the determinants of initial employment status with the 2009 survey and found 61.9% of the whole sample were graduates with bachelor's degrees. The authors grouped the potential determinants of getting employment into three major categories: student and family background; family economic, culture, and social capital; and students' academic achievement in college. It turned out that higher employment opportunities went to Project 211 university students when other things being equal. Likewise, Yue and Yang (2012) conducted a national scale survey of 30 universities and eight provinces in 2011 and calculated the influence of factors on employment opportunities. The results showed the coefficient on the Project 211 college type dummy was positive in the logit model, and it was statistically significant at the 1% level when compared with regular HEIs as the reference group

Most recently,Yang and Yue (2016) explored the initial socioeconomic status of graduates defined by whether the student had a managerial and technology related job position, which included occupations, such as managers and technology staff in government, communist party organizations, and state-owned enterprises. In other words, the authors viewed high positions in these employment units as having high socioeconomic status.

In summary, the existing Chinese empirical evidence generally suggested college quality played an important role in individual early labor market prospects, however, Chinese studies tend to vary in terms of the magnitude of various college quality types. Furthermore, the majority of studies that explored the link between college quality and student employment treated college quality as a covariate. Most scholars failed to analyze the impact of college quality in a counterfactual framework in which students in different college quality types were similar in all aspects except for college quality. In addition, there were few studies that included a comprehensive set of covariates, which called into question if potential missing variables, such as student ability caused biases. Building

upon previous empirical studies, we used a nationally representative sample of fresh Chinese college graduates to examine the role of college quality, which may contribute to students' labor market outcomes in China, and tried to fill in the gaps identified above. Our study also aimed to extend the existing literature by rigorously examining the short-term effects of college quality on initial employment status and employment unit ownership of fresh college graduates with propensity score matching (PSM) with the hope that findings from this study will offer implications for shaping policies to improve the efficiency of college student employment and ensure equal job opportunities.

Methodology

Data The survey data used in this studywere collected through the College Student Labor Market (CSLM) survey conducted by the Institute of Education, Tsinghua University,China. The CSLM survey contains not only basic information, such as student characteristics and family backgrounds, but also rich information about students' pre-college experiences, during-college activities, and post-college placement after graduation. Therefore, these survey data enables us to address concerns of the non-random college selection process by including possible confounding factors in our regression analyses. In addition, this survey employed a multi-stage stratified random sample strategy taking into account institutional regions (municipal cities, Northeast, East, Central and West China)[2], quality categories (Project 985, Project 211, non-key, and independent colleges), and institutional academic specializations (comprehensive, science and engineering, agriculture, finance and economics, etc.). Therefore, this sample was a good national representative sample of HEIs in China in terms of geographic locations and academic concentration, and the overall response rate was about 74%. In order to make inferences about the national population of college graduates in 2011, the sampling weight was calculated according to the stratified sampling arrangement and employed to adjust for the non-representativeness of the surveyed students.

The original sample size of submitted student questionnaires was 8176. In order to study the Cohort 2007 students, who entered college in 2007 and graduated in 2011, we restricted our sample to Cohort 2007 students and excluded observations in other cohorts, three-year vocational colleges, those outside of mainland China, and contract students

[2] We divide the sample into several economic regions according to the seventh 5-year plan in 1986. The institution region division is according to the regional belonging of the province or the municipal city where the college campus locates. The municipalities include Beijing, Tianjin, Shanghai. The East region includes Hebei, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan. The northeast region includes Liaoning, Jilin and Heilongjiang. The central region includes Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan. The west region includes Inner Mongolia, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shannxi, Gansu, Ningxia, Qinghai, and Xinjiang.

whose jobs after graduation were assigned rather than obtained by themselves. Afterwards, the remaining 6977 observations constituted the final whole sample. According to criteria that related to the college graduates' plans right after graduation, the whole sample can be split into three subgroups, namely the "Intention-to-work" sample, "No-intention-to-work" sample, and the "Missing-intention" group. In accordance with labor economics definitions, unemployed status is conditional on one's intention to find a job. Thus, the analysis on employment status was conducted based upon the "Intention-to-work" sample. The final sample size was 4,984, accounting for 61% of the original sample. Given the moderate missing data percentages for some variables in the "Intention-to-work" samples, the dummy variable adjustment approach was employed to treat the missing data.

In multiple regression, retaining all available covariates may lead to severe multicollinearity problems and cause over fitting of the model. Therefore, some variables derived from the CSLM instruments were combined into indexes with the principal component analysis (PCA) method, including the socioeconomic status (SES) index and pre-college home environment index. The SES index is commonly applied to measure the student's family's social and economic position relative to other students. [3]The home environment index describes the study environment at home and parental attention to the child's study. This first component explains 42% of the total variance; it was constructed from four indicator variables as to whether the student has a private room, a private desk, a private computer, and a high volume of books during the senior middle school period.[4]

Empirical Methods We used the term "initial employment status" to refer to whether the student was employed when he or she took the CSLM survey conditional upon the student's work intention after college graduation. To examine the effects of college quality on initial employment status and ownership of the employer, logistic regressions were performed since the dependent variable was binary. For example, the initial employment status was measured by whether the student had successfully obtained at least one job by the time of the survey before college graduation. The dependent took the value of 1 if the student had obtained at least one job; otherwise, it was coded as 0. The logistic regression of the dependent variable on key independent variable and covariates can be specified as follows:

$$\text{logit}(\text{p}) = \text{logit}\left(\frac{\text{p}}{1-\text{p}}\right) = \beta_0 + \beta_1 Q + \beta_2 X_1 + \cdots + \beta_k X_k + \varepsilon \quad (1)$$

[3] The SES index is presented in Table A1 in the appendix.
[4] The pre-college HOME environment index is presented in Table A2 in the appendix.

where p denotes the probability of the dependent variable to be 1, and Q measures college quality. X_i is a set of covariates, including student demographics, student ability, family background, college experience, and institutional characteristics, and ε is the error term. [5]Multiple college quality measures were used in this study to distinguish each college quality type and to achieve estimation results with better precision. Chinese universities and colleges were divided into four quality categories, namely, Project 985 colleges, Project 211 colleges, regular HEIs, and independent colleges, to be consistent with previous studies. Furthermore, Project 985 and 211 colleges were furthered defined as elite colleges, while other regular and independent HEIs were the so-called non-elite colleges. Hence, the treatment was defined as whether the student attended an elite college when we treated the college quality variable as dichotomous.

We controlled for a rich set of covariates that are of importance for fresh college graduates' employment. Specifically, we included students' demographics, such as gender, age, and ethnic minority. Confounders that represent student ability (student intellectual ability, and non-cognitive leadership skills) were also included. For family characteristics, we controlled for the student's family's rural residency status, single child or not, and SES index. A set of college experiences were also taken into consideration, including student's major, party membership, leadership experience, holding certificates, English proficiency, part-time work experience, earning merit-aid, and having a minor. For institutional characteristics, the institutional region and specialization type were what we cared about most. Since we also collected detailed information about students' pre-college experiences, these variables were used to model the elite college selection and entry process. The typical methodological challenge to draw causal inferences with observational data was that we did not observe the employment outcome if the student attended a college that differs in quality from the one the student actually attended. In this study, the treatment variable of college quality may suffer from an endogeneity problem, which may occur when college quality is correlated with the error term and results in biased estimation results. This problem can arise due to possible omitted variable bias and the nonrandom assignment into colleges of various qualities even after we controlled for the NCEE score, which served as the proxy of students' cognitive ability. If the baseline characteristics for high-quality colleges and low-quality colleges differed, directly comparing students from these two college groups would have been inappropriate. Therefore, we adopted the potential outcome approach and resorted to propensity score matching (PSM) as the

[5] The list of definitions and measures of key variables are included in Table A3 in the appendix.

identification strategy to adjust for the potential endogeneity problem. It was also performed as the additional robustness check of our results from logistic regressions.

PSM has several advantages over traditional regressions and it works when two underlying assumptions are fulfilled: (1) the Conditional Independence Assumption (CIA) and (2) the common support assumption. The CIA assumption implies that after controlling for confounders, the assignment of units to treatment is "as good as random" (Angrist & Pischke, 2008), and the common support assumption requires that the probability of receiving treatment is strictly within the unit interval between 0 and 1 so that there is sufficient overlap for adequate matching. Once these assumptions were fulfilled, we will be able to construct comparable treatment and control groups to assess the contribution of college quality to students' initial employment.

According to Caliendo and Kopeinig (2008), six steps were implemented when we conducted the PSM: First, this study estimated the propensity scores of elite college attendance with the logistic model. Based on the college choice and human capital theory, elite college attendance could be influenced by observed covariates, including student ability, senior high school characteristics, pre-college experiences, home environment, and family background. Second, we matched up elite college students (the treatment group) with those in non-elite colleges (the control group) based on their propensity scores using the 1 to 3 nearest neighbor matching algorithm, and we restricted the matched sample in the common support area. Third, we checked the overlap or the common support assumption by visual analysis to ensure this assumption was met. Fourth, we checked the balance of the covariates and made sure that the treatment and the control groups were indeed comparable. Fifth, we obtained the regression-adjusted treatment effects by running regressions on the matched sample in which observations in the treatment and control group were identical in all aspects. Finally, we tested for sensitivity by changing matching algorithms to confirm that our PSM results were robust to alternative ways of matching.

Empirical Results

Descriptive Statistics Table 1 displays the descriptive statistics for all of the variables used in the models for the "Intention-to-work" sample. According to Table 1, the percentage of students who had at least one offer was 66.2%, while the government or SOEs employed 26.8%. Female students accounted for around 46% of all of the students who had the intention to work after graduation. About 5.4% of graduates were minority students and 46.6% were rural registered-residence students. Their average NCEE score was 69.8 in the

rescaled range of 0 to 100. Within this sample, 34.8% were an only child in the family. More than half chose science, technology, engineering, and math (STEM) majors compared with 13.1% who majored in liberal arts, 8% in social sciences, 17.8% in economics and management and 6.1% in other disciplines. The sample college average score was about 79. The percentage of party members, student union leaders, and technical certificate holders was 27.1%, 20.5% and 45.1% respectively. There were 24.1% of students in the sample who did not pass the College English Test Level 4(CET4) even when they were about to graduate; in contrast, 46.3% of the students passed CET4, and 29.6% of the students passed College English Test Level 6 (CET 6). Part-time working during the term was quite prevalent for students in our survey (82.2%). The percentages of students who earned scholarships, or had load burden were just under 30%. On average, each student submitted 17 resumes while job hunting.

With regard to institutional characteristics, 16% of the students were in elite colleges versus 84% in non-elite colleges after we adjusted the sampling weight. More specifically, 5.1% of the students were in Project 985 colleges, 10.8% were in Project 211 colleges, 72.8% were in non-key colleges, and 11.2% were in independent colleges. A considerable proportion of the students were in HEIs and specialized in engineering, followed by 29.7% of the students who were in normal universities, and 21.2% who were attending comprehensive colleges. In addition, our sample covered institutions in five regions. HEIs in the Eastern and Central China accommodated over half of the whole sample.

Impact of College Quality on Initial Employment Status In Table 2, the dichotomous categorical measure of college quality (elite/non-elite) was used in the estimation equations and the odds ratios from estimating the logit models are reported. Student demographic characteristics, family background, student ability, college experience, and institutional characteristics were included as covariates. In model 1, we report a model that does not control for student ability and college experience. Student cognitive ability and non-cognitive leadership skill are included in model 2. In model 3, we add a set of college experience covariates. We put more weight on interpreting estimation results in model 3 and 4, because model 3 included comprehensive controls of covariates, and results from PSM in column 4 accounted for potential endogenous elite college attendance, and can be used for robustness check. The estimation from logistic regressions provide benchmarks for assessing the matching estimates. Also, for all of the models, we controlled for college characteristics other than quality with a series of dummy indicators.

Table 1. Summary of Variables in the "Intention-to-work" Sample, weighted

Variable	N	Mean/%	S.D.	Minimum	Maximum
Student variables					
Have job offer (Yes=1) (%)	4984	0.662	0.473	0	1
Employed by government or SOEs	3460	0.268	0.443	0	1
Age	4890	23.016	0.995	20	31
Female (Yes=1) (%)	4967	0.459	0.498	0	1
Minority (Yes=1) (%)	4942	0.054	0.227	0	1
Rural household (Yes=1) (%)	4969	0.466	0.499	0	1
NCEE (rescaled to 1~100)	4420	69.824	7.721	24	100
Academic track in high school (%)					
Humanity	4930	0.245	0.430	0	1
Science & Comprehensive	4930	0.693	0.461	0	1
Art & Athletics	4930	0.062	0.242	0	1
Non-cognitive leadership skills (%)	4984	0.398	0.490	0	1
Single child (Yes=1) (%)	4921	0.348	0.476	0	1
SES index	3888	-0.237	0.942	-2.191	2.799
Key senior high school (%)	4926	0.760	0.427	0	1
Residential region before college (%)					
Municipality	4858	0.093	0.291	0	1
East	4858	0.308	0.462	0	1
Northeast	4858	0.134	0.340	0	1
Central	4858	0.248	0.432	0	1
West	4858	0.216	0.412	0	1
Home environment in high school	4892	-0.155	1.167	-1.479	2.95
College majors (%)					
Liberal arts	4978	0.131	0.338	0	1
Social sciences	4978	0.080	0.271	0	1
STEM	4978	0.551	0.497	0	1
Economics & Management	4978	0.178	0.382	0	1
Others	4978	0.061	0.239	0	1
Average academic score in college	3859	78.617	6.553	25	100
Communist party member (Yes=1)(%)	4935	0.271	0.444	0	1
Student leader (Yes=1) (%)	4984	0.205	0.404	0	1
Have technical certificate (Yes=1) (%)	4984	0.451	0.498	0	1
College English Test proficiency (%)					
Did not pass CET4 & CET6	4848	0.241	0.428	0	1
Pass CET4	4848	0.463	0.499	0	1
Pass CET6	4848	0.296	0.456	0	1
Part-time workexperience (Yes=1) (%)	4917	0.822	0.382	0	1
Have merit aid (Yes=1) (%)	4396	0.308	0.462	0	1
Have need-based aid	4984	0.210	0.408	0	1
Have loan	4884	0.293	0.445	0	1
Have minor (Yes=1) (%)	4880	0.064	0.246	0	1
Like major	4886	2.633	0.802	1	4
Number of resume submitted	3665	16.621	14.502	0	50

Institution variables					
Elite college (Yes=1) (%)	4984	0.160	0.366	0	1
Institution quality categories (%)					
Project 985 college	4984	0.051	0.221	0	1
Project 211 college	4984	0.108	0.311	0	1
Non-key college	4984	0.728	0.445	0	1
Independent college	4984	0.112	0.316	0	1
Institution specialization (%)					
Comprehensive	4984	0.212	0.408	0	1
Engineering	4984	0.441	0.497	0	1
Normal	4984	0.297	0.457	0	1
Agriculture	4984	0.040	0.196	0	1
Finance	4984	0.001	0.035	0	1
Political Science	4984	0.007	0.081	0	1
Minority	4984	0.003	0.053	0	1
Institution region (%)					
Municipality	4984	0.133	0.339	0	1
East	4984	0.272	0.445	0	1
Northeast	4984	0.150	0.357	0	1
Central	4984	0.242	0.428	0	1
West	4984	0.203	0.403	0	1

Table 2. Impact of College Quality (Elite vs. Non-elite) on Initial Employment Status

Models	**(1) Logistic**	**(2) Logistic**	**(3) Logistic**	**(4) PSM**
Elite college	1.299	1.060	1.095	1.183
	(0.244)	(0.176)	(0.151)	(0.210)
Age	1.025	1.026	0.995	1.049
	(0.038)	(0.039)	(0.039)	(0.087)
Female	0.892	0.919	0.800*	0.743
	(0.121)	(0.123)	(0.105)	(0.182)
Minority	0.819	0.856	0.844	0.816
	(0.177)	(0.175)	(0.190)	(0.281)
Rural	1.125	1.102	1.038	1.245
	(0.273)	(0.272)	(0.332)	(0.255)
Only child	0.675***	0.664***	0.746***	1.085
	(0.061)	(0.062)	(0.084)	(0.216)
SES	0.891	0.916	0.925	0.944
	(0.068)	(0.068)	(0.093)	(0.115)
NCEE		1.021***	1.024**	1.017
		(0.008)	(0.009)	(0.014)
Humanities track		0.768**	1.003	1.325
		(0.093)	(0.208)	(0.349)
Arts and athletics track		0.873	1.280	0.953
		(0.220)	(0.546)	(0.379)

Non-cognitive leadership skills		1.386***	1.321**	1.006
		(0.158)	(0.158)	(0.169)
Major in liberal arts			0.843	0.475
			(0.137)	(0.224)
Major in social sciences			0.455***	0.390**
			(0.090)	(0.151)
Major in economics and management			0.718	0.644**
			(0.158)	(0.132)
Major in other disciplines			0.639	1.333
			(0.248)	(0.429)
Average academic score			0.975**	1.001
			(0.011)	(0.021)
Party member			1.191*	1.038
			(0.125)	(0.223)
Student leader			0.984	0.916
			(0.107)	(0.110)
Have certificate			1.167	1.095
			(0.155)	(0.113)
Pass CET4			1.306	2.661***
			(0.226)	(0.638)
Pass CET6			1.285**	1.830***
			(0.148)	(0.381)
Part-time work			1.672***	1.329
			(0.246)	(0.282)
Have merit aid			1.097	0.865
			(0.143)	(0.117)
Have nee- based aid			1.304*	0.898
			(0.194)	(0.210)
Have loan			1.292	1.275
			(0.252)	(0.269)
Have minor			1.273	2.016**
			(0.251)	(0.681)
Like major			1.199***	1.011
			(0.070)	(0.087)
Number of submitted resumes			1.007**	1.003
			(0.003)	(0.004)
College discipline concentration	Y	Y	Y	Y
College region	Y	Y	Y	Y
N	4984	4984	4984	3079
Pseudo R^2	0.059	0.073	0.196	0.254

Note: Clustered standard errors over colleges are shown in parentheses * p<0.1, ** p<0.05, ***p<0.01

The results indicated the odds ratios in all of the models were larger than 1, but they were insignificant at any significance level. It suggested the dichotomous measure of college quality might be too abstract and disguised the discrepancy between colleges of various qualities. Hence, we turned to a more concrete quality measure by dividing Chinese universities into four college quality categories, namely, Project 985 colleges, Project 211 colleges, non-key colleges, and independent colleges for more informative analysis. Moreover, the estimation results on the elite college dummy from PSM were quite similar to those from model 3, suggesting our results were generally robust. Alternative matching algorithms, such as kernel matching and radius matching were also performed, and the PSM results stayed consistent.[6]

We also identify a number of covariates in student demographics, student ability, family background, college experience, and institutional characteristics that have significant effects on initial employment right after college graduation as shown in Table 2. Specifically, female students were less likely to find jobs, although it was only significant at the 10 % significance level. Holding other things constant, being the single child in the family produced less chance of finding a job; however, students with higher cognitive ability and non-cognitive leadership ability were more likely to get employed. Students who majored in social sciences were at a disadvantage in terms of job seeking. Students who had higher English proficiency levels were more likely to find jobs, and part-time working experience was beneficial for job seeking. Considering that the sample size was restricted to the common support area when we used PSM, the results from the PSM and logistic regressions were not consistent on some of the covariates, such as whether the student had a minor, or whether the student liked his/her major, etc., but the inferences on the key independent variable remained consistent.

Table 3 displays the odds ratios from logistic regressions for students in Project 985, Project 211 colleges, and students in non-key, and independent colleges. Given that the definition of the treatment and control groups can be arbitrary if we had four college quality categories, PSM was not performed when we adopt this college quality measure. The odds ratio of graduates from Project 985 colleges is about 1.6 in model 3, suggesting that they are 1.6 times more likely to find jobs than those in non-key regular institutions, although it is only significant at the 10% level. We do not detect significant differences between students in Project 211, non-key, and independent colleges in terms of employment. In other words, students from Project 985 colleges might gain an advantage

[6] Detailed PSM results of alternative matching algorithms are not reported, but are available upon request.

in the early labor market while students from Project 211 colleges may not be able to easily find jobs compared with students in non-key colleges.

Table 3. Impact of College Quality on Initial Employment Status

Models	(1) Logistic	(2) Logistic	(3) Logistic
Project 985 college	1.683*	1.364	1.605*
	(0.522)	(0.392)	(0.417)
Project 211 college	1.089	0.991	0.982
	(0.187)	(0.157)	(0.128)
Independent college	0.513**	0.590*	0.686
	(0.142)	(0.174)	(0.199)
Age	1.028	1.028	0.998
	(0.040)	(0.040)	(0.040)
Female	0.860	0.894	0.785*
	(0.117)	(0.117)	(0.099)
Minority	0.831	0.841	0.835
	(0.177)	(0.171)	(0.186)
Rural	1.089	1.079	1.019
	(0.262)	(0.265)	(0.329)
Only child	0.685***	0.671***	0.746***
	(0.061)	(0.062)	(0.085)
SES	0.892	0.914	0.922
	(0.069)	(0.068)	(0.093)
NCEE		1.013	1.018*
		(0.010)	(0.011)
Humanities track		0.784**	1.014
		(0.093)	(0.209)
Arts and athletics track		0.798	1.216
		(0.212)	(0.533)
Non-cognitive leadership skills		1.375***	1.308**
		(0.160)	(0.160)
Major in liberal arts			0.859
			(0.148)
Major in social sciences			0.445***
			(0.084)
Major in economics and management			0.718
			(0.158)
Major in other disciplines			0.633
			(0.250)
Average academic score			0.976**
			(0.011)
Party member			1.180
			(0.123)

Student leader			0.978
			(0.107)
Have certificate			1.188
			(0.160)
Pass CET4			1.322
			(0.226)
Pass CET6			1.281**
			(0.145)
Part-time work			1.650***
			(0.233)
Have merit aid			1.103
			(0.146)
Have need-based aid			1.302*
			(0.193)
Have loan			1.286
			(0.248)
Have minor			1.268
			(0.260)
Like major			1.203***
			(0.069)
Number of submitted resumes			1.007**
			(0.003)
College discipline concentration	Y	Y	Y
College region	Y	Y	Y
N	4984	4984	4984
Pseudo R^2	0.065	0.076	0.198

Note: Clustered standard errors over colleges are shown in parentheses * p<0.1, ** p<0.05, ***p<0.01

When compared to previous empirical studies that utilized Chinese data, our study not only contained more comprehensive controls of covariates, such as student cognitive or non-cognitive abilities, but also took into account the potential endogeneity of elite college attendance by performing the PSM method. In addition, our sample contained all four-year college students with bachelor's degrees, and excluded three-year vocational college students, and postgraduate students, while early Chinese studies often mixed them all together in their analyses (W. Li & Yue, 2009; Min et al., 2006; Yang & Yue, 2016; Yue et al., 2004; Yue & Yang, 2012). These might be the reasons why previous studies tended to find statistically significant effects of elite college attendance (Du & Yue, 2010; Yue & Yang, 2012) that were not so evident in this study.

Impact of College Quality on Employment Unit Ownership As college enrollment rocketed and the job search competition heated up, many college students were oriented towards seeking government officer/civil servant jobs or positions in state-owned

enterprises (SOEs). Jobs in these public sectors were usually regarded as promising jobs with secured remuneration, stable fringe benefits, high social status and recognition, and less work burden when compared with private sector jobs. Table 4 reports the odds ratio of the dichotomous categorical measure of college quality (elite/non-elite) on the ownership of employment units for students who were employed. Again, student demographic characteristics, family background, student ability, college experience, and institutional characteristics were included as covariates. The model specifications were the same as we examined the effects of college quality on initial employment status.

The results demonstrated the odds ratios in all of the models were larger than 1 but only the odds ratio from PSM was significant at the 10% significance level. The magnitude of estimate yielded by matching was slightly higher than those yielded by logistic regressions. This may due to the fact that this PSM estimate could be interpreted as the average treatment effect on the treated (ATT), which refers to the effect of elite college attendance on those who actually attended elite colleges rather than the average treatment effect (ATE), which captures the effect of college quality on students in both elite and non-elite colleges. On the whole, the regression estimates from all of the 4 models implied elite college attendance plays a key role in determining employment unit ownership of jobs obtained. In order to figure out which students from the specific college quality categories benefited from their college quality, we ran the regressions again with four concrete college quality categories.

Several covariates were the determinants of whether the student took job positions in the government or SOEs. We discovered that female students were less likely to find such jobs while one unit increase in the family socioeconomic index increased the odds of entering such jobs by over 20%. With regard to student ability, cognitive ability may not be correlated with finding public sector jobs, while non-cognitive leadership was highly valued in locating these types of jobs. Moreover, liberal arts students were at a disadvantage in finding employment in the government or SOEs compared to students with STEM majors. There were several ways to accumulate human capital in order to enter public job sectors, such as earning certificates, passing College English Tests, and spending more effort on major course studies. However, submitting more resumes may not improve the chances of finding these public sector jobs.

Previous studies that examined the job sector choice of college graduates yielded mixed results (Xie & Zhao, 2009; Yang & Yue, 2016). Although we found positive effects on locating public sector jobs, our results were contrasted to Xie and Zhao (2009)'s study, which attributed more chances to Project 985 college students. The reason might be that

most Project 985 colleges are research universities that produce a considerable proportion of students who will pursue postgraduate education and thus, they are less likely to take alternative positions as employees in government or SOEs in comparison to Project 211 college students.

Table 4. Impact of College Quality on Employment Unit Ownership

Models	(1) Logistic	(2) Logistic	(3) Logistic	(4) PSM
Elite college	1.451***	1.268	1.265	1.723***
	(0.207)	(0.205)	(0.194)	(0.323)
Age	0.907*	0.917*	0.924	0.842*
	(0.047)	(0.047)	(0.052)	(0.074)
Female	0.549***	0.594***	0.621***	0.503***
	(0.088)	(0.090)	(0.096)	(0.074)
Minority	0.980	1.016	1.061	0.854
	(0.207)	(0.196)	(0.204)	(0.199)
Rural	0.867	0.853	0.835	1.303
	(0.132)	(0.128)	(0.105)	(0.222)
Only child	1.004	1.047	1.019	0.938
	(0.111)	(0.121)	(0.116)	(0.202)
SES	1.181*	1.216**	1.234**	1.225**
	(0.105)	(0.109)	(0.109)	(0.125)
NCEE		1.015	1.007	0.981
		(0.012)	(0.012)	(0.017)
Humanities track		0.679*	0.882	1.526
		(0.149)	(0.233)	(0.534)
Arts and athletics track		0.380**	0.642	0.203***
		(0.180)	(0.294)	(0.090)
Non-cognitive leadership skills		1.183*	1.121	1.224
		(0.107)	(0.117)	(0.188)
Major in liberal arts			0.491**	0.257***
			(0.143)	(0.084)
Major in social sciences			1.035	0.613
			(0.600)	(0.264)
Major in economics and management			0.867	0.959
			(0.174)	(0.160)
Major in other disciplines			0.325***	1.063
			(0.132)	(0.293)
Average academic score			0.991	1.006
			(0.011)	(0.018)
Party member			1.234	1.583**
			(0.179)	(0.313)
Student leader			1.115	0.719
			(0.196)	(0.149)

Have certificate			1.099	1.420*
			(0.101)	(0.255)
Pass CET4			1.442***	1.567*
			(0.194)	(0.388)
Pass CET6			1.333	1.400
			(0.243)	(0.421)
Part-time work			0.846	0.703**
			(0.093)	(0.118)
Have merit aid			1.065	1.005
			(0.114)	(0.210)
Have nee- based aid			1.221*	0.884
			(0.127)	(0.241)
Have loan			1.042	1.264
			(0.114)	(0.259)
Have minor			1.127	0.614
			(0.225)	(0.199)
Like major			1.272***	1.078
			(0.117)	(0.109)
Number of submitted resumes			0.993***	0.992
			(0.002)	(0.005)
College discipline concentration	Y	Y	Y	Y
College region	Y	Y	Y	Y
N	3714	3714	3708	2342
Pseudo R^2	0.105	0.117	0.146	0.160

Note: Clustered standard errors over colleges are shown in parentheses * p<0.1, ** p<0.05, ***p<0.01

Table 5 displays the odds ratios from logistic regressions for students in Project 985, Project 211 colleges, and students in non-key and independent colleges. The odds ratio of graduates from Project 985 colleges was close to 1 in model 3, suggesting that they probably had equal odds as the students in non-key universities in terms of finding jobs in the government or SOEs. On the contrary, students from Project 211 universities were 1.42 times more likely to take government or SOE positions than those in non-key universities, and the odds ratio value was significant at the 5% significance level. Also, independent college students had less chance to find these types of jobs.

Table 5. Impact of College Quality on Employment Ownership

Models	(1) Logistic	(2) Logistic	(3) Logistic
Project 985 college	1.066	0.883	0.921
	(0.213)	(0.219)	(0.215)
Project 211 college	1.556***	1.446***	1.419**
	(0.219)	(0.203)	(0.199)
Independent college	0.656*	0.763	0.769
	(0.160)	(0.218)	(0.226)
Age	0.901*	0.911*	0.920
	(0.048)	(0.047)	(0.052)
Female	0.534***	0.583***	0.609***
	(0.090)	(0.091)	(0.095)
Minority	0.982	1.011	1.052
	(0.206)	(0.194)	(0.201)
Rural	0.863	0.852	0.835
	(0.131)	(0.128)	(0.105)
Only child	1.014	1.056	1.032
	(0.114)	(0.123)	(0.119)
SES	1.181*	1.215**	1.236**
	(0.105)	(0.109)	(0.109)
NCEE		1.012	1.004
		(0.012)	(0.012)
Humanities track		0.676*	0.878
		(0.147)	(0.234)
Arts and athletics track		0.357**	0.612
		(0.166)	(0.278)
Non-cognitive leadership skills		1.180*	1.118
		(0.105)	(0.114)
Major in liberal arts			0.494**
			(0.144)
Major in social sciences			1.038
			(0.607)
Major in economics and management			0.861
			(0.172)
Major in other disciplines			0.320***
			(0.133)
Average academic score			0.990
			(0.011)
Party member			1.227
			(0.180)
Student leader			1.107
			(0.195)
Have certificate			1.101

			(0.103)
Pass CET4			1.437***
			(0.195)
Pass CET6			1.332
			(0.243)
Part-time work			0.843
			(0.092)
Have merit aid			1.072
			(0.114)
Have need-based aid			1.234**
			(0.123)
Have loan			1.033
			(0.111)
Have minor			1.098
			(0.221)
Like major			1.273***
			(0.117)
Number of submitted resumes			0.993***
			(0.002)
College discipline concentration	Y	Y	Y
College region	Y	Y	Y
N	3714	3714	3708
Pseudo R^2	0.107	0.119	0.148

Note: Clustered standard errors over colleges are shown in parentheses * p<0.1, ** p<0.05, ***p<0.01

Conclusions and Discussion

In this paper, we investigated whether better colleges bring better jobs for their graduates by measuring college quality in two different ways, either as a dichotomous variable or as multiple quality categories with a nationally representative sample. Two major conclusions were reached. First, even after we controlled for a comprehensive set of covariates, including student demographics, student ability, family background, student college experiences, and institutional characteristics, the results showed that students who graduated from elite colleges gained advantages in terms of obtaining employment opportunities. More specifically, higher employment probabilities went to students in Project 985 colleges instead of students in Project 211 colleges; this is consistent with Xie and Zhao (2009) and supported the notion that elite college students acquired higher human capital stock and capabilities that paid off when they hunted for jobs. Second, we also examined whether students from elite colleges were more likely to find public sector jobs in the government or SOEs. It turned out that students who graduated from elite colleges had a higher probability to find such jobs. According to the PSM estimate that was significant at the 10% level, elite college students were 1.72 times more likely to take

public sector jobs. After splitting the colleges into four quality categories, we found that students who graduated from Project 211 colleges were the actual beneficiaries in the early labor market in terms of finding employment positions in the government or SOEs. We did not observe the same situation for students who graduated from Project 985 colleges since the coefficient on the Project 985 college dummy was less than 1 and was statistically weak

The major findings from our study contribute to existing Chinese literature by extending past endeavors to estimate the effects of college quality on early labor market employment outcomes in several ways. First, we examined two dimensions of early labor market employment outcomes, including both initial employment status and work unit ownership. Second, we showed a clear pattern of results by emphasizing alternative measurements of college quality, and by contrasting estimation parameters from alternative specifications and identification strategies.

Our study also offers important policy implications for shaping national as well as institutional policies to enhance college quality and promote the employment of college graduates. As the number of college graduates grew year after year, it became increasingly difficult for students to find jobs in China after many years of higher education expansion. Our study using the 2011 data helped to investigate whether college quality mattered even more when the college student labor supply surges in recent years. The short-term college quality effects on college students' initial employment status in our sample were generally consistent with the findings from many earlier studies. Thus, our results indicate that college quality gaps worsen the equity in the early career stages and labor market performance for college attendees. Given the fact that the scale of college enrollment after the higher education expansion persists, this equity in terms of employment opportunity may continue to emerge for elite and non-elite college graduates. To some extent, the findings justified Chinese students and families' keen interest in being admitted to elite Chinese universities, and it called for the attention of HEIs to cultivate knowledge and skills that are valued in the labor market, and to improve college campus recruitment services to maintain a higher employment rate.

Furthermore, our findings show that substantial pre-college background characteristics and experiences exist and influence who goes to elite colleges, and intensify education stratification at the phase of tertiary education. If students from socioeconomically disadvantaged families have difficulties entering elite colleges, they will probably face social stratification and low social mobility when they complete their college education. For example, they may spend more time and money on their job search and tend to move

to the coastal region and large cities where job opportunities are abundant. Even for students with identical characteristics, employers may prefer to hire elite college students, which urges the government and society to eliminate college diploma discrimination against institutional quality, and to avoid early labor market segmentation by efficiently matching job positions with qualified college-trained graduates.

In addition, it is notable that among all obtained job offers, only 27% of them were located in the government and SOEs and Project 211 students gain more such job positions. Our findings reflected that public sector employers implemented job filter and selection to recruit employees with signs of potential high future productivity, which is manifested by college prestige and social perception of college quality. However, we have to keep in mind that it is the private sector that absorbs the majority of fresh college graduates. If entities and companies in the private sector were motivated to recruit more college-educated labors and public sector employers were derived of privileges that originate from administrative and monopoly power due to their ownership attribute, the dispersion of college graduates in public and private job sectors would be more even and the economy would be better boosted by numerous private enterprises comprised of more elite college graduates, which answers the call from the national strategy to enhance mass entrepreneurship and innovation in China.

Despite the key findings and implications suggested above, this study had some important limitations. First, an obvious caveat is data constraint. Given the time to conduct the survey, there would be a higher proportion of fresh graduates who did not receive any job offers compared with U.S. studies that typically collect job placement data several months after graduation (Black & Smith, 2004; Brand & Halaby, 2006; Dale & Krueger, 2002, 2011; Long, 2008; Zhang, 2012). It may bias the estimates when we draw inferences for time-variant outcomes such as initial employment status and employment unit ownership status. In addition, due to the survey timeline, the effective sample size was substantially lower, and the statistical power was compromised. Further research is still needed to track the sampled students and check the reliability of the results due to the fact that the returns to college quality may be fully exhibited in the college graduates' mid- or late-career. Second, the internal and external validity of the research designs are subject to potential threats. Although we tried to solve the endogeneity problem with the PSM method, it is based on the "selection on observables" assumption, and generated results that were not that different from those discovered from logistic regressions. We should be cautious to interpret the results as causal rather than as a correlation. More research with higher precision and reliability are expected to confirm the causality.

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Appendix

Table A1. Component Loadings for Socioeconomic Status Variable

Variable	Component 1
Annual household income	0.625
Area of dwelling	-0.120
Mother's years of schooling	0.723
Father's years of schooling	0.729
Rural residency	-0.739
Ordinary commercial residency	0.514
At least one parent is a manager in the household	0.568
At least one parent is a professional in the household	0.541
At least one parent is an ordinary staff in the household	0.307
At least one parent is a farm worker	-0.602
At least one parent works in the government	0.414
At least one parent works in the public institutions	0.606
At least one parent works in public service sector	0.582
At least one parent works in service and retail industry	0.168

Note: Extraction Method: Principal Component Analysis; Component 1: Socioeconomic Status (SES)

Table A2. Component Loadings for Pre-College Home Environment Variable

Variable	Component 1
Have private room in senior middle school	0.4496
Have private desk in senior middle school	0.4832
Have private computer in senior middle school	0.5779
Have a high volume of book in senior middle school	0.4800

Note: Principal Component Analysis; Component 1: Pre-college home environment index (HOME)

Table A3. Definitions and Measurements of Key Variables

Variable name	Definition	Measures
Dependent Variable		
Employment status	Initial employment status: whether student has at least one job offer at the time of the survey	Dummy:1=employed, 0=unemployed
Employment unit ownership	Employment unit ownership: whether student was employed by government or State-Owned Enterprises (SOEs)	Dummy:1=employed by government or state owned enterprises, 0=otherwise
Key Independent Variable: College Quality		
Elite	College quality categories: 985 and project 211 colleges are elite colleges; other regular HEIs are non-elite colleges	Dummy: 1=elite college, 0=non-elite
Project 985 college	College in the project 985	Dummy:1=project 985 college, 0=otherwise
Project 211 college	College in the project 211	Dummy：1=211 colleges, 0=otherwise
Non-key college	Public college not in the 985 or project 211	Dummy: 1=non-key colleges, 0=otherwise

Independent college	Private college affiliated to public HEIs	Dummy: 1=independent colleges, 0=otherwise
Key Covariates		
Student demographics		
Female	Student's gender	Dummy variable: 1=Female, 0=Male
Age	Age at college graduation	Continuous, calculated from birth year and month
Minority	whether the student is an ethnic minority	Dummy variable: 1=Minority, 0=Han
Student ability		
Intellectual /Academic ability	Student cognitive ability measured by NCEE score rescaled to 0-100	Continuous
Academic track	Academic track in upper secondary school	Categorical: Science, liberal arts, arts and athletics
Non-cognitive leadership skills	Whether the student has leadership experiences in upper secondary school	Dummy:1=class/school leader, 0=otherwise
Family background		
Rural Residency	The Household's registered residence location is in urban or rural area	Dummy variable: 1=Rural, 0=Urban
Single child	Whether a single child in the family	Dummy: 1=Single child, 0=has siblings
SES index	An index of family socio-economic status constructed from the family background variables	Continuous
Pre-college experiences		
Key school	Student's high school quality type	Dummy: 1=key school, 0=non-key
Residential region before college	Student's residential region before college	Categorical: Municipalities (reference group) , Northeast, East, Central and West
Home environment	An index calculated from indicators including the number of books at home; have private room/private desk/private computer	Continuous
College experiences		
Major	Major field of study in college	Categorical: STEM is the reference group
Party membership	Whether the student join the Communist Party of China (CPC)	Dummy: 1=CPC Party member, 0=otherwise
Student leader	Whether has leadership experiences in student organizations	Dummy: 1=student organization leader, 0=otherwise
Certificate	Whether have technical certificate	Dummy:1=have certificate, 0=otherwise
English Proficiency	Whether pass the College English Test (CET) level 4 & level 6	Categorical: do not pass CET4 is the reference group

Part-time working	Whether have part-time working experiences during college	Dummy:1=worked in college,0=otherwise
Have merit aid	Whether have merit aid scholarships in college	Dummy:1=have merit aid, 0=otherwise
Have minor	Whether have a minor in college	Dummy: 1=have minor, 0=otherwise
Institutional characteristics		
Institution region	The institutional location region	Categorical: Municipalities (reference group) , Northeast, East, Central and West
Institution specialization	The institutional specialization type	Categorical: Comprehensive (reference group), Engineering

Table A4. Determinants of Elite College Attendance

Model	(1) Logistic
Age	0.821***
	(0.036)
Female	0.881
	(0.081)
Minority	3.236***
	(0.616)
Rural	1.030
	(0.112)
Residential region in the East	0.815
	(0.158)
Residential region in the Northeast	0.988
	(0.215)
Residential region in the Central	0.828
	(0.170)
Residential region in the West	3.381***
	(0.633)
NCEE	1.335***
	(0.017)
Humanities track	0.662***
	(0.074)
Arts and athletics track	28.737***
	(11.133)
Non-cognitive leadership skills	1.051
	(0.088)
Only child	1.148
	(0.121)
SES	1.137**
	(0.072)
Key senior high school	1.512***
	(0.166)

Home environment index	1.021
	(0.041)
N	4984
Pseudo R^2	0.319

Note: Robust standard errors are shown in parentheses * p<0.1, ** p<0.05, ***p<0.01

Table A5. Balance Between Elite and Non-elite College Attendees.

		Mean		SD		STD	SD
Variable	**Sample**	**Treated**	**Control**	**Treated**	**Control**	**Diff**	**Ratio**
NCEE	Unmatched	75.41	69.67	7.540	7.630	0.760	0.990
	Matched	75.42	74.98	7.450	7.320	0.0580	1.020
Muni	Unmatched	0.0450	0.187	0.210	0.390	-0.682	0.530
	Matched	0.0440	0.0390	0.210	0.190	0.0280	1.070
East	Unmatched	0.260	0.194	0.440	0.400	0.151	1.110
	Matched	0.260	0.244	0.440	0.430	0.0350	1.020
Northeast	Unmatched	0.0860	0.115	0.280	0.320	-0.102	0.880
	Matched	0.0870	0.0800	0.280	0.270	0.0240	1.040
Central	Unmatched	0.179	0.281	0.380	0.450	-0.267	0.850
	Matched	0.179	0.165	0.380	0.370	0.0350	1.030
West	Unmatched	0.430	0.224	0.500	0.420	0.416	1.190
	Matched	0.431	0.472	0.500	0.500	-0.0840	0.990
Humanities track	Unmatched	0.185	0.212	0.390	0.410	-0.0690	0.950
	Matched	0.184	0.211	0.390	0.410	-0.0690	0.950
Arts and athletics track	Unmatched	0.0490	0.0740	0.220	0.260	-0.118	0.820
	Matched	0.0490	0.0520	0.220	0.220	-0.0130	0.970
Science track	Unmatched	0.756	0.703	0.430	0.460	0.123	0.940
	Matched	0.756	0.720	0.430	0.450	0.0850	0.960
Minority	Unmatched	0.104	0.0500	0.300	0.220	0.177	1.400
	Matched	0.103	0.118	0.300	0.320	-0.0490	0.940
Key senior high school	Unmatched	0.831	0.741	0.370	0.440	0.242	0.850
	Matched	0.832	0.833	0.370	0.370	-0.00200	1
Rural	Unmatched	0.460	0.416	0.500	0.490	0.0870	1.010
	Matched	0.461	0.420	0.500	0.490	0.0820	1.010
SES	Unmatched	-0.180	-0.176	0.970	0.900	-0.00400	1.070
	Matched	-0.181	-0.116	0.970	0.940	-0.0670	1.030
Home environment index	Unmatched	-0.117	-0.0880	1.250	1.220	-0.0230	1.030
	Matched	-0.118	-0.0680	1.250	1.310	-0.0400	0.960
Age	Unmatched	22.95	23.00	1.020	0.970	-0.0550	1.050
	Matched	22.95	22.93	1.020	1.050	0.0150	0.970
Female	Unmatched	0.374	0.451	0.480	0.500	-0.158	0.970
	Matched	0.374	0.408	0.480	0.490	-0.0700	0.980
Only child	Unmatched	0.359	0.397	0.480	0.490	-0.0800	0.980
	Matched	0.359	0.348	0.480	0.480	0.0240	1.010
Non-cognitive leadership skills	Unmatched	0.427	0.417	0.490	0.490	0.0200	1
	Matched	0.427	0.446	0.490	0.500	-0.0380	1

Note: SD refers to standard deviation; STD Diff. refers to absolute standardized difference in group means; and Ratio of RDs refers to the ratio of the standard deviations between the treatment and control groups. The balance table demonstrates that the propensity score matching has fulfilled the balance requirement on all covariates. For each covariate, the absolute STD Diff. was <0.1 With regard to the balance of standard deviations, the ratio of standard deviations between the two groups was <1.1 after matching. Since a ratio close to 1 indicates better balance, our results show that the balance is satisfactory. Therefore, we believe that we construct a control group for the treated group and the two groups are identical in every aspect after matching.

Figure A1. Distribution of Propensity Scores Before Matching

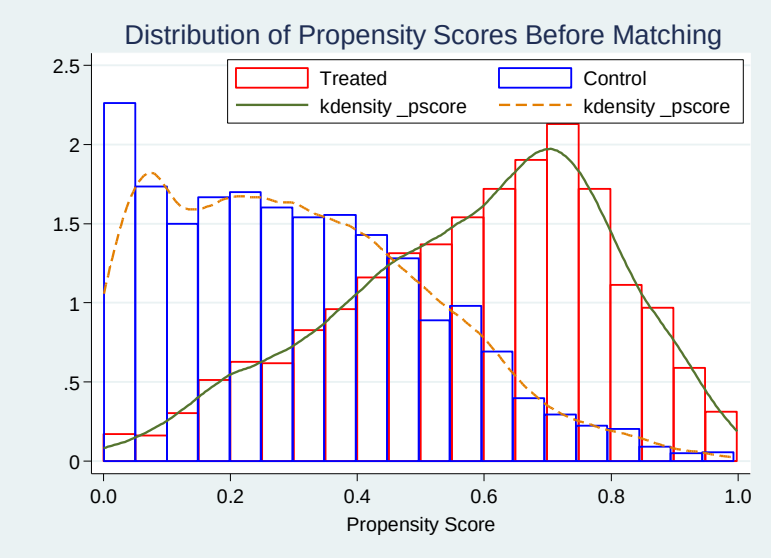

Figure A2. Distribution of Propensity Scores After Matching