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The Impact of an Academic High School Tuition Relief Program on Students' Matriculation into High Schools in Rural China

Yunli Bai [a,b], Linxiu Zhang [a], Hongmei Yi [c,*], Liming Zheng [a,b], Scott Rozelle [d]

[a] Center for Chinese Agricultural Policy, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China
[b] University of Chinese Academy of Sciences, Beijing, China
[c] School of Advanced Agricultural Sciences, Peking University, Beijing, China
[d] Rural Education Action Program, Freeman Spogli Institute for International Studies, Stanford University, California, USA

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ABSTRACT

By 2010, only one-quarter of workers in China had received a high school (HS) education. One of the root causes of this low rate is that China has the highest HS tuition fees globally. Although the Chinese government has implemented a series of programs to reduce the cost of attending vocational HS, the cost of attending academic HS in China emains high. This study evaluates the extent to which an academic HS tuition relief program initiated by a poor county in western China affects students' schooling decisions after graduation from junior high school. By using a longitudinal dataset of 2348 students in two counties, we use ordinary least squares and propensity score matching to evaluate the impact of this program on four student outcomes: matriculation into academic HS, matriculation into vocational HS, entering the labor market, and retaking high school entrance exams. The results show that the program significantly increased matriculation into academic HS by 21 percentage points, while it reduced matriculation into vocational HS by 7 percentage points, the likelihood of entering the labor market by 11.9percentage points, and the likelihood of retaking exams by 2.1 percentage points. Further, we find that the effects of the program among middle-income students are stronger compared with those of other groups. And we found that the program had no significantly heterogeneous impact on students with different academic performance.

1. Introduction

As the Chinese economy transitions from lower value-added to higher value-added industries, the need for quality human capital is increasing (Autor, Murnane, & Levy, 2001; Heckman & Yi, 2012). Higher value-added industries require workers with higher skill levels (Autor, Katz, & Krueger, 1998; Bresnahan, 1999; Bresnahan, Brynjolfsson, & Hitt, 2002; Zhang, Yi, Luo, Liu, & Rozelle, 2013). However, census data show that only 8% of rural Chinese workers (25–64 years) received a high school education (academic high school or vocational high school) in 2010, while 37% of urban workers did so (Khor et al., 2015). This figure is far behind that in OECD countries (74%) and G20 countries (56%) (Khor et al., 2015). Even in the most recent decade, the high school completion rate in rural China was less than 40% (Shi et al., 2015; Yang, Sicular, & Lai, 2013).

To build a future labor force equipped with higher levels of skills, China's policymakers, as in other developing countries, have thus taken measures to expand access to high school (Carnoy et al., 2013; Loyalka et al., 2015; National Congress of Brazil, 2011;

* Corresponding author at: Room 412, Wangkezhen Buidling, Peking Unviersity, No. 5 Yiheyuan Road, Haidian District, Beijing, 100871, China.
E-mail address: hmyi.ccap@pku.edu.cn (H. Yi).

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Newhouse & Suryadarma, 2009). In the past decade, the high school enrollment rate has increased steeply (MOE, 2004, 2014). The government has strived to increase high school enrollment by expanding vocational high schools. With the removal of score-based criteria and rising financial support (including a tuition relief program (TRP) since 2009) for entering vocational high school, vocational high school enrollment increased from 12 million in 2002 to 22 million in 2011 (MOE, 2012, 2003). Recently, the Chinese government stated its aim to universalize high school education by 2020 (China Government, 2016; Ifeng News, 2016).

But how can China achieve this goal? What is preventing students from entering high school? Of the factors that prevent rural students from attending high school, the high cost may be one of the greatest barriers. The cost of academic high school tuition in rural China is the highest among public high schools globally and far beyond the affordability of many rural households in poor areas (Liu et al., 2009). High tuition fees are further accompanied by the high and rising opportunity cost of staying in school (Angrist & Lavy, 2009; Lincove, 2012). In particular, opportunity costs are a problem for students entering high school, since labor laws in China permit high school-age students to find employment. Indeed, many rural students in China choose to drop out of education before entering high school because of these high costs (Shi et al., 2015; Yi et al., 2012).

The literature has also shown that the competitiveness of China's education system prevents many rural students from attending high school. China's education system has been designed to fast track individuals by focusing resources on higher performing students that are believed to have more chance of succeeding in high school and ultimately performing well in national college entrance examinations (Li, Liu, & Zhang, 2012). However, rural students (especially poorer students) always perform worse than their urban counterparts (Liu et al., 2009). Further, low-performing students—especially those from rural areas—are found to drop out at higher rates than students from urban areas (Chang, Min, Shi, Kenny, & Loyalka, 2016; Yi et al., 2012; Yi et al., 2015).

To meet the goal of universalizing high school education, the debate on whether the government should make academic high school free is ongoing (China Education Daily, 2016; Wang, 2008; Yan, 2010; Yang, Du, & Zhao, 2015). Will making academic high school free increase high school enrollment? In this study, we use a natural experiment to evaluate the extent to which the academic high school TRP in one rural county in China—Ningshan county in Shaanxi province—affects the schooling decisions of students after they have completed junior high school. Ningshan county, a nationally designated poor county, took the lead by implementing the TRP in 2009 (Chen et al., 2013; People Daily, 2011). This program not only waived the tuition fee for students who attend academic high school, but also relaxed the requirement on entry scores to recruit as many students as possible (People Daily, 2011). This natural experiment thus provides us with a unique opportunity to examine the impact of making academic high school free on the decision to continue in school.

In essence, the TRP is a type of financial aid program designed and implemented by the local (county) government to provide students with full tuition relief. Previous studies have focused on the effect of financial aid on increasing the enrollment of students (Chen & Desjardins, 2010; Jackson, 1978; John & Noell, 1989; Yi et al., 2015). Some researchers have gone further, exploring the impact of financial aid on student efforts (Chen et al., 2013). For example, in a study also conducted in Ningshan, Chen et al. (2013) found that the TRP significantly improved the math scores of the seventh grade students in the first year of the program announcement (presumably because more students were able to continue their schooling into high school). However, given the nature of China's education system, it is unclear whether the gains in the first year of junior high school continue into the subsequent two years, allowing more students to enter into high school. Although previous studies have examined the impact of the financial aid program on students' college choices (Liu et al., 2011; Schwartz, 2008), it is unclear whether a financial aid package would affect the high school choices of students in poor rural counties.

In this study, we have three research objectives. First, we describe three outcomes: a) the plans of students for their future schooling at the beginning of junior high school, b) the nature of the costs that they perceive for high school, and c) the decision to continue schooling after graduation from junior high school. Second, we identify whether the TRP significantly affects the choice of students to continue on to high school. In particular, we assess whether the TRP affects a) matriculation into any high school, b) matriculation into an academic high school, c) matriculation into a vocational high school, d) the decision to enter the labor market (and not continue schooling), and e) the decision to retake high school entrance exams[1]. Finally, we examine how the TRP affects the decisions of different types of students (e.g., poor compared with nonpoor, high performing compared with low performing).

The remainder of the paper is organized as follows. Section 2 describes the high school system in China and the TRP in Ningshan. Section 3 introduces the study's approach, including the sampling, data collection, and statistical approach. The analytical results are presented in Section 4, followed by a discussion in Section 5. We conclude in Section 6.

2. High school education system in China and TRP in Ningshan county

2.1. High school education system

China's high school system consists of academic high school and vocational high school. The ultimate goal of attending academic high school is to go to college, with the teaching activities focusing on general skills. By contrast, vocational high school students typically enter the labor market directly and thus the teaching activities focus on specific skills (MOE, 2008a). After

[1] If a third year junior high school student chooses to repeat a year, it often means that he/she failed to pass the high school entrance examination, although he/she firmly aims to attend academic high school. He/she thus hopes to score better in the following year's examination.

graduating from junior high school, students must select one kind of high school to attend if they plan to continue their schooling. Alternatively, students might choose to enter the labor market or retake their high school entrance exams.

Although junior high school students can decide freely to take the high school entrance exam, their examination score is the primary determinant for entry into academic high school. Since the beginning of this century, the government has removed the score-based requirement for entering vocational high school (versus academic high school), thereby allowing students with poor academic performance to attend. However, every county has a cutoff for whether a student's score makes him/her eligible to enter academic high school (based on the number of slots available that year). Those that do not take the test or have a test score below the cutoff are unable to attend and must choose whether to enter the labor market or vocational high school. Those students that have a test score below the cutoff but who insist on entering academic high schools may choose to retake their exams one year later.

With great support from the government, the costs of attending vocational high school have been declining (compared with attending academic high school). Since 2007, the government has invested more than 16.3 billion yuan in financial aid (i.e., 1500 yuan, or $200, per vocational high school student from rural areas and from poor families in urban areas). Moreover, a tuition waiver program for poor vocational high school students was implemented in 2009 and this had expanded to cover more than 90% of vocational students across China by 2012 (MOE, 2008b, 2013). At the same time, although the academic high school tuition fee is far beyond the household income of those living in poor rural areas, fewer than 10% of students receive financial aid (Liu et al., 2009).

As a result of the high cost, poor students may have to choose to enter a vocational high school or the labor market despite their high scores. Between 18% and 31% of students in poor areas drop out of junior high school, and one of the most cited reasons is that their family cannot afford the fees of academic high school and college (Shi et al., 2015). Poor students also frequently decide not to attend academic high school because of their lower chance of passing the college entrance examination due to the poor quality of schools that they attend (Hanushek, 2008; Loyalka et al., 2013). Thus, the decision on which pathway to enter high school is complicated for poor students and their families.

2.2. TRP in Ningshan county

Ningshan, a mountainous area in western China, has around 74,000 inhabitants. However, the limited number of employment opportunities locally forces nearly half (48%) of workers to migrate outside the county (Ningshan Government, 2012). Indeed, annual per capita income in the county was just 3201 yuan ($500) in 2009, 62.1% of the national average (Ankang Bureau of Statistics, 2010, 2010).

In the belief that only by improving the human capital of its labor force can local people carve out a better standard of living, the Ningshan government committed to making high school free for all. The goal of the TRP, which was announced in July 2009, is to make academic high school affordable for most families through two initiatives. First, the local government pays the annual tuition fees of all academic high school students for three years (2000 yuan/year). Second, academic high schools have adjusted their cutoff scores for the high school entrance exam to maximize academic high school attendance (People Daily, 2011). This policy came into effect on August 1, 2009 for both prospective and current academic high school students.

When the new fall semester began in September 2009, we carried out the baseline survey in a junior high school and found that only 15% of students knew about the TRP[2]. We reported this information to the local government, and the government began to make this program known to all junior high school students in October. When we revisited the schools in March 2010, almost every student randomly selected knew about this program.

3. Methods

3.1. Sampling

This study drew on the longitudinal survey data collected by the authors in September 2009 and October 2012. The sample for the longitudinal survey was chosen in several steps. First, another county was randomly selected as a comparison county in addition to Ningshan (which served as the treatment county). Because we planned to match junior high students in Ningshan with those in a county without the program, we needed a sample of junior high school students with shared characteristics across the two counties. To achieve this goal, we randomly selected Hanyin county as a comparison county. Hanyin county lies in the same prefecture as Ningshan and is also a nationally designated poor county. The two counties are both extremely mountainous. The rural per capita income in Hanyin was 3323 yuan ($519) in 2009 (Ankang Bureau of Statistics, 2010). Most education expenditure is transferred from the government. Further, the students in Hanyin and Ningshan, as in the other counties in the same prefecture in China, take the same courses, use the same textbooks, take the same entrance examination to high school, and pay the same tuition fees. In 2008, new academic high school enrollees in Hanyin and Ningshan accounted for 55% and 58% of junior high school graduates, respectively (regardless of taking the high school entrance exam or not)[3]. In sum, the two counties are nearly identical in terms of their geography, fiscal capacity, poverty status, and education level. The most important difference between these two counties is that Hanyin has no TRP. The families of the junior high school students in Hanyin county must thus pay

[2] This is expected since this program mainly targets academic high school students.
[3] Junior high school dropouts were excluded.

more than 6000 yuan in tuition fees (2000 yuan/year × three years) for the three years of high school and forego more than 30,000 yuan in wages[4].

The next step was to choose the sample schools. All 26 junior high schools in the two study counties were surveyed. Specifically, we surveyed 6 junior high schools in Ningshan and 20 in Hanyin. We then sampled classes in the selected schools. In Ningshan, all seventh-grade classes in all six junior high schools were selected. Because of the size of Hanyin, it would have been impossible, given our budget, to survey all the classes in all the schools. Therefore, our sample included 51 classes in all 26 junior high schools. Finally, in every sample class, we surveyed all students. The total sample in 2009 consisted of 2348 seventh graders (763 students in Ningshan and 1585 in Hanyin).

The sample students were representative of those that live in a rural region of China (Table A1). For example, 53% of students were boys (row 1) and the average age of students was 13 years old (row 2). Although students' math scores were modest with an average of 50 points (full score = 100 points) (row 3), around two-thirds of them planned to go to academic high school after junior high school and 24% planned to go to vocational high school (rows 7 and 8). Three-fifths of students had siblings (row 10).

We also found that the human capital of students' parents in our sample, as in other poor areas, was low. Specifically, 10% of students had at least one parent chronically sick or handicapped (row 11) and only 14% of students' fathers had received high school education or higher, while the share of students' mothers was even less (rows 12 and 13). Furthermore, many parents had to leave their children behind. Our data showed that 36% of students' fathers and 17% of students' mothers had been working away from home for more than 24 months in the past three years (rows 14 and 15).

Although we failed to track some students at the follow-up survey, the attrition does not affect our estimation of the impact of the TRP on students' schooling choices. We surveyed 2348 students in September 2009 (baseline survey), and followed up with 2159 students in October 2012 (evaluation survey). Hence, around 8% of students attrited. However, the multivariate analysis shows that the treatment has no significant impact on students' attrition (Table A2).

Nevertheless, attrition might bias our sample by underrepresenting vulnerable students (Table A3). Specifically, students missing from the follow-up survey were more likely to be older (row 2, $p < 0.01$), have lower math scores (row 3, $p < 0.01$), and planned to attend vocational high school rather than academic high school (rows 7 and 8, $p < 0.05$). Their mothers were also more likely to have less education (row 13, $p < 0.05$), and both their father and mother were more likely to work away from home (rows 14 and 15, $p < 0.05$).

3.2. Data collection

We conducted two rounds of surveys to collect longitudinal data. The first round of surveys was conducted in early September 2009 at the beginning of the first year of junior high school. This was one month after the academic high school TRP had taken effect in Ningshan. However, as discussed earlier, few knew about the program. Therefore, during the baseline survey, we can assume that there was no treatment effect between the students in either county. Three years later (October 2012), we followed up with the same cohort after they had finished their three years of junior high school.

The baseline survey consisted of four blocks. The first block was a 30-min standardized math test. Because we administered the survey/test ourselves, no coaching for the test was required. Further, since the test was administered at the start of the school year, neither students nor teachers shifted their efforts from other subjects to math. Moreover, at this point, only 15% of junior high school students knew about the TRP. Hence, the math test score collected in early September could safely be used as the pre-program outcome. This score represented the academic performance of students, which is an important factor affecting dropout rates and high school enrollment (Chen et al., 2013; Li, Loyalka, Rozelle, & Xie, 2015; Yi et al., 2012).

In the second block, students were asked to provide a checklist of household assets. We used principal component analysis to calculate a single metric of the "family asset value" for each student (Kolenikov & Angeles, 2009). Low-income students were defined as those students whose family asset value was in the bottom 33% of the sample, while middle-income students were defined as those students whose family asset value was in the middle 33%.

The third block collected students' plans for and the perceived cost of attending high school. We inquired of each student his/her plan for schooling after graduation from junior high school (attending academic high school, attending vocational high school, or entering the labor market). Students who planned to attend academic or vocational high school were asked to estimate their perceived attendance cost comprising tuition fees, living expenses, and miscellaneous costs. If students reported that they planned to attend vocational high school or enter the labor market, we further asked why they planned to do so.

In the fourth block, enumerators collected data on the characteristics of students and their families to create the demographic and socioeconomic variables used in this study as well as the control variables used in our later analyses. Specifically, we collected data on gender and age as well as family characteristics such as number of siblings, the health status of parents, the years of schooling of each parent, and the periods of staying at home of each parent in the past three years. Similar variables have been used in previous studies to explain differences in high school matriculation rates (Yi et al., 2015).

The evaluation survey in October 2012 involved two steps. The first step was to collect information on the schooling status of sample students. We revisited the principals and head teachers of the sample schools and asked whether sample students took the high school entrance exam and continued their schooling. If students went to either academic or vocational high school, we recorded the name and contacts of schools. If students had not continued their schooling, the phone numbers of students

[4] According to Liu et al. (2009), the opportunity cost per student of attending high school is $5055.

were requested from their head teacher and classmates. Our enumerators also met students who had repeated the third grade in junior high school to retake their high school entrance exams in the next year. The second step was to confirm the information collected from principals and head teachers. We went to the high schools that students had attended to confirm their matriculation. In addition, we called each student who had not continued their schooling after junior high school and confirmed their status through a brief telephone interview.

3.3. Analytical approach

To assess the extent to which the TRP affected students' schooling decisions, we conducted two types of analyses: ordinary least squares (OLS) and propensity score matching (PSM). In both analyses, we estimated robust standard errors to correct for school-level clustering.

3.3.1. OLS regression

Our first type of analysis uses OLS regression. We conducted OLS analysis to examine the basic relationship between the treatment (having a TRP or not) and student outcomes, while controlling for the observable covariates that may confound that relationship. The basic specification for the OLS analysis is

$$Y_{ij} = \alpha_0 + \alpha_1 A_j + \alpha X_{ij} + \varepsilon_{ij} \quad (1)$$

where Y_{ij} represents the outcome variables of interest (matriculation into academic high school, matriculation into vocational high school, entering the labor market, and retaking high school entrance exams) of student i in school j. A_j is a dummy variable for whether school j is located in the Ningshan county (treatment county). In the absence of omitted variable bias, α_1 would be the treatment impact of the TRP on Y_{ij}.

X_{ij} in Eq. (1) represents the vector of the observable baseline covariates for student i in school j. It includes the following student and family covariates: *Male* (1 = male), *Age* (in years), *Baseline math score* (full score = 100), *Low-income students* (1 = students are in the bottom 33% of the distribution of our poverty index variable), and *Middle-income students* (1 = students

Table 1
Student and family characteristics at baseline, by treatment status

	Variables	Ningshan (1)	Hanyin (2)	Difference (3) = (1)–(2)
(1)	Male (1 = yes, 0 = otherwise)	0.50	0.54	-0.04
		(0.50)	(0.50)	(0.03)
(2)	Age (year)	12.99	13.07	-0.08
		(0.86)	(1.06)	(0.12)
(3)	Baseline math score (full score = 100)	54.21	48.59	5.63**
		(15.40)	(15.29)	(2.36)
(4)	Low-income students (1 = students are in the bottom 33% of the distribution of our poverty index variable, 0 = otherwise)	0.33	0.33	0.00
		(0.47)	(0.47)	(0.08)
(5)	Middle-income students (1 = students are in the middle 33% of the distribution of our poverty index variable, 0 = otherwise)	0.33	0.33	-0.00
		(0.47)	(0.47)	(0.04)
(6)	High-income students (1 = students are in the high 33% of the distribution of our poverty index variable, 0 = otherwise)	0.33	0.33	-0.00
		(0.47)	(0.47)	(0.11)
(7)	PlanAcad (1 = student plans to attend academic high school at baseline, 0 = otherwise)	0.74	0.62	0.12*
		(0.44)	(0.49)	(0.07)
(8)	PlanVoc (1 = student plans to attend vocational high school at baseline, 0 = otherwise)	0.18	0.26	-0.08*
		(0.39)	(0.44)	(0.04)
(9)	PlanLabor (1 = student plans to attend labor market at baseline, 0 = otherwise)	0.08	0.12	-0.04
		(0.27)	(0.33)	(0.03)
(10)	Sibling (1 = student has any siblings, 0 = otherwise)	0.55	0.62	-0.07
		(0.50)	(0.49)	(0.06)
(11)	SickParents (1 = one or both of parents are chronically sick or permanently handicapped; 0 = otherwise)	0.11	0.10	0.01
		(0.32)	(0.30)	(0.03)
(12)	DadHighEdu (1 = student's father had reached high school or above, 0 = otherwise)	0.20	0.11	0.09
		(0.40)	(0.31)	(0.08)
(13)	MomHighEdu (1 = student's mother had reached high school or above, 0 = otherwise)	0.16	0.07	0.09
		(0.37)	(0.25)	(0.06)
(14)	DadMigt (1 = student's father had been working away from home for more than 24 months in the past three years, 0 = otherwise)	0.26	0.41	-0.15***
		(0.44)	(0.49)	(0.05)
(15)	MomMigt (1 = student's mother had been working away from home for more than 24 months in the past three years, 0 = otherwise)	0.11	0.20	-0.09***
		(0.31)	(0.40)	(0.03)

Data source: Authors' survey.
Note: a. Standard deviations are reported in parentheses of column (1) and (2), and standard errors are reported in parentheses of column (3).
b. * indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

are in the middle 33% of the distribution of our poverty index variable), *PlanAcad* (1 = student plans to attend academic high school at baseline), *PlanVoc* (1 = student plans to attend vocational high school at baseline), *Sibling* (1 = student has siblings), *SickParents* (1 = one or both parents are chronically sick or permanently handicapped), *DadHighEdu* (1 = student's father reached high school or above), *MomHighEdu* (1 = student's mother reached high school or above), *DadMigt* (1 = student's father has been working away from home for more than 24 months in the past three years), *MomMigt* (1 = student's mother has been working away from home for more than 24 months in the past three years).

3.3.2. PSM analysis

Although the two sample counties share a number of similar characteristics, we do not expect to see full balance between the treatment and comparison students as our study did not randomly assign students. Indeed, the groups differ substantially in some of the baseline characteristics (Table 1). Specifically, Ningshan students are more likely to have higher math scores ($p < 0.05$) (row 3). In addition, they are more likely to plan to go to academic high school ($p < 0.10$) (row 7) and less likely to plan to go to vocational high school ($p < 0.10$) (row 8). Moreover, both parents of Ningshan students are less likely to work away from home ($p < 0.01$) (rows 14 and 15). Given these issues with regard to nonexperimental studies, differences in students' schooling decisions could be partly due to the group differences that had existed before the implementation of the TRP. Therefore, we use PSM, a method that has become increasingly popular in social, psychological, and educational research in recent years (Thoemmes & Kim, 2011), to address this type of selection bias.

The propensity score is defined as "the conditional probability of assignment to a particular treatment given a vector of observed covariates" (Rosenbaum & Rubin, 1983). The main idea of this method is to generate a balance across the distribution of each of the covariates between the treatment and comparison groups by comparing only those subjects who have similar or equal propensity scores. Thus, by determining the likelihood of being in the county of implementing TRP from the treatment and comparison samples, we can compare students in Ningshan county with those subjects who exhibit just random differences. For further explanations of matching methods, see, for example, Caliendo and Kopeinig (2008).

We implemented PSM according to the following four steps. First, we chose to match students from the treatment and comparison samples on the baseline covariates X_{ij} in Eq. (1). Second, a student from the comparison group was chosen as a matching partner for a treated student that is closest in terms of the propensity score. Third, because the average treatment effect on the treated (ATT) is only defined in the region of common support, we checked the overlap and the region of common support between the treatment and comparison groups (Fig. 1). The matching procedure produces balance across the observable covariates by excluding the students whose propensity scores are smaller than the minimum and larger than the maximum in the opposite group. Finally, we ran the same regression analyses as in Eq. (1) on the matched set of students to estimate the ATT. The ATT characterizes the average effect of implementing the TRP on only those students who would typically be covered by the program. This kind of effect is of particular interest when evaluating interventions that usually cover a particular subpopulation of students.

3.3.3. Heterogeneous analysis

According to the policy components (People Daily, 2011), the academic high school TRP is meant to benefit poor and low-performing students. We examine the heterogeneous impacts of the academic high school TRP on students' choices of schooling by including interaction terms between treatment and student characteristics such as students' family wealth and math score at baseline.

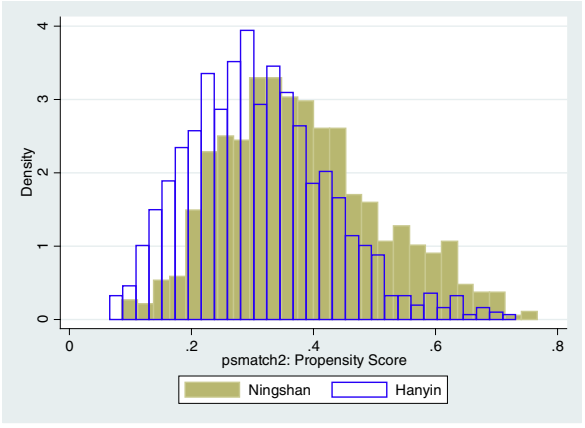

Fig. 1. Distributions of propensity score, by treatment status Note: Ningshan county is our treatment county, and Hanyin county is comparison county. Data source: Authors' survey.

4. Results

4.1. Students' plans, perceived barriers, and decisions for schooling after graduation from junior high school

Most seventh-grade students, when asked at the beginning of junior high school (i.e., at the baseline survey), plan to continue schooling after junior high school. Specifically, only 10.5% of students reported that they planned to enter the labor market after graduation from junior high school, instead of continuing their schooling, at the baseline survey (Panel A, Fig. 2). In other words, almost 90% students plan to attend high school after junior high school. However, it seems that most students would like to attend academic high schools. Our data show that the share of students who planned to attend academic high school (66.3%) is triple that who planned to attend vocational high school (23.2%).

When we asked students why they planned to attend vocational high school or enter the labor market, the most cited reasons are economic poverty and poor academic performance. Specifically, the first three cited reasons (multiple choices) by students who planned to attend vocational high school are "I can learn specific skills" (37.5%), "My family is poor" (36.3%), and "My academic performance is poor" (35.2%). The first three cited reasons (multiple choices) by students who planned to enter the labor market after junior high school are "My family is poor" (55.9%), "My academic performance is poor" (51.7%), and "I don't like to go to school" (8.5%).

In fact, few students believe their families could afford the costs of attending high school even they planned to go. Our data show that students who planned to attend academic high school perceived the cost would be 5410 yuan each year. Although most students planned to attend high school at the baseline survey, more than three-quarters (77.0%) reported that their family could not afford these fees or would face pressure trying to find funding. The students who planned to attend vocational high school perceived that the cost would be 6610 yuan each year and nearly 90% of students did not think their family could afford these fees.

The prohibitive cost and low assessment of their own academic performance might explain why we found that the number of students who actually entered the labor market was almost three times that of those who planned to enter the labor market at the baseline survey. When we followed up with these students after their graduation from junior high school, we found that 55.8% of them attended academic high school and 11.7% of them attended vocational high school (Panel B, Fig. 2). Hence, 67.5% of students matriculated into high school, a decline of 22 percentage points compared with students' plans three years earlier. By contrast, 29.0% of students entered the labor market after graduation from junior high school, while only 10.5% of students had planned to do so at the baseline survey. In addition, 3.4% of students chose to retake exams at junior high school.

However, the descriptive statistics showed that the TRP significantly increases the matriculation of junior high school students into academic high schools (Table 2). Specifically, when we look at matriculation by school type, we find that the matriculation

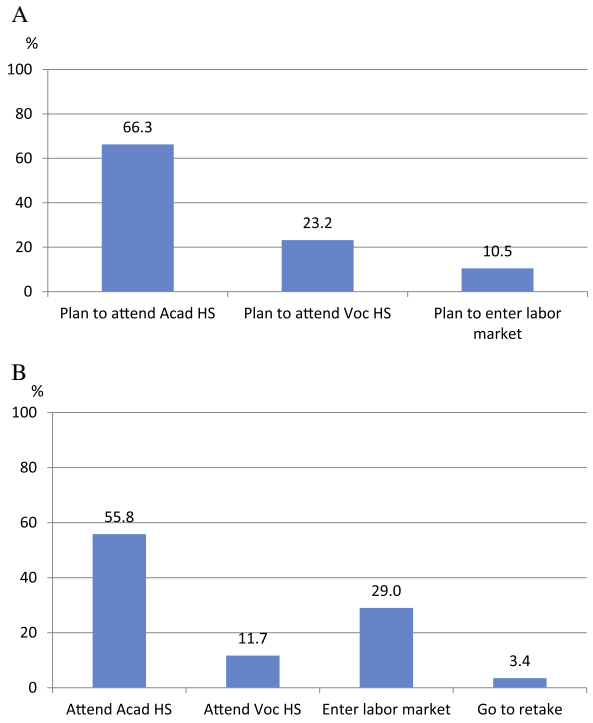

Fig. 2. Students' plans and decisions for attending high schools Data source: Authors' survey. **Panel A** Student's plans for attending high schools at the beginning of junior high school **Panel B** Students' decisions on attending high schools after graduation from junior high school

Table 2
Students' schooling decisions after junior high school by counties

	Ningshan	Hanyin	Difference	P-value
Percentage of students matriculating into high schools, %	79.8	61.4	18.4***	<0.001
Percentage of students matriculating into academic high school, %	74.3	46.6	27.7***	<0.001
Percentage of students matriculating into vocational high school, %	5.6	14.8	-9.2***	<0.001
Percentage of students entering labor market, %	17.8	34.6	-16.8***	<0.001
Percentage of students retaking high school entrance exam, %	2.4	4.0	-1.6*	0.055

Data source: Authors' survey.
Note: * indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

rate of academic high school in Ningshan county (74.3%) is substantially higher ($p < 0.001$) than that in Hanyin county (46.6%), while the matriculation rate of vocational high school in Ningshan county is lower than that in Hanyin county by 9.2 percentage points ($p < 0.001$). Taken together, the matriculation rate of high school in Ningshan county (which has a TRP) is significantly higher than that in Hanyin (which does not have a TRP) by 18.4 percentage points ($p < 0.001$). The shares of students who entered labor market and retook exams in Ningshan county are also less than those in Hanyin county by 16.8 and 1.6 percentage points, respectively. All these differences are statistically significant.

4.2. Impacts of the TRP on the matriculation rates of students

According to the results of the OLS analysis, the TRP significantly changed students' schooling decisions (Table 3). Specifically, it significantly increased academic high school enrollment by 21.3 percentage points ($p < 0.01$) (row 1, column 2). In 2008, 548 students matriculated into academic high school in Ningshan, which accounted for 45.4% of the new enrollees of junior high school in 2005 (Ningshan Education Department, personal communication). This indicates that the TRP increased the

Table 3
Impact of the academic high school tuition relief program on students' schooling decisions after junior high schools-OLS regression

Variables	Attend High School (1)	Attend Academic High School (2)	Attend Vocational High School (3)	Enter Labor Market (4)	Go to Retake (5)
Treatment	0.141**	0.213***	-0.072***	-0.119**	-0.021*
	(0.056)	(0.041)	(0.023)	(0.056)	(0.011)
Male	-0.021	-0.026	0.005	0.007	0.014
	(0.020)	(0.027)	(0.017)	(0.016)	(0.011)
Age	-0.087***	-0.106***	0.019**	0.098***	-0.012***
	(0.012)	(0.011)	(0.008)	(0.013)	(0.004)
Baseline math score	0.004***	0.007***	-0.003***	-0.004***	-0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Low-income students	-0.036	-0.007	-0.029*	0.056	-0.022***
	(0.038)	(0.038)	(0.015)	(0.034)	(0.007)
Middle-income students	0.030	0.042	-0.013	-0.016	-0.014
	(0.032)	(0.033)	(0.015)	(0.027)	(0.013)
PlanAcad	0.161***	0.137***	0.024	-0.182***	0.020**
	(0.037)	(0.029)	(0.026)	(0.034)	(0.008)
PlanVoc	0.078**	0.036	0.041**	-0.099**	0.020**
	(0.037)	(0.034)	(0.019)	(0.036)	(0.010)
Sibling	-0.001	-0.022	0.020	-0.003	0.003
	(0.022)	(0.021)	(0.015)	(0.024)	(0.007)
SickParents	-0.063	-0.092***	0.029	0.069	-0.005
	(0.041)	(0.026)	(0.030)	(0.042)	(0.009)
DadHighEdu	-0.010	0.031	-0.041	-0.027	0.038*
	(0.037)	(0.037)	(0.027)	(0.034)	(0.020)
MomHighEdu	0.004	0.008	-0.004	-0.016	0.012
	(0.035)	(0.035)	(0.023)	(0.027)	(0.024)
DadMigt	0.005	0.008	-0.004	0.010	-0.014
	(0.020)	(0.021)	(0.021)	(0.022)	(0.009)
MomMigt	-0.023	-0.004	-0.019	0.022	0.001
	(0.037)	(0.034)	(0.024)	(0.036)	(0.011)
Constant	1.439***	1.429***	0.010	-0.634***	0.204***
	(0.175)	(0.153)	(0.127)	(0.175)	(0.059)
Number of observations	2146	2146	2146	2146	2146
R-squared	0.142	0.228	0.049	0.170	0.026

Data source: Authors' survey.
Note:
a. The definition of variables please refer to Table 1.
b. Standard errors are reported in parentheses.
c. * indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

matriculation rate of academic high schools by at least 47%. However, vocational high school enrollment reduced by 7.2 percentage points ($p < 0.01$) (row 1, column 3). Taken together, the program therefore significantly increased the matriculation rate of high schools by 14.1 percentage points ($p < 0.05$) (row 1, column 1). The OLS regression also shows that the TRP reduced the likelihood of students entering the labor market by 11.9 percentage points ($p < 0.05$) and the likelihood of students retaking exams by 2.1 percentage points ($p < 0.10$) (row 1, columns 4 and 5). In summary, the program significantly improved the probability of students matriculating into academic high school rather than selecting other choices after junior high school.

The results of the PSM analysis tell a similar story (Table 4). The program significantly increased matriculation into academic high school by 15.7 percentage points ($p < 0.01$), while having a significantly negative effect on matriculation into vocational high school ($p < 0.05$) (row 1, columns 2 and 3). Taken together, our analysis indicates the TRP had no significant impact on overall matriculation into high school even though the coefficient is positive (8.2 percentage points, $p > 0.10$) (row 1, column 1). We also find that the TRP reduced the likelihood of students entering the labor market. However, the effect is not statistically significant. Its effect on retaking exams was also not significant (row 1, columns 4 and 5). The PSM analysis thus demonstrates similar and consistent effects of the program on students' schooling decisions after junior high school compared with the OLS regression.

4.3. Heterogeneous impact of the TRP on low-income and low-performing students

The results in Table 5 suggest that the low-income students did not benefit more than high-income students from the TRP as expected. The OLS results show that no coefficient of the interactions of treatment and low-income students is significant for all outcomes (attend high school, attend academic high school, attend vocational high school, enter labor market, or retake; row 4, columns 1–5, Table 5). This finding indicates that the impact of the TRP on low-income students in the treatment county is not significantly different from that on high-income students in the treatment county. The PSM analysis also shows no significant heterogeneous effects on low-income students (row 4, columns 6–10, Table 5).

Table 4
Impact of the academic high school tuition relief program on students' schooling decisions after junior high schools – OLS regression using matched data

Variables	Attend High School (1)	Attend Academic High School (2)	Attend Vocational High School (3)	Enter Labor Market (4)	Go to Retake (5)
Treatment	0.082	0.157***	-0.074**	-0.054	-0.024
	(0.057)	(0.048)	(0.033)	(0.058)	(0.015)
Male	0.001	-0.037	0.038	-0.024	0.026***
	(0.020)	(0.034)	(0.022)	(0.019)	(0.009)
Age	-0.095***	-0.100***	0.005	0.100***	-0.007
	(0.018)	(0.020)	(0.009)	(0.020)	(0.006)
Baseline math score	0.004***	0.006***	-0.002***	-0.004***	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Low-income students	-0.010	0.023	-0.032	0.023	-0.017*
	(0.040)	(0.042)	(0.020)	(0.042)	(0.008)
Middle-income students	0.059**	0.065**	-0.005	-0.050*	-0.01
	(0.025)	(0.027)	(0.022)	(0.026)	(0.009)
PlanAcad	0.155**	0.241***	-0.086	-0.165**	0.007
	(0.063)	(0.036)	(0.051)	(0.062)	(0.015)
PlanVoc	0.067	0.105**	-0.039	-0.082	0.015
	(0.064)	(0.043)	(0.049)	(0.061)	(0.016)
Sibling	0.026	-0.005	0.031**	-0.035	0.008
	(0.024)	(0.023)	(0.014)	(0.024)	(0.008)
SickParents	-0.075	-0.119***	0.045	0.079	-0.003
	(0.055)	(0.041)	(0.044)	(0.064)	(0.014)
DadHighEdu	0.017	0.005	0.012	-0.043	0.027
	(0.063)	(0.053)	(0.033)	(0.048)	(0.022)
MomHighEdu	-0.009	0.014	-0.022	-0.033*	0.042
	(0.032)	(0.043)	(0.031)	(0.019)	(0.030)
DadMigt	0.006	-0.016	0.022	0.008	-0.012**
	(0.029)	(0.034)	(0.029)	(0.030)	(0.006)
MomMigt	-0.023	-0.043	0.020	0.007	0.017
	(0.052)	(0.034)	(0.036)	(0.047)	(0.019)
Constant	1.566***	1.379***	0.187	-0.688**	0.142
	(0.243)	(0.297)	(0.172)	(0.252)	(0.086)
Number of observations	992	992	992	992	992
R-squared	0.137	0.209	0.064	0.160	0.034

Data source: Authors' survey.
Note:
a. The definition of variables please refer to Table 1.
b. Standard errors are reported in parentheses.
c.* indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

Table 5
Heterogeneous impacts of the academic high school tuition relief program on low-income students' schooling decisions after junior high school

	OLS regression					OLS regression using matched data				
Variables	Attend High School (1)	Attend Academic High School (2)	Attend Vocational High School (3)	Enter Labor Market (4)	Go to Retake (5)	Attend High School (6)	Attend Academic High School (7)	Attend Vocational High School (8)	Enter Labor Market (9)	Go to Retake (10)
Treatment	0.082*	0.156***	-0.075***	-0.051	-0.030	0.001	0.088	-0.086*	0.031	-0.032
	(0.046)	(0.044)	(0.019)	(0.049)	(0.021)	(0.046)	(0.052)	(0.043)	(0.052)	(0.027)
Low-income students	-0.063	-0.032	-0.031	0.088*	-0.028***	-0.098	-0.032	-0.066	0.118*	-0.031
	(0.051)	(0.048)	(0.022)	(0.046)	(0.009)	(0.069)	(0.074)	(0.056)	(0.069)	(0.021)
Middle-income students	0.002	0.015	-0.013	0.014	-0.016	-0.018	-0.025	0.007	0.029	-0.012
	(0.040)	(0.042)	(0.021)	(0.036)	(0.018)	(0.063)	(0.051)	(0.066)	(0.062)	(0.027)
Treatment * Low-income students	0.088	0.081	0.007	-0.105	0.019	0.127	0.079	0.047	-0.137	0.021
	(0.079)	(0.069)	(0.030)	(0.077)	(0.019)	(0.086)	(0.082)	(0.054)	(0.085)	(0.024)
Treatment * Middle-income students	0.089*	0.087*	0.002	-0.097**	0.008	0.111*	0.126**	-0.015	-0.113*	0.003
	(0.047)	(0.051)	(0.023)	(0.045)	(0.021)	(0.064)	(0.056)	(0.064)	(0.062)	(0.029)
Constant	1.453***	1.443***	0.010	-0.650***	0.205***	1.621***	1.437***	0.185	-0.745**	0.145
	(0.175)	(0.153)	(0.128)	(0.175)	(0.061)	(0.243)	(0.299)	(0.176)	(0.257)	(0.088)
Observations	2146	2146	2146	2146	2146	992	992	992	992	992
R-squared	0.144	0.229	0.049	0.172	0.027	0.140	0.211	0.066	0.165	0.034

Data source: Authors' survey.
Note:
a. The definition of variables please refer to Table 1.
b. The covariates controlled in the analysis are same to those in Table 3.
c. Standard errors are reported in parentheses.
d. * indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

However, we find that middle-income students in the treatment county were more likely to matriculate into high school than high-income students. The OLS results show that middle-income students in the treatment county were 8.7 percentage points more likely than high-income students (base group) to matriculate into academic high school (row 5, column 2). The increase in the academic high school matriculation rate among middle-income students in the treatment county also drives higher matriculation into high school (by 8.9 percentage points, $p < 0.1$) (row 5, column 1) compared with high-income students in the treatment county. There was no significant difference in effect of the TRP on matriculation into vocational high school between middle-income and high-income students in the treatment county (row 5, column 3). Middle-income students were 9.7 percentage points less likely than high-income students to enter the labor market in the treatment county ($p < 0.05$) (row 5, column 4). The heterogeneous effect of the TRP on middle-income students on retaking was also not statistically significant (row 5, column 5). The PSM analysis gives similar and consistent results: there are significant heterogeneous effects on middle-income students on their matriculation into high school/academic high school and entering the labor market (row 5, columns 6, 7, and 9).

Table 6
Heterogeneous impacts of the academic high school tuition relief program on low-performing students' schooling decisions after junior high school

	OLS regression					OLS regression using matched data				
Variables	Attend High School (1)	Attend Academic High School (2)	Attend Vocational High School (3)	Enter Labor Market (4)	Go to Retake (5)	Attend High School (6)	Attend Academic High School (7)	Attend Vocational High School (8)	Enter Labor Market (9)	Go to Retake (10)
Treatment	0.131	0.313***	-0.182**	-0.160	0.028	0.046	0.212	-0.166	-0.106	0.057*
	(0.146)	(0.103)	(0.067)	(0.139)	(0.018)	(0.156)	(0.129)	(0.101)	(0.153)	(0.030)
Baseline math score	0.004***	0.008***	-0.003***	-0.004***	-0.000	0.004***	0.007***	-0.003**	-0.004***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Treatment* Baseline math score	0.000	-0.002	0.002**	0.001	-0.001***	0.001	-0.001	0.002	0.001	-0.002**
	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	1.442***	1.399***	0.043	-0.622***	0.189***	1.591***	1.341***	0.249	-0.653**	0.087
	(0.182)	(0.155)	(0.127)	(0.181)	(0.061)	(0.252)	(0.308)	(0.188)	(0.261)	(0.093)
Observations	2146	2146	2146	2146	2146	992	992	992	992	992
R-squared	0.142	0.229	0.051	0.170	0.028	0.137	0.209	0.066	0.161	0.038

Data source: Authors' survey.
Note:
a. The definition of variables please refer to Table 1.
b. The covariates controlled in the analysis are same to those in Table 3.
c. Standard errors are reported in parentheses.
d. * indicate significance at 10%; ** indicate significance at 5%, and *** indicate significance at 1%.

However, we found that the TRP had no significantly heterogeneous impact on students with different academic performance on their matriculation into high school (Table 5). The OLS analysis shows that high-performing students (higher baseline math score) in the treatment county are more likely to matriculate into vocational high school by 0.2 percentage points (row 3 and column 3 in Table 6). Nevertheless, this effect is not significant in the PSM analysis (row 3 and column 8 in Table 6). Although both the OLS and the PSM results consistently indicate that high-performing students in the treatment county are less likely to retake high school entrance exams (row 3 and columns 5 and 10 in Table 6), the effect size is negligible (0.2 percentage points). That is to say, an increase of 16 points in the baseline score (a standardized deviation) only reduces the possibility of retaking by 3 percentage points. In summary, low-performing students did not benefit more from the TRP.

5. Discussion

In this study, we used a natural experiment to evaluate the extent to which the TRP in Ningshan county in western China affected students' schooling decisions after junior high school, finding that it significantly changed students' high school choices. Specifically, the program significantly increases the likelihood of students matriculating into academic high school by 21 percentage points (an increase of 45%). However, it reduces the possibility of students matriculating into vocational high school by 7 percentage points. This finding might be explained by the decline in the relative price of attending academic high school (compared with attending vocational high school). The lower cost helps more students, who planned to attend academic high school, realize their dreams. Taking these results on attending these two types of high schools together, the program had a positive impact on students' matriculation into high school.

From an income perspective, our results show that low-income students did not benefit more from the program. Instead, middle-income students in the treatment county are more likely to matriculate into academic high school than other students. This might seem counterintuitive. In theory, low-income students should be more sensitive to the cost of attending academic high school given their financial constraints. However, this finding might be explained by the non-tuition fee costs of attending academic high school.

Indeed, such non-tuition fee costs remain high for poor households. After deducting the tuition fee, students still need to pay around 2000 yuan annually to study at high school in Ningshan, which accounts for 62% of the per capita net income in Ningshan county (3201 yuan in 2009) (Ankang Bureau of Statistics, 2010; Liu et al., 2009). The cost of attending higher education (i.e., college) for four more years is another barrier to entry to academic high school[5]. Further, if students fail to matriculate into college or university, their likelihood of returning to academic high school is low because such schools mainly serve as a mechanism to select college students (Li et al., 2012). Meanwhile, the rising opportunity cost of attending high school might encourage low-income students to leave school as early as possible (Yi et al., 2012). Thus, the funding amount of the TRP might be sufficient to release the financial burden on middle-income students and thus send them to academic high school; however, it is insufficient for low-income students.

Although the TRP has adjusted the cutoff of the high school entrance exam to make academic high school accessible to all students, we found no heterogeneous effects on low-performing students on their matriculation into academic high school. In other words, low-performing students in the treatment county did not take advantage of this lower cutoff to matriculate into academic high school. There are two possible explanations for these divergent findings. One is that these low-performing students did not work sufficiently hard to meet the minimum requirement of attending academic high school. Obviously, this is not true. By using follow-up survey data, for example, Chen et al. (2013) find that the TRP has significantly improved students' scores in the first year of the program.

Thus, it is more likely that low-performing students still perceived little hope of passing the college entrance examination, the ultimate goal of attending academic high school, even though they made progress. Although students made gains in the first year (Chen et al., 2013), many low-performing students had given up the opportunity of attending academic high school before graduation. Our data show that 27% of low-performing students did not even take the high school entrance exam (prerequisite of attending academic high school) in the treatment county. Because of the huge population aspiring for higher education and the limited number of college (and university) places, entrance to college is extremely competitive in China. According to Li et al. (2015), only about 7% of rural youth from poor counties can go to college, while nearly half of urban youth can do so. Even students who took the high school entrance exam have little chance of entering college if they cannot achieve outstanding performance at high school. Hence, low-performing students might give up before entering academic high school.

6. Conclusion

By exploiting a longitudinal dataset of 2348 students in two counties, we use OLS and PSM to evaluate the impact of the TRP on the schooling decisions of students after they finish junior high school. According to the results of the empirical analysis, the TRP significantly increased matriculation into academic high school. At the same time, it reduced matriculation into vocational high school. In the analysis, we also found that the TRP had no significant heterogeneous effects on the matriculation rates of either low-income students or low-performing students. In other words, the findings suggest that low-income students and low-performing students did not benefit relatively more from the program (than nonpoor or higher-performing students).

[5] Although several financial aid programs are available at college or university, students know little about these programs beforehand (Liu et al., 2011).

To our knowledge, this is the only study in China to explore the impact of an academic high school TRP on matriculation into high school. The results of the study should help policymakers design new initiatives to improve the high school education system in poor rural areas as well as be a part of the effort to boost attendance to high school. Such policies, as discussed in the Introduction, are important for more effectively building the nation's future human capital.

There are limits, however, to what a TRP can do. It is true that making academic high school free helped more students matriculate into academic high school. However, the cost and competitiveness of attending academic high school appears to have remained sufficiently high that merely making high school less costly is not enough for students in the lower-income or academically lower-performing groups.

Such results, then, also accentuate the nature of the challenge that policymakers face when trying to improve human capital in rural areas and realizing the goal of universalizing high school education. The results suggest that two additional types of actions might need to be considered. On the one hand, the government should not only provide financial aid, but also try to help promote the idea of the importance of getting a high school education to the families of poor children. Rural families should be aware that if their children are not educated to at least the high school level, it is likely that they will be resigned to low paying, informal jobs in the future.

On the other hand, more actions should be taken to help low-performing students improve their learning at school. It is imperative that all levels of government join together to try to make preschool and primary school (and before) periods of time that rural students are provided with the highest quality of health care, nutrition, and educational services. All children in China—at this stage of development—need to be equipped for the future with a quality education.

Finally, we need to recognize that the findings of this study should be interpreted cautiously and that there should be more research in this area. First, while we believe the results of the impact evaluation are robust, the data for this study only covered two counties. In China's poor rural areas, hundreds of counties are equally as poor, if not poorer. While we believe that our work informs the debate on whether the TRP should be part of a policy effort that is focused on increasing high school matriculation, we do not claim full external validity for all other poor areas. It is always possible that the students in Ningshan benefited from the program because of other county-specific characteristics.

In addition, this study only focuses on the impact of the TRP on the matriculation of students into high school. Matriculation into academic high school, however, is not an end unto itself. Instead, future research should explore how the TRP could affect the performance of students in the labor market and beyond.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.chieco.2016.12.003.

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