



# What is keeping the poor out of college?

Educational  
barriers in China

## Enrollment rates, educational barriers and college matriculation in China

131

Xiaobing Wang, Chengfang Liu, Linxiu Zhang and Renfu Luo

*Center for Chinese Agricultural Policy,  
Institute for Geographical Sciences and Natural Resources Research,  
Chinese Academy of Sciences, Beijing, China*

Thomas Glauben

*Leibniz Institute of Agricultural Development in Central and Eastern Europe,  
Halle (Saale), Germany*

Yaojiang Shi

*College of Economic Management, Northwest University, Xi'an, China, and*

Scott Rozelle and Brian Sharbono

*Shorenstein Asia-Pacific Research Center, Freeman Spogli Institute,  
Stanford University, Stanford, California, USA*

### Abstract

**Purpose** – With the rise in the opportunity to go to college, the purpose of this paper is to identify if China's rural poor are being excluded from the university system, and if so, why.

**Design/methodology/approach** – Two sets of the authors' own primary survey data were used: a group of randomly selected high school students in Shaanxi Province and a census of all freshmen entering into four universities in Sichuan, Anhui and Shaanxi. The intention was to show if the rate of the rural poor attending universities is lower than that of urban students and that of rural non-poor; also to identify the barriers to education (if they exist) that are keeping enrollment rates low for the rural poor. The authors used ordinary least squares method to make the estimations.

**Findings** – Matriculation rate of the poor into college was found to be substantially lower than the students from non-poor families. Clearly, barriers exist that are excluding the rural poor; however, the authors demonstrate that the real barriers are not at the point of college admissions, but before students have even matriculated into high school.

**Originality/value** – This is the first empirical work which studies the barriers that keep the poor out of university.

**Keywords** Higher education, Poverty, China, Rural regions, Equal opportunities

**Paper type** Research paper

**JEL classification** – I29, I30, O53

The authors would like to thank Jennifer Adams, Fang Chang, Jin He, Min He, Prashant Loyalka, Yingquan Song, Hongmei Yi, Ai Yue and Qiran Zhao for support of this work and comments on early drafts of the paper. A special acknowledgement goes to Cyrus Tang Foundation and IET/CORE Foundation that supplied the funding for the research. Leibniz Institute of Agricultural Development in Central and Eastern Europe, Germany, Stanford's Freeman Spogli Institute and an anonymous donor also provided financial assistance.



## 1. Introduction

Opportunities to attend college and earn a degree have expanded dramatically in China over the past decade. Government appropriations for education increased from 186 billion RMB in 1997 to over 600 billion RMB in 2006, an annual real growth rate of over 13 percent (CNBS, 2008). With this large injection of funds, over 800 new comprehensive universities and professional colleges were founded, nearly doubling the number of tertiary institutions. (A note on terminology: in this paper, we use the terms “college” and “university” interchangeably, to refer to all types of tertiary educational institutions.) There has also been dramatic growth in college enrollment rates, from around three million students in 1997, to over 17 million in 2007.

From the demand side, the rise in college enrollment opportunities is a welcome change. A college degree is increasingly seen as the single most important criterion for employment in professional, management and other technically oriented jobs. Research confirms that the economic return to college is high in China; in 2002, the increase in earnings for an individual that attended college (compared to individuals who only completed elementary school) was about 23.1 percent, and that number is rising (Fleisher *et al.*, 2007). Despite a common perception that finding a job after graduation is still difficult, almost all college students find a job within one year, and their earnings curve is steep (Cai *et al.*, 2008).

A college education is also important because it is so tightly linked to productivity, which, in turn, is the critical determinant of economic growth rates and long-run national welfare. China’s rapid development, combined with fundamental shifts from an agricultural-based, labor-intensive economy to one increasingly based on more complex industries and services, means that China will need to have more students educated in its tertiary system. The demand for highly educated workers – an important source of economic growth – has been increasing rapidly, partly because of the increasingly widespread use of sophisticated information and communication and the continuing advances of technology.

A college education not only imparts significant benefits to individual students through the high returns to education, it can also have strong and transformative impacts on the communities from which the graduates have come. A substantial body of empirical evidence demonstrates that when outstanding members of a community have access to higher education, and the employment that follows, the community itself often enjoys certain benefits, such as durable assets and financial service, etc. (Bhagwati and Rao, 1999; Gibson and McKenzie, 2009). Boucher *et al.* also document substantial “brain gains” when low-income communities are able to send one of their own to college (Boucher *et al.*, 2005). While no paper has yet attempted to show these brain gain effects in China, the increase in the returns to higher education has been shown to help reduce income inequality in China, suggesting that low-income communities are indeed benefiting from the increasing number of college students (Fleisher *et al.*, 2005). Finally, it is becoming increasingly evident that educated individuals are more likely to be socially responsible, sympathetic to philanthropy and to subscribe to personal values – such as tolerance and an appreciation of ethnic and cultural differences – that are crucial for the healthy function of a modern, diverse society (Dee, 2004; Glaeser *et al.*, 2006).

With the expansion of the college education system occurring at the same time as China’s efforts to develop its rural communities, several questions naturally arise: who is getting the opportunity to go to college and earn these high rates of return?

---

Specifically, are the rural poor – perhaps those that would most benefit and produce the greatest spillovers for their communities – being excluded by the system? If they are, what are the barriers limiting their access to higher education?

The overall goal of this paper is to help answer these questions. To meet this goal, we pursue two specific objectives. First, we measure the college enrollment rates of students from poor rural areas and compare them against their counterparts in urban and non-poor rural areas. Because the largest discrepancies in college enrollment rates are between rural poor and rural non-poor, most of the paper focuses on the analysis of these two groups. Second, we attempt to identify the barriers to education (if they exist) that are keeping enrollment rates low for the rural poor. Specifically, we examine if there are any anti-poor biases in the college entrance exam (CEE) process that prevent low-income, rural, high school students from attending college at the same rates as their middle- and high-income rural counterparts. In our paper, we define the CEE process as all of the educational activities that occur after students have already been accepted into an academic high school. We recognize that there are other potential factors – from the preschool years to graduation from junior high – that also may be impeding the progress of poor, rural students. We do not specifically address these or seek to identify which of these pre-high school factors may be limiting the ability of the poor to continue through the education system.

Because of the great scale of China's college and university system, we necessarily must limit the scope of this study. Specifically, we restrict our analysis of college enrollment to the top universities in our sample provinces (which are all in non-coastal province). If we were to examine college enrollment in lower tier colleges, we might find that enrollment by the rural poor is higher. However, the geographic focus of our study makes it so we may be looking at areas where there are relatively more poor trying to get into college. We are unable to say anything about college enrollment in the rich coastal provinces and municipalities. Because the poverty rates are lower in coastal areas, this likely means that we would find fewer rural poor in the colleges in these areas. These limitations, while not making the current study any less interesting, do caution against using our results to draw conclusions about all of China. The paper also should be considered as a call for further research in these other types of colleges and in other areas of the country.

The rest of the paper is organized as follows. Section 2 describes the two sets of survey data that we use in this study. Section 3 presents the evidence showing that the rural poor are, in fact, being systematically excluded from college. The next section contains empirical results that seek to identify the barriers limiting the opportunities of the rural poor during the CEE process. The final section concludes.

## 2. Data

In this paper, we use two sets of our own survey data. The first survey is a complete census of all entering freshmen at four universities – two nationally supported universities (Xi'an Jiaotong University and Sichuan University) and two provincially supported universities (Anhui University and Northwest University in Xi'an). These four universities are located in three poor provinces: Shaanxi, Sichuan and Anhui. For clarity, we call this survey the Four-University Freshmen Survey.

In order to implement the survey, we worked closely with the student affairs division of each university. The division head assigned a task force to make sure that the survey form was distributed to each student at some point during the first week

of the academic year. Within each university, a set of survey forms was distributed to each class director (*banzhuren*, in Chinese), which is the equivalent of a homeroom teacher in US high schools. Students were told that filling out the survey was voluntary, that the survey was for research purposes only and that in the final dataset their names would be eliminated and their survey information could only be identified with the aid of a confidential identifier code. The students returned the completed forms to the homeroom teacher, who returned the forms to the university's student affairs office by the end of the second week of September. The response rate was over 99 percent.

We surveyed a total of 20,253 students. Sichuan University had by far the most students, at over 8,800. The number of students in the other universities ranged from 3,000 at Xibei University to 4,900 at Anhui University (Table I).

The second survey, the Shaanxi Senior High School Survey, covers a group of randomly selected high school students from the poorest regions of Shaanxi, one of China's poorest provinces. In order to identify the poor students, we conducted a canvas survey in June 2007, while the students in our sample were still second-year students (*gao-er*). They had not yet started their third and final year (*gao-san*). In the canvas survey, eight poor counties were randomly selected to represent four major areas of Shaanxi: Hengshan and Mizhi in Yulin prefecture, Yanchang and Yichuan in Yan'an prefecture, Zhashui and Danfeng in Shangluo prefecture and Ziyang and Ningshan in Ankang prefecture. Yulin and Yan'an are located in the Loess Plateau in Northern Shaanxi. Shangluo and Ankang are in the mountainous areas of Southern Shaanxi.

Ten sample high schools as well as the classes and students within them were selected according to a carefully designed sampling protocol. In six counties, one senior high school was randomly selected from each county. In the remaining two counties (Hengshan in Northern Shaanxi and Danfeng in Southern Shaanxi), which have much larger populations, two high schools were randomly selected. Within each school, the survey team randomly chose two second-year classes. All of the students in the selected classes became part of the study's sample, totaling 1,177 students.

The students filled out a survey instrument that collected information on several different aspects of their educational experience and family life. We collected information on individual characteristics, including age and gender. The survey also asked about educational interests, including the students' subject major – either *li-ke* (a science and engineering track student) or *wen-ke* (a humanities and social science track student) – and the score that each student achieved on the high school

	All students in the sample (rural + urban)		Rural students from poor areas <sup>a</sup>	
	Number of students	%	Number of students	%
Freshmen from all four sample universities	20,253	100	n.a.	n.a.
Rural	10,031	49	1,937	9.5
Urban	10,222	51	n.a.	n.a.
Freshman from universities that have designations as				
National universities	12,277	61	845	6.9
Provincial universities	7,976	39	1,092	14

**Table I.**  
Enrollment rates of the rural poor at four sample universities, 2008

**Note:** <sup>a</sup>“Poor areas” refer to nationally designated poverty counties  
**Source:** Author's Four University Freshmen Survey

---

admission exam, taken before the students entered high school at the end of the ninth grade year. The survey also collected information on each student's family members and siblings, including parental age, educational attainment, occupation, migration status and current residence (at home or away from home).

Because we ultimately hoped to use the student survey as a tool to identify low-income students, in addition to the questions described in the previous paragraph, each student was also asked to mark a checklist of the durable assets owned by his/her family. Once a value was attached to each asset (based on the National Household Income and Expenditure Survey which is organized and published by the China National Bureau of Statistics), we were able to create a single metric representing the value of the asset holdings of each student's household (CNBS, 2007).

Because of the important role poverty status plays in this study, we did not rely solely on information from the student survey. We used two other pieces of supplemental information to identify low-income students: a separate oral interview with the homeroom teacher, and an independently run survey of a staff member in the student affairs office of each high school. In both of these interviews, interviewers asked the respondents to provide a list of the ten poorest students in the sample classes. These three pieces of information (data from the student survey and information from the two rankings) were then used to identify 592 students in our sample (out of a total of 1,177 students) that were from poor rural families with less than 7,600 RMB in assets.

In order to collect information on our dependent variables (CEE scores and college admissions), we conducted a second survey of our sample students and their homeroom teachers a little over one year later, in August 2008. By this time, the sample students had already taken their CEEs, graduated from high school and, if their test scores were high enough, received offer letters from the colleges that had admitted them.

The second round of our survey had two parts. First, we conducted a survey with the homeroom teachers. Using a form that included all the names of each homeroom teacher's students (both poor and non-poor), we collected information on each student's CEE score, the college choices on his/her college admissions application form (*zhiyuan*) and the exact college into which each student was able to enroll (if any). Second, we also contacted each student by phone to ascertain whether he/she had received an offer of admission and whether he/she was able to matriculate (which would have required his or her family to pay – or make arrangements to pay – tuition and fees)[1].

### 3. Are the poor being excluded from college?

The first step to understanding if students from poor rural areas are being excluded from college is to assess the promotion rates from high school to college. At the national level, the promotion rate is around 35 percent in 2006 (Ministry of Education, 2007). This is calculated as  $a/b$ ; where  $a$  is the number of newly matriculating college students who were admitted to universities in 2005, and  $b$  is the total number of students that graduated from high school during the same year. The number of newly matriculating college students includes both students that matriculated directly out of high school, and students that graduated from high school at least one year earlier, but did not matriculate to college during the year in which they graduated[2]. These latter students make up around 10 percent of first-year college students, so the rate at which students matriculate to college directly from high school is actually 10 percent less than the official figure, around 31 percent.

Although college matriculation rates are rising across China, they have been rising at different rates for different groups. Most poignantly, in 2007, nearly 54 percent of high school students (144,000 out of 268,000) living in three provincial-level municipalities (Beijing, Tianjin and Shanghai) attended college (CNBS, 2008). This is 23 percent higher than the national average of 31 percent[3]. Since wealthier urban areas send students to college at much higher rates than the national average, we can infer that poorer rural areas likely send students to college at much lower rates than the national average. In fact, despite a scarcity of empirical evidence, it is widely surmised in the literature that poor rural areas are lagging behind in China's continuing drive to develop college education (*China View*, 2009).

Because published statistical sources do not provide information on college enrollment rates by residency or income status, we must rely on our own calculations. As the national average college matriculation rate is, in effect, an average of urban and rural rates weighted by their respective proportion of the national graduating high school class, we can extract a rough estimate of the rural college matriculation rate using the national average (31 percent), and using the above estimate of the matriculation rate in provincial-level municipalities to proxy for the urban matriculation rate (54 percent). The formula we use is:

$$\begin{aligned} \text{National college matriculation rate} = & (\text{urban matriculation rate} \\ & \times \% \text{ senior high graduates that are urban}) \\ & + (\text{rural matriculation rate} \\ & \times \% \text{ senior high graduates that are rural}) \end{aligned}$$

Substituting known values for variables, we have:

$$0.31 = (0.54 \times 0.40) + (\text{rural matriculation rate} \times 0.60)$$

From this calculation, we estimate that the rural rate of promotion from high school to college is 16 percent.

As it turns out, we can also estimate the rural matriculation rate directly from the Shaanxi Senior High School Survey. Our data from this survey corroborate our calculations using the national data: we find that 20 percent of students from poor, rural areas were promoted from high school to college, indicating that while the promotion rate of students in wealthy urban areas is more than 20 percentage points above the national average, the promotion rate of students from poor, rural areas is 11-15 percentage points below the national average. Assuming that the promotion rate of rural students is similar across China[4], our data suggest that poor rural students are not offered equal access to college.

However, not all rural households are created equal; non-poor rural households certainly exist, and are difficult to separate from poor rural households. As a result, both our calculated estimate (16 percent) and our direct estimate (20 percent) most likely include students from non-poor households, thus overstating the matriculation rate for poor, rural students.

The bias against students from poor, rural areas can also be seen when looking at the data from the Four-University Freshmen Survey. Since this survey only has information on students enrolled in a university (and not on students who did not matriculate), a different strategy must be used for making an assessment about whether there

---

are biases against poor rural students. We first calculate the proportion of rural students in the overall enrollment of the sample universities and compare this share against the share of the rural students in the population as a whole. If the share of rural students is less than its population share, we can surmise that there is some sort of bias restricting this group's access to college.

According to the Four-University Freshmen Survey, we find that there is some bias against rural students. The enrollment rates of students from urban areas and from rural areas are almost even, at 51 and 49 percent, respectively, (Table I, column 3, rows 2 and 3). However, the 18 to 21-year-old rural population accounts for a full 60 percent of the national (rural + urban) population in this age group (NBS, 2008). Since 60 percent is greater than 49 percent, we can conclude that a smaller percentage of rural students matriculate to university compared with urban students, suggesting a bias against rural students. The matriculation gap is even greater when limiting the data on residency status to the home provinces of the universities in our sample: Sichuan, Shaanxi and Anhui. Data from these three provinces indicate that the share of rural students in the universities is 18 percentage points lower than the share of the rural population in the overall population (67 percent)[5].

Following this approach, we can see that there is even more of a bias against poor rural students than against rural students in general. According to our data, the share of students from poor rural areas is 9.5 percent (Table I, column 5, row 2)[6]. Data from the *2006 Statistical Yearbook* show that 17 percent of the population lives in nationally designated impoverished counties, and that 88 percent of those living in impoverished counties live in rural areas (CNBS, 2006). We can then infer that 15 percent of the population lives in poor rural areas ( $0.88 \times 0.17$ ). Since the percentage of college students from poor rural areas is 5.5 percentage points lower than the population share, we can conclude that certain systemic biases exist limiting these students' access to higher education.

Our data show that these numbers are even more extreme when looking at only the "top" universities (that is, when looking at Sichuan University and Xi'an Jiaotong University and ignoring Xibe University and Anhui University). The share of poor, rural students in the total number of entrants in these two universities is only 6.9 percent (Table I, column 5, row 4), which is less than half of the population share of poor rural areas (15 percent). This allows us to conclude that poor rural students are being systematically excluded from college and that they are facing even higher barriers when trying to enter China's top colleges.

#### *Estimates from the bottom, up*

Approaching the estimates from the other direction (i.e. estimating how many students from rural areas drop out at each level), the estimated share of China's university students that come from poor rural areas is even lower. In the early 2000s, almost 90 percentage of students from rural areas finished elementary school and matriculated into junior high school (Ministry of Education, 2006, 2008). The other 10 percent dropped out. During the same period, national data show that about 22 percent of students from rural areas dropped out of junior high school and did not graduate. This is calculated by dividing the number of students that graduated from junior high school in 2007 by the number of students admitted to junior high school in 2004. In 2005, according to our phone interviews with local officials from the bureaus of education in Shaanxi's poor rural counties and other sources of information[7], only around 30 percent of rural

---

students from poor provinces passed their *zhongkao* and matriculated to high school. In addition, according to surveys of the best junior high schools in poor rural counties, many students do not even take the *zhongkao* since they do not intend to attend high school. Our field interviews suggest that in most cases this is due to a belief that they will not be able to pass the *zhongkao* (Loyalka *et al.*, 2009). Finally, data from the Shaanxi Senior High School Survey indicate that 7.4 percent of poor rural students dropped out between their first and third year of high school. Virtually, all students that stay through the third year of high school take the CEE. Also, according to the same data, 20 percent of poor rural students passed their CEE and entered college. When the conditional percentages are all multiplied through:  $(0.90 \times 0.80 \times 0.30 \times 0.93 \times 0.20 = 0.04)$  we find that only about 4 percent of poor rural students that began elementary school make it to college.

In summary, a variety of collected data and national statistics indicate that the poor are facing barriers to higher education. Estimates from three sources of data all find that the rural poor in our sample areas are underrepresented in universities. Our estimates for the share of children, who start elementary school in rural areas and eventually enroll in college range from 1.3 to 6.7 percent, with our best guess being 4 percent[8]. At the same time, our best estimate of the share of children in China's wealthy municipalities who start elementary school and eventually enroll in college is 47 percent. In other words, the college matriculation rate is more than ten times higher for students born in Beijing, Tianjin or Shanghai than for students born in poor rural areas, making for a truly wide urban-rural gap for attending college.

#### 4. Barriers at the gates of college

In this section, we attempt to identify why fewer Chinese college students come from poor rural areas. There are two possible sets of barriers: those encountered before students test into high school, and those encountered after students enter high school and before they enter college. This paper focuses on the latter. The former have been discussed and documented elsewhere, and include such barriers as an absence of preschool educational opportunities (Ming and Abbott, 1992), lower quality teachers and facilities (Hannum *et al.*, 2008), and less parental care and support (Chen and Liang, 2008).

##### *Barriers inside China's high schools*

Once students from poor rural families test into high school, they face two types of potential barriers: those that occur during the three years of high school, and those that arise during the CEE process of sitting for the exam, scoring the exam and paying for college. To look at the barriers encountered during the three years of high school, we examine two sets of indicators from the Shaanxi Senior High School Survey – the grades and dropout rates of low-income students – and compare these indicators to those of middle- and high-income students.

Our analysis shows no difference in the grades and dropout rates of low-income students compared with the grades and dropout rates of their classmates, suggesting that no barriers exist between the time students matriculate into high school and the time that they take the CEE. The data on the standardized grades collected for the sample students from their first and second years of high school show that the average math (65/100) and Chinese language scores (66/100) of poor students and the average math (64/100) and Chinese language scores (67/100) of non-poor students are statistically

---

identical ( $p$ -values of 0.59 and 0.29, respectively)[9]. In other words, the results suggest that we cannot reject the null hypotheses that there is no statistical difference between the math and Chinese language scores between poor and non-poor students.

In addition to having statistically identical CEE scores, poor and non-poor students appear to experience similar dropout rates as well. While our data show a slightly higher dropout rate for poor students compared with their non-poor classmates (3.7 percent versus 2.1 percent), this difference is not statistically significant. However, these rates are only for dropouts occurring between the end of the second year and the end of the third year. By extrapolating these rates to the interval between the end of the first and second years of school, the higher dropout rate of low-income students would still only account for a 3.3 percentage point ( $2 \times 3.7 - 2 \times 2.1$ ) difference in the rates of high school graduation. Even this higher estimate is unlikely to be one of the main sources of the difference in college matriculation rates between poor and non-poor students.

### *Barriers during the CEE process*

For our analysis, it is helpful to think of the CEE process (at least in Shaanxi) as consisting of three steps. First, students take the CEE examination. Next, after finishing the examination, but before knowing their scores, students fill out a college admissions application form, called the *zhiyuan*. Finally, if their CEE scores are high enough and their colleges have been strategically chosen (that is, if the CEE score cutoffs of the colleges to which the students applied were not higher than their actual exam scores), the students have to be able to make the payments for tuition and fees[10].

*Is the CEE biased against the poor?* Because those who write and design the exam questions are almost certainly from an urban background, we hypothesized that rural students may be at a disadvantage when taking the CEE. However, the data do not support such a contention. Data from the Shaanxi Senior High School Survey on CEE performance show no evidence of bias against low-income students (Table II, last row). In seven out of the eight *li-ke* classes, and six out of the seven *wen-ke* classes, there is no statistical difference between the scores of poor students and the scores of non-poor students (columns 8 and 15, respectively). In other words, our data show that low-income students appear to be performing as well on the CEE as middle- and high-income students.

Using the data on students' CEE scores in conjunction with their scores on the high school entrance exams (*zhongkao*) from three years earlier also refutes the notion that low-income students are falling behind in high school. The decomposition of CEE scores by historical performance (using *zhongkao* scores as a measure of historical performance) confirms the finding that there is no systemic difference between the poor and non-poor at this stage of the academic process (Table III). We can more clearly show this by dividing poor and non-poor students into quartiles according to their *zhongkao* scores. Using these breakdowns, we can then examine if differences in CEE performance. For those in the upper quartile of the *zhongkao* scores (regardless of academic track), the CEE scores of poor students, on average, are not statistically different than the scores of non-poor students. The same is true in the other three quartile groups as well. This set of findings implies that after three years of high school, the poor are as competitive as the non-poor throughout the CEE process. One interpretation of this finding is that students from poor families perform as well on the CEE as they did on the *zhongkao*.

**Table II.**  
CEE scores for poor  
and non-poor students  
in high schools in  
Shaanxi Province, 2008

School	No.	Poor <sup>a</sup>			<i>Li-ke</i> <sup>b</sup>			Test of mean difference			<i>Wen-ke</i> <sup>b</sup>			Test of mean difference		
		Mean	SD	No.	Non-poor Mean	SD	No.	Poor <sup>a</sup> Mean	SD	No.	Non-poor Mean	SD	Test stats: <i>p</i> -value	Test stats: <i>p</i> -value		
1	43	1.08	0.56	42	1.13	0.58	n.a.	n.a.	n.a.	n.a.	n.a.	0.65	n.a.	n.a.	n.a.	
2	28	-0.68	0.59	10	-1.10	0.37	0.04**	-0.66	0.50	5	-0.70	0.81	0.88	-0.66	0.50	0.91
3	29	0.65	0.59	12	0.62	0.57	0.88	-0.55	0.72	10	-0.05	0.77	0.45	-1.13	0.64	0.13
4	22	0.12	0.72	20	0.27	0.58	0.45	-1.13	0.64	10	-1.14	0.88	n.a.	0.42	0.92	0.97
5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.42	0.92	40	-0.38	0.64	0.70	0.42	0.92	0.00**
6	21	-0.60	0.91	23	-1.00	0.76	0.12	1.33	0.89	42	0.76	0.50	0.70	1.33	0.89	0.07
7	9	-1.29	0.25	12	-1.22	0.51	0.70	-0.48	0.85	31	-0.68	0.83	0.20	-0.48	0.85	0.42
8	66	-0.08	0.72	31	-0.29	0.90	0.36	n.a.	n.a.	n.a.	n.a.	n.a.	0.36	n.a.	n.a.	n.a.
9	22	-0.68	0.51	8	-0.88	0.50	0.36	n.a.	n.a.	n.a.	n.a.	n.a.	0.56	0.81	0.45	n.a.
10	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.03	1.02	183	-0.03	0.98	0.66	0.03	1.02	0.13
All	240	0.02	0.93	158	-0.03	1.10	0.66	0.03	1.02	183	-0.03	0.98	0.66	0.03	1.02	0.58

**Notes:** Significance at: \*5 and \*\*1 percent; <sup>a</sup>statistics in these columns are generated for rural students that live in nationally designated poverty counties; <sup>b</sup>*Li-ke* indicates the science and engineering track; *Wen-ke* indicates the social science and humanities track

**Source:** Authors' survey – Shaanxi Senior High School Survey

	Poor <sup>a</sup>				Non-poor				Test of mean difference Test stats: <i>p</i> -value	
	Quartile <sup>b</sup> 1	Quartile 2	Quartile 3	Quartile 4	Quartile1	Quartile 2	Quartile 3	Quartile 4		
<i>Li-ke</i> <sup>c</sup>										
Mean	-0.94				-1.10					0.24
SD	0.56				0.67					0.50
Mean		-0.60				-0.46				0.85
SD		0.69				0.95				0.14
Mean			0.06				0.09			
SD			0.66				0.89			
Mean				0.67				0.86		
SD				0.73				0.74		
No.	42	45	53	100	37	26	43	52		
%	17.50	18.75	22.08	41.67	23.42	16.46	27.22	32.91		
<i>Wen-ke</i> <sup>c</sup>										
Mean	-0.49				-0.80					0.07
SD	0.88				0.80					0.59
Mean		-0.17				-0.25				0.49
SD		0.83				0.74				0.40
Mean			0.56				0.43			
SD			0.71				0.96			
Mean				0.75				0.95		
SD				1.08				0.64		
No.	51	53	39	23	51	52	53	27		
%	30.72	31.93	23.49	13.86	27.87	28.42	28.96	14.75		

**Notes:** Significance at: \*5 and \*\*1 percent; <sup>a</sup>statistics in these columns are generated for rural students that live in nationally designated poverty counties; <sup>b</sup>quartiles are defined by ranking all students by their *zhongkao* scores and dividing them into four groups; Quartile 1 students have the lowest *zhongkao* scores; Quartile 4 students have the highest *zhongkao* scores; <sup>c</sup>*Li-ke* indicates the science and engineering track; *Wen-ke* indicates the social science and humanities track

**Source:** Authors' survey – Shaanxi Senior High School Survey

**Table III.**  
Normalized CEE scores for poor and non-poor students in *li-ke* and *wen-ke* track classes by the quartile ranking of each student's high school entrance exam (or *zhongkao*) scores in Shaanxi Province, 2008

---

Finally, multivariate analysis supports the descriptive results. Table IV presents regression analysis that seeks to explain the CEE scores. We want to see if, holding other variables constant, a student's poverty status is a significant factor in determining his or her performance on the CEE.

To answer this question, we use two types of variables to proxy a student's poverty status. In one version of the regression, we use a simple dummy variable, where the variable is equal to 1 if the student is from a poor family (that is, a family with assets less than 7,600 RMB), and 0 otherwise. In another version, we use the log of family assets in value terms. However, since the CEE score may also be influenced by other factors, we include the characteristics of the student, the characteristics of the parents, and academic track as control variables. Our results show that neither poverty status nor the value of the household asset holdings affects the CEE scores, *ceteris paribus* (Table IV, rows 2 and 3).

*Are poor students making mistakes filling out their zhiyuan forms?* Within several days of completing the CEE, students in Shaanxi fill out a college choice form (called the *zhiyuan* form) and submit their top choices in each of the different tiers of colleges (tiers 1-3) to a provincial education authority. In filling out their *zhiyuan* form, students are able to choose several colleges within each of the college tiers. After the CEE scores of the students are tallied, provincial educational authorities then sort through the *zhiyuan* forms, matching students to colleges and majors according to their score ranking. At the end of the sorting, students are assigned to one college.

Mistakes can be made by students in this process. One of the main sources of problems (at least in Shaanxi) is that when students are filling out their *zhiyuan* form, they do not know what their actual CEE score is, since the CEE does not get graded or returned to the student until about three weeks after the *zhiyuan* form is handed in. Moreover, even if the student has a sense of his or her score, he/she does not know what the minimum score cutoff will be for any given college or major. The minimum score that allows a student to enter any given college or major is determined by the student demand for the college or major in that particular year, the number of slots allocated by the college in that particular year, and the distribution of the CEE in that particular year. Therefore, when making a decision about to which colleges or majors one should apply, students often rely on cutoff scores from previous years that are published in a Ministry of Education-approved publication. The objective when filling out the *zhiyuan* is to put down as one's first choice the best college and major that one can get into, given one's expected CEE score. A successful strategy for filling in the *zhiyuan* form depends on accurate estimates both of one's own actual score and of the cutoffs for the various college and majors in which one is interested.

To examine, if the poor make mistakes in estimating their CEE score or college cutoffs, we first calculate the difference between the student's actual CEE score and the past cutoff score of their first choice for the tier 1 college in each student's *zhiyuan* form. We call this measure the CEE score-cutoff gap. For clarity, we only report the score-cutoff gaps in the first-tier college category for students that were admitted to first-tier colleges. If the student was admitted to a second-tier college, we only report the score-cutoff gap in the second-tier category.

Score-cutoff gaps can be either positive or negative. If the score-cutoff gap is positive, it indicates that the student underestimated his or her CEE score and chose a school with a lower cutoff than his or her actual CEE score. The consequence of underestimating, of course, is that had the student chosen a college/major with a higher cutoff, he/she could

Variables	Specification 1 Coef.	Specification 1 t-ratio	Specification 2 Coef.	Specification 2 t-ratio	Specification 3 Coef.	Specification 3 t-ratio	Specification 4 Coef.	Specification 4 t-ratio
<i>Poverty</i>								
Poverty indicator (if student is from poor rural area - 1)	0.00	0.03	-0.03	1.08	0.00	0.03	-0.04	1.16
<i>Log(assets)</i>								
<i>Student characteristics</i>								
Female - 1	0.06	1.01	0.07	1.04	0.07	1.12	0.07	1.15
Li-ke track - 1	-0.26**	4.12	-0.27**	4.24	-0.25**	3.90	-0.26**	3.99
Zhongkao (high school exam) score	8.04**	21.39	8.03**	21.4	7.90**	20.34	7.87**	20.30
<i>Father characteristics</i>								
Education								
Living at home, 1 - yes					0.01	0.83	0.01	0.95
Migrant worker, 1 - yes					0.17*	2.30	0.16*	2.22
<i>Mother characteristics</i>								
Education					0.05	0.61	0.03	0.38
Living at home, 1 - yes					-0.01	0.87	-0.01	0.72
Migrant worker, 1 - yes					-0.24*	2.51	-0.23*	2.45
Constant	-5.64**	20.54	-5.36**	14.29	-0.08	0.81	-0.08	0.80
No. of observations	725		725		-5.47**	18.32	-5.15**	12.72
Adj. R <sup>2</sup>	0.3866		0.3876		708		708	
					0.3857		0.3868	

**Notes:** Significance at: \*5 and \*\*1 percent; dependent variable = normalized CEE score  
**Source:** Authors' survey - Shaanxi Senior High School Survey

**Table IV.**  
Regression results using ordinary least squares estimators of the impact of the poverty of a student on the student's CEE score in Shaanxi Province, 2008

have attended a better college or could have been admitted to a better major). If the score-cutoff gap was negative, we say that the student overestimated the CEE score, indicating that he/she was not admitted into his or her first choice college/major. The student may still have been admitted into a tier 1 college, but he/she would have been allocated to a second, third, or fourth choice major. In the following analysis, we report and compare the score-cutoff gaps for poor and non-poor students, and do so for both *li-ke* and *wen-ke* separately.

On average, both the poor and non-poor in the *li-ke* tracks underestimated their CEE scores (Table V, rows 1 and 2). The point estimate of the score-cutoff gap of poor tier 1 students (30) was higher than the point estimate of non-poor tier 1 students (25), indicating either that the poor were more conservative in their score estimates, or that they were not as good at estimating their CEE scores as the non-poor. Tests comparing these point estimates, however, show no statistical difference. In the case of tier 2 students, poor students (10) underestimate less often than non-poor students (23). In this case, the difference is statistically significant. In the case of both tiers 1 and 2 *wen-ke* track students, there is no statistical difference between the score-cutoff gaps of poor and non-poor students.

*Are there liquidity constraints that limit the poor from matriculating to college?* We have already shown that the college enrollment rate of poor students (4 percent) is much lower than that of non-poor students (over 45 percent in large municipalities). In our attempts to identify the root causes of this disparity, we have found little evidence that the barriers to college education are encountered during the three years of high school or while taking the CEE (the first stage of the CEE process). Nor do poor students appear to make more serious mistakes in filling out their *zhiyuan* forms than do non-poor students (the second stage of the CEE process). In this section of the paper, we analyze the final stage of the CEE process: the matriculation process, covering the period

	Poor <sup>a</sup>		Non-poor		Test of mean difference
	Tier 1 colleges	Tier 2 colleges	Tier 1 colleges	Tier 2 colleges	Test stats: <i>p</i> -value
<i>Li-ke</i> <sup>b</sup>					
Mean	30		25		0.61
SD	25.44		27.83		
Mean		10		23	0.05*
SD		22.10		24.15	
No.	16	36	16	20	
<i>Wen-ke</i> <sup>b</sup>					
Mean	-3.00		-13.80		0.83
SD	8.72		16.57		
Mean		4.86		3.89	0.56
SD		26.06		22.65	.
No.	3	22	5	28	

**Table V.**  
The CEE score-cutoff gaps for students matriculating into tier 1 and tier 2 colleges from Shaanxi Province, 2008, by income and academic track

**Notes:** Significance at: \*5 and \*\*1 percent; the CEE score-cutoff gap is the difference between the actual CEE score and the past cutoff score of the first choice for either the tier 1 or tier 2 college on each student's *zhiyuan* form; <sup>a</sup>statistics in the "poor" columns were generated for rural students from nationally designated poverty counties; <sup>b</sup>*Li-ke* indicates the science and engineering track; *Wen-ke* indicates the social science and humanities track

**Source:** Authors' survey – Shaanxi Senior High School Survey

---

from when students receive their college acceptance notice to when they pay tuition and fees and are formally admitted to college.

Why might we expect there to be a barrier at this stage? Although the expansion in college education has provided more opportunities for Chinese students to attend college, these opportunities are not free. Tuition and fees have soared in recent years. Tuition costs quadrupled between 1997 and 2006, from 1,620 RMB to 4,500 RMB per student per year (Yu, 2008). By 2005, the share of college funding from tuition and fees had increased to 31 percent (Ministry of Education, 2006). And, tuition is at most only about half of the cost of a college education. Once the cost of textbooks and room and board are taken into account, most college students spend between 10,000 and 12,000 RMB per year to attend school. In addition to overcoming the academic hurdle of getting into college, therefore, poorer families also have to pay for the higher levels of tuition and fees (at least for the first year of their college education). In 2008, the 10,000 RMB cost of college was 9.4 times the per capita income of a rural family living at China's poverty line (Poverty Alleviation Office, 2008). Are the families of poor college students able to come up with the tuition and fees they need to pay for their first year of college? Is there any evidence that liquidity constraints are literally turning low-income rural students away from the university gates after they have passed their CEE and received an offer of admission?

Although in the late 1990s and early 2000s, there were many stories of students being admitted to college but not being able to afford the cost of attendance (*People's Daily*, 2003a), our data from the Shaanxi Senior High School Survey find no evidence of students not attending college due to financial reasons. In fact, 100 percentage of the students that passed the CEE and were admitted to a tier 1 or tier 2 college ended up attending the college.

This is not to say that the hefty tuition and fees do not affect the financial status of low-income families; indeed, there are many stories of the incredible burden that these families bear in order to send their children to college (*People's Daily*, 2003b). However, there is no evidence that the liquidity constraint is posing an insurmountable barrier at this point of the CEE process. This may not be as surprising a result as it seems. Because Chinese high schools are generally considered a three-year preparatory program for the CEE, the families of high school students taking the CEE likely prepare a financial plan to pay for university well before the formal college admission letter arrives, perhaps even borrowing money or liquidating their assets. Those families with any doubts about being able to afford college most likely pull their child out of school and have him or her enter the labor market. These students, then, are not captured by our surveys.

## 5. Conclusion

Over the past decade, government investment in the college system has skyrocketed and the size of universities has increased sharply. Yet, the increase in the opportunity to attend college has been unfolding unevenly across China, with our results indicating that the college matriculation rate of low-income students is substantially lower than that of middle- and high-income students. According to our analysis, only 4 percent of students from poor rural areas are able to enter universities, while in some large municipalities nearly 50 percent of students matriculate into the tertiary education system. Why are the rural poor being excluded?

In this paper, we focused on potential barriers appearing between admission into high school and college matriculation. There is no empirical evidence that the CEE

is biased against the poor. Holding all other factors constant, the exam scores and dropout rates of poor students are virtually the same as those of non-poor students. Nor does the level of household liquidity appear to be a constraint, as every low-income student in our survey that was admitted to college was able to pay the fees and tuitions demanded upon matriculation. Conditional on admission to high school, the college admission rates of poor and non-poor students who take the CEE examination are statistically identical.

Given our finding that low-income high school students perform as well in high school as their middle- and high-income counterparts, and that students are promoted at the same rate regardless of income, we conclude that the barriers to college education must occur before students enter high school. Other sources have shown that the rural education system is putting rural children at a severe disadvantage at almost every point of the education process. Low-income rural students are faced with low rates of enrollment into early childhood education, low-quality elementary schools, poor nutrition and low-quality boarding facilities, exorbitant high school tuition rates, and a migrant schooling system that is outside of the public education system. In conclusion, we believe that the real barriers to college education are being erected early in the education experience of the rural poor – as early as preschool and elementary school – and are present until high school.

One final idea is worth noting. The gap between poor and non-poor most likely is not just a function of poverty. The wide gap between poor and non-poor also is likely to be due to a set of regional factors, perhaps most importantly the financial constraints of the local government. According to Lu and Zhang (2007), since education is the responsibility of the provincial government, financial differences and differences in budget allocations to college education among the provinces is also one of the most significant factors that makes education accessible to some and not to others. The central government has been trying to narrow the gap in educational quality among regions (Liu, 2006). Our results demonstrate that, at least through the time of this paper, this goal has not been met. While not addressed in this paper, this issue deserves the full attention of researchers in the future.

### Notes

1. Under the college/major choice system within the CEE, students in Shaanxi Province must list their preferred college/majors before knowing the year's cutoffs. Students rely on the previous year's cutoff information for a best estimate of what the cutoffs will be for current year. We collected the CEE score cutoffs for each university (by major) from a compilation published by *College Admission Magazine* in 2008 (which is a publication supported and authorized by the Division of Student Affairs, Ministry of Education).
2. These students either repeat their final year of high school or study on their own before retaking the CEE.
3. Note that, the rate would be (much) higher if the rural students living in the suburban counties surrounding the core city districts were not included. Statistics for these administrative units, however, are not available by rural/urban residency permits (*hukou* status). However, it is likely that rates of matriculation from other urban areas are less than those of Beijing, Tianjin and Shanghai. Therefore, we believe 54 percent is not a bad estimate of national urban matriculation rates. In fact, when we searched the web sites of smaller municipalities across China, and called their bureaus of education, we found estimates of urban matriculation ranging from 40 to 70 percent.

4. In fact, this is not an extreme assumption. It is well known that Shaanxi Province (especially Xi'an) is relatively well endowed with universities and colleges. To the extent that universities within a province give preference to students from the province, this would mean that we are providing conservative estimates of the biases against students from poor, rural areas.
5. It is unclear, if we should use population shares from the entire nation or just from the three provinces housing the universities in our sample. If we had information on enrollment rates from the entire country (instead of only from four universities), we would of course, use the national population shares. Unfortunately, we do not have a nationally representative sample. In contrast, if universities only recruited students from the host province, then we would use data from those three provinces. What complicates the issue is the fact that enrollment is split almost evenly between students from the host province and students from outside the province. According to our data, 53 percent of the students in the four universities are from outside of the province (47 percent of rural students and 59 percent of urban students). So, which figure should be used? Because a small majority of rural students are recruited from within the province, we use the population shares from the three provinces only, except where otherwise noted.
6. Here, "poor rural areas" refers to the rural areas in nationally designated poverty counties, a designation bestowed on counties by the State Council ([www.en.cpad.gov.cn/item/2004-05-24/50008.html](http://www.en.cpad.gov.cn/item/2004-05-24/50008.html)).
7. Because there are no official statistics on the rate at which students who graduated from junior high school matriculate to academic high school in poor rural areas, we need to estimate the rate. There are some published estimates, but they admit to be biased. For example, according to the Ministry of Education, 10 percent of rural junior high school graduates matriculate into rural academic high schools (Ministry of Education, 2006). This number, however, is too low because many rural junior high school graduates attend non-rural academic high schools (and the reverse does not occur – almost no urban students attend rural high schools). At the upper bound, a study by Loyalka *et al.* (2009) finds that more than 50 percent of the students from the fast track, rural junior high schools in his sample counties matriculate to academic high school. Since these students are among the best rural students in each sample county, this number is too high of an estimate to generalize to all rural students. These biased estimates do help us determine an acceptable range for the true matriculation rate: that the real rate is somewhere between 10 and 50 percent. According to Liu *et al.* (2007), the best guess at the national promotion rate from junior high to high school is around 25 percent. In order to be conservative (that is, we would rather err on the side of having too high of a matriculation rate), we choose 30 percent (which is also the average of the two published numbers – 10 and 50 percent). About 30 percent is also the number that was most often given to us as an estimate during our phone interviews with officials from bureaus of education in Shaanxi's poor counties.
8. If we replace the third figure (students' promotion rate from junior high school to senior high school in poor rural areas) in the formula with 10 or 50 percent, the percentage of poor rural students admitted to college ranges from 1.3 percent ( $0.90 \times 0.80 \times 0.10 \times 0.93 \times 0.20 = 0.0134$ ) to 6.7 percent ( $0.90 \times 0.80 \times 0.50 \times 0.93 \times 0.20 = 0.067$ ).
9. Here, the score is standardized to make the full marks equal to 100. Since we are comparing poor and non-poor students in a single class, we do not have a comparison problem.
10. Under the college/major choice system within the CEE, students in Shaanxi Province must list their preferred college/majors before knowing the year's cutoffs. Students rely on the previous year's cutoff information for a best estimate of what the cutoffs will be for the current year. We collected the CEE score cutoffs for each university (by major) from a compilation published by *College Admission Magazine* in 2008, a publication supported and authorized by the Division of Student Affairs, Ministry of Education.

---

## References

- Bhagwati, J. and Rao, M. (1999), "Foreign students in science and engineering Ph.D. programs: an alien invasion or brain gain?", in Lindsay Lowell, B. (Ed.), *Foreign Temporary Workers in America: Policies That Benefit the US Economy*, Quorum Books, Westport, CT, pp. 238-58.
- Boucher, S., Stark, O. and Taylor, J.E. (2005), "A gain with a drain? Evidence from rural Mexico on the new economics of the brain drain", Invited paper, paper presented at the 14th World Congress of the International Economic Association, Marrakech, August 29-September 2.
- Cai, F., Park, A. and Zhao, Y.H. (2008), "The Chinese labor market in the reform era", in Brandt, L. and Rawski, T. (Eds), *China's Economic Transition: Origins, Mechanisms, and Consequences*, Cambridge University Press, Cambridge, pp. 167-214.
- Chen, Y. and Liang, Z. (2008), "Educational attainment in migrant children: the forgotten story of urbanization in China", in Hannum, E. and Park, A. (Eds), *Education and Reform in China*, Routledge, New York, NY, pp. 117-32.
- China View* (2009), "Survey: gap between China's rural and urban education levels huge", available at: [www.news.xinhuanet.com/english/2009-03/05/content\\_10951127.htm](http://www.news.xinhuanet.com/english/2009-03/05/content_10951127.htm)
- CNBS (2006), *China County Statistical Yearbook*, China Statistics Press, Beijing, p. 442.
- CNBS (2007), *Household Income and Expenditure Survey*, China National Bureau of Statistics, Beijing.
- CNBS (2008), *China Statistical Yearbook*, China National Bureau of Statistics, Beijing, Table 20-36.
- Dee, T.S. (2004), "Are there civic returns to education?", *Journal of Public Economics*, Vol. 88, pp. 1697-720.
- Fleisher, B.M., Li, H.Z. and Li, S. (2007), "Job choices, sectoral attachment, and educational attainment in China's transition economy", paper presented at the Chinese Economists Society (CES) European Conference on "Economic Transition at Midlife: Lessons from the Development of Markets and Institutions", Protoroz, May 11-14.
- Fleisher, B.M., Li, H.Z., Li, S. and Wang, X.J. (2005), "Sorting, selection, and transformation of the return to college education in China", IZA Working Paper No.1446, Institute for the Study of Labor (IZA), Bonn.
- Gibson, J. and McKenzie, D. (2009), "The microeconomic determinants of emigration and return migration of the best and brightest: evidence from the Pacific", IZA Working Paper No. 3926, Institute For the Study of Labor (IZA), Bonn.
- Glaeser, E.L., Ponzetto, G. and Shleifer, A. (2006), "Why does democracy need education?", NBER Working Paper Series No. 12128, National Bureau of Economic Research, Cambridge, MA, March.
- Hannum, E., Behrman, J., Wang, M.Y. and Liu, J.H. (2008), "Education in the reform era", in Brandt, L. and Rawski, T.G. (Eds), *China's Great Economics Transformation*, Cambridge University Press, Cambridge, pp. 215-49.
- Liu, K.L. (2006), "Lun Zhuanxing Shiqi Gaodeng Jiaoyu Fazhan Zhong de Zhengfu Zeren", *Zhongguo Jiaoyu Xianfeng Wang*, August 23.
- Liu, X., Luo, R., Liu, C. and Zhang, L. (2007), "The cost of going to senior high schools in rural China", Working Paper No. WP-07-C8, Northwest Socio-economic Development Research Center, Shaanxi.
- Loyalka, P., Song, Y. and Wei, J. (2009), "Information, college choice and financial aid: evidence from a randomized control trial in China", Working Paper No. 9009, China Institute for Educational Finance Research, Peking University, Beijing.

- 
- Lu, N.G. and Zhang, Y.P. (2007), "Quanqiuhua Beijing Xia Gaodeng Jiaoyu Lingyu Zhong de Zhengfu Jiaose Bianqian" ("The government's role in the college education under the Globalization"), *Beijing Daxue Jiaoyu Pinlun*, Vol. 1.
- Ming, Z.F. and Abbott, D.A. (1992), "Preschooling education in China", *International Journal of Early Childhood*, Vol. 24 No. 2, pp. 50-2.
- Ministry of Education (2006), *Educational Statistics Yearbook of China*, People's Education Press, Beijing.
- Ministry of Education (2007), *Educational Statistics Yearbook of China*, People's Education Press, Beijing.
- Ministry of Education (2008), *Educational Statistics Yearbook of China*, People's Education Press, Beijing.
- NBS (2008), *China Population Statistics Yearbook*, National Bureau of Statistics, Beijing, pp. 10-15.
- People's Daily* (2003a), "China initiates financial aid program for needy college students", available at: [www.english.peopledaily.com.cn/200307/15/eng20030715\\_120306.shtml](http://www.english.peopledaily.com.cn/200307/15/eng20030715_120306.shtml)
- People's Daily* (2003b), "Tears of needy Chinese college students arouse social concern", available at: [www.english.peopledaily.com.cn/200308/27/eng20030827\\_123134.shtml](http://www.english.peopledaily.com.cn/200308/27/eng20030827_123134.shtml)
- Poverty Alleviation Office (2008), National Poverty Alleviation Congress, Beijing, December 27.
- Yu, Y. (2008), "Wei Daxue Xuefei er Bianhu" ("Defending for college tuition"), *Jiaoyu Pinglun* (Educational Review), Vol. 1, pp. 20-4.

**Corresponding author**

Scott Rozelle can be contacted at: [rozelle@stanford.edu](mailto:rozelle@stanford.edu)