Economics of Education Review 36 (2013) 26–40

Contents lists available at SciVerse ScienceDirect

Economics of Education Review

journal homepage: www.elsevier.com/locate/econedurev

Information, college decisions and financial aid: Evidence from a cluster-randomized controlled trial in China

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ARTICLE INFO

Article history:
Received 15 October 2011
Received in revised form 30 April 2013
Accepted 1 May 2013

JEL classification:
I22
015

Keywords:
Information
Financial aid
College choice
China
Rural high school
Randomized controlled trial

ABSTRACT

Past studies find that disadvantaged students in the United States are often misinformed about college costs and financial aid opportunities and thus may make sub-optimal decisions regarding college. This information problem may be even more serious in developing countries. We therefore conducted a cluster-randomized controlled trial to examine the effects of providing information on college costs and financial aid to high school students in poor regions of northwest China. We find that information increases the likelihood that students receive some types of financial aid. Information also positively affects the choice to attend college but does not seem to affect more specific college choices.

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1. Introduction

Recent research underscores the effect of college costs and financial aid on educational outcomes (Long, 2008). Increased financial aid can improve college outcomes by lowering the price of college and loosening credit constraints (Dynarski, 2002). Empirical studies find positive effects of merit aid (Cornwell, Mustard, & Sridhar, 2006), needs-based aid (Kane, 1996) and educational loans (Dynarski, 2003). The effects are multidimensional; financial aid raises college attendance (Linsenmeier, Rosen, & Rouse, 2006), increases enrollment (Van der Klaauw, 2002), prolongs attendance (Bettinger, 2004) and influences college choice (Avery & Hoxby, 2003). As the cost of college in a net sense (that is, total cost minus the contribution of financial aid) is potentially of greatest concern to students from disadvantaged backgrounds, a number of studies focus on the effects of financial aid on lower-income and minority students (e.g. Linsenmeier et al., 2006).

Despite the importance of financial aid on student outcomes, students and their parents may not have complete or correct information about the costs of college and financial aid options (ACSFA, 2005; Horn, Chen, & Chapman, 2003; Ikenberry & Hartle, 1998). This information problem is especially prevalent among low-income families and minorities (Horn et al., 2003; Kane & Avery, 2004; McDonough & Calderone, 2006). According to several studies, if students and their parents overestimate the expected net costs of higher education (which includes underestimating the probability of receiving financial aid),

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http://dx.doi.org/10.1016/j.econedurev.2013.05.001

they are less likely to attend college; they may choose colleges of lower quality; and/or they may fail to apply for all of the available sources of financial aid (Long, 2008; Commission, 2006). As a consequence, differences in access to information about financial aid and college costs among the population of potential college students may in part explain why disadvantaged groups tend to have more difficulties attending college (Long, 2008).

To address this information problem, governments, universities and other private organizations in developed countries provide students and their families with steadily improving access to low-cost (or free), user-friendly materials about college costs and financial aid (Perna, 2006). Some organizations offer comprehensive intervention packages that include college counseling, mentoring and pre-college preparation programs (Kane & Avery, 2004; Long, 2008). The assumption is that the information conveyed through such materials and services helps students make better decisions. However, such assumptions are based on perception and not evidence. In fact, we are only familiar with one concurrent study in the United States that utilized experimental methods to evaluate the causal effects of providing this kind of information on college outcomes (Bettinger, Long, Oreopoulos, & Sanbonmatsu, 2009).

This paper contributes toward closing this gap in the literature by presenting experimental evidence about the effects of providing college cost and financial aid information on a student's choices of college, their persistence to go to college, and their likelihood of receiving aid. Specifically, in this paper we present results from a cluster-randomized controlled trial conducted across poor counties in Shaanxi province in Northwest China. During the intervention, designed and implemented by the authors, trained enumerators provided senior high school students in 41 high schools with comprehensive, user-friendly information about college costs and financial aid. After conducting a baseline survey and intervention in April 2008, we followed-up with students eight months later and inquired about three main outcomes: what college did they choose to apply for; did they attend college, and did they receive financial aid. Our results indicate that college cost and financial aid information increased the probability that students attended college and received certain types of financial aid. The results also suggest that information had no significant impact on whether students chose to go to (free) military college or more select tiers of colleges.

The findings of this paper may be of interest to policymakers in China. In 2007, the State Council implemented a new financial aid policy that, for the first time, provided extensive coverage and substantial funding to eligible students. Yet descriptive evidence, including our own baseline survey data, indicates that a significant proportion of students in their last year of high school, especially those of lower socioeconomic status, are not adequately familiar with the financial aid opportunities granted by this policy or even with college costs in general (Shi et al., 2007). According to the findings of the current paper, China's education system should provide more information to students so as to increase college attendance and help students take advantage of the financial aid available to them.

The rest of the paper is organized as follows. Section 2 describes the costs of attending college in China and introduces different types of financial aid instruments that are currently available to students. Section 3 explores how students in China are acquiring information about college costs and financial aid. In this section we also discuss how greater access to information may affect the college outcomes of students. Section 4 lays out the hypotheses. Section 5 describes the intervention, the cluster-randomized research design, the data, and the analytical models. Section 6 presents the results of the analysis and Section 7 concludes.

2. College costs and financial aid opportunities in China

In 1999 the central government embarked on an ambitious initiative to expand higher education. Four-year college undergraduate enrollments grew from 2.7 million in 1999 to over 10 million in 2007 (National Bureau of Statistics of China, 2008). The number and diversity of higher education institutions (HEIs) also increased. Two years earlier, in 1997, cost-sharing (implemented in large part to finance the expansion of the college system) and financial aid also emerged in China's higher education system.

Together, the new cost-sharing policies, the expansion in enrollments and greater institutional differentiation combined to dramatically increase the public's concerns about the affordability of college. Scholars and educators began to discuss the challenges families faced in affording college (Chen & Zhong, 2002). In response, China's government began establishing policies for controlling college costs (MOE, NDRC, MOF, 2003) and introducing financial aid instruments that have steadily grown in scope and complexity.[1]

While college costs have grown everywhere, they vary systematically across the higher education landscape (Table 1).[2] College costs in China are fixed by policymakers in different agencies at both the central and provincial levels. Policymakers control tuition according to an institutional hierarchy that exists within the higher education system (rows 1–4). The two most selective university tiers, tiers one and two, are generally comprised of four-year public universities which admit only students with the highest college entrance exam scores. Paradoxically, college costs at these universities are relatively low compared to those of the less competitive four-year private institutions that comprise tier three universities. The costs of tier four colleges are similar to those of tier one and two. Tuition fees also vary across different provinces and universities (columns 1–3). In fact, college costs can even

[1] "Costs" in this paper refers to tuition fees and other direct college expenditures (e.g. dormitory fees) from the perspective of students and families.

[2] In this section we discuss tuition fees. Other college fees have been capped by government policies. For example, dormitory fees across all university types cannot exceed 1200 RMB (about 180 US dollars) per year (MOE, NDRC and MOF, 2003).

Table 1
Range (minimum to maximum) of tuition list prices (RMB) for different university tiers across China in 2009.

	Beijing/Shanghai	Shaanxi	Other regions
First and second tier universities (public four year)	4200–10,000	3500–4500	2500–5500
Third tier universities (private four-year)	11,500–18,000	8500–10,000	6000–18,000
Fourth tier public colleges (three-year vocational)	6000–7500	4500–6100	1200–7000

Source: Shaanxi Admissions Committee (2007).
Notes: (1) China's State Council (2007) fixed list tuition prices at 2006 levels for five years. (2) Tuition prices across tiers and across provinces are somewhat higher for more competitive majors.

differ across majors within the same university (Shaanxi Admissions Committee, 2007).

While rising costs have become a reality for those pursuing a college education, financial aid initiatives have emerged to help low-income students. In the 1990s policymakers began to offer subsidies and grants for low-income students. Work study programs were launched. Tuition reductions were ostensibly offered to students having trouble paying tuition and fees. A government-subsidized student loan scheme was also piloted. In 2000, education officials initiated the "green channel" program which was designed to allow low-income students to enroll in and begin attending university before undergoing a needs-based financial aid assessment or having to pay any tuition fees. A national merit scholarship was also implemented in 2004.

Even after these programs were established, however, many gaps still remained. In 2007 the State Council made several adjustments to the existing financial aid system. First, it significantly expanded the national needs-based grant program with the goal of providing enough funding to reach 20 percent of total college enrollment. Second, it provided a greater number of merit-based scholarships. Third, it offered full-tuition waivers and stipends to students who enrolled in one of six normal universities affiliated with the Ministry of Education (MOE). Finally, the government piloted a new kind of student loan scheme in which students could apply for loans in their hometowns through the China Development Bank (hereafter referred to as "home-based" loans).

3. Information about college costs and financial aid in China

Despite the rapid expansion of and continual reforms within China's higher education system over the last decade, students continue to perceive that the levels of tuition and fees are a major barrier to obtaining a college education. A significant proportion of students in our baseline survey (described below) show a limited knowledge of college costs and financial aid. Given the complex nature of China's university admissions process and the fact that students are granted admission into only one university, such lack of information may inhibit students from making optimal choices. In this section we first discuss when and how students acquire information on college costs and financial aid. In the second part of the section we explore the potential importance of timely and complete information.

3.1. How students access information

To gain admission into college, China's high school students take a provincial-wide college entrance exam at the end of their senior year. A week or two later, students fill out a college choice form (called the *zhiyuan* form) and submit their top choices in each of the different tiers of colleges to a provincial education authority. In filling out their college choice form, students are able to choose several universities within each of the four university tiers (described in Section 2), as well as from a "pre-tier" which is comprised of universities that have special permission to offer early admissions to students (e.g. military universities, arts and sports universities). After the college entrance exam scores of the students are tallied, provincial educational authorities sort through the college choice forms, matching students to universities according to their score ranking. At the end of the sorting process, each student is assigned to only one university. Admitted students receive an admissions packet in mid-summer and then have just one choice—attend the college to which they are assigned or not attend college. If they choose to matriculate, students go to their university around late August, pay the required tuition and fees and are then enrolled.

In lieu of a formal program or information source to help guide students through this process, high school students rely on a mix of information sources, including their parents, friends and teachers (Liu et al., 2008). Economically-disadvantaged students in fact often get information from individuals who themselves never went to college and are generally not in a position to keep up with the latest changes in educational policy (Liu et al., 2008).

Students' only official introduction to financial aid opportunities comes in the form of a financial aid informational booklet that is included in the admissions packet sent to students after they *have already been admitted* into public universities.[3] In other words, students do not have access to the booklet, which is created by the Ministry of Education and the Ministry of Finance, when they fill out their college choice form. In their admissions packet, students also officially learn *for the first time* about

[3] The content of this booklet is similar to the one used in our intervention, but it does not include information on general college costs, contains fewer details about the process by which students apply for financial aid and their basic rights, and also includes less detail about certain types of aid, including home-based loans.

the costs of going to the particular college into which they are enrolling. Students also do *not* find out about whether or not they are eligible for financial aid until—at the earliest—the middle of their first semester in university.

3.2. The importance of access to information

The problems resulting from inadequate information about college costs and financial aid have the potential to seriously affect the choices and educational outcomes of students everywhere. Net college prices may directly affect the educational choices of students—especially in poorer developing countries like China. Having access to adequate college cost and financial aid information may be particularly important for poor students from rural areas, as the average annual tuition for a public four-year Chinese university is roughly 150% of an average rural household's yearly disposable income.[4] The tuition and fees can be many times more than the income of a family at the poverty line.

Unlike the US, where colleges usually offer financial aid packages to attract students *before* they make their decision to enroll, students in China formally learn about financial aid only once they have made their college choices and were admitted into one specific university. This lack of timely information about costs and financial aid may cause students to make poor college-related choices. Without having a clear idea of China's HEI fee structure or the financial aid opportunities that they may be eligible for, students might overestimate the cost of attending more selective universities. Such a miscalculation could, for example, cause students to choose lower-ranked schools or to apply for military universities or teaching colleges (which although free, require lengthy periods of service upon graduation). At the same time, some students could underestimate the cost of college. If so, they may choose to enroll in an institution that they cannot afford and thus have to make the difficult post-admissions decision of whether or not to attend the college despite its high costs, reapply for college the next year, or choose an option outside of the higher education system. In China, where students gain admission into a single HEI and generally cannot transfer to another university or department, the ramifications of making poorly-informed choices are serious.

Students from disadvantaged backgrounds may especially lack information. For example, educators in poorer regions may provide lower quality information to their students or students may not be able to acquire informational resources easily through the Internet. This is further exacerbated by the fact that the language used in China's financial aid policies tends to be jargon-laden and difficult to understand. These types of information constraints raise the costs of college decisions for disadvantaged students (Hastings, Van Weelden, & Weinstein, 2007).

Finally, because China's education system tracks students at various points along their educational careers, misinformation about net college costs could deter disadvantaged students from aspiring or preparing for college early on (Long, 2008). Parents lacking accurate information about college costs and financial aid may assume that they will not be able to afford college in the future, and thus early on steer their children into non-academic tracks or allow them to drop out of school altogether and join the unskilled labor force.

4. Hypotheses

The broad research questions of this paper are: How does access to information about college costs and financial aid affect the choice of college? Does information affect the choice to attend college? Can access to information increase the likelihood of receiving financial aid? In this section we explore these questions in more detail within the context of the present study and provide a specific hypothesis for each.

4.1. Information and college choice

There are many dimensions of college choice in China that might be affected by increased access to information. Given the complexity of China's application and admissions process (as well as the ways in which this process could interact with an information intervention to offer diverse and competing incentives to students from different backgrounds), we believe that it is difficult to produce unambiguous hypotheses when considering some dimensions of college choice. Indeed, the complexity of China's admissions matching process combined with the fact that aid is allocated only after students enter college makes the value of providing information difficult to assess for many choices. For the sake of illustration, Appendix A presents a simple model of choice to illustrate the potential role of college cost and financial aid information in affecting students' college choices.

For example, we specifically choose not to look at students' choices to go to one of six normal universities that offered free tuition as a result of the financial aid policy in 2007; this is because this policy also requires students to agree to spend a lengthy period of service as a teacher (and perhaps in a certain location) in exchange for such aid. Thus the direction of the effect of information about financial aid on whether a student chose to apply for one of these six normal universities is not clear a priori.

We decide to focus on a two types of college application choices (choices that students fill out on their college application forms) in which the direction of the effect of receiving more college cost and financial aid information is more clear. The first outcome is applying for early admission to a military college. Though military colleges have been widely known not to charge tuition or other fees for decades, they do require students to serve in the military for a lengthy period of time, thereby restricting their future career mobility (and possibly their long run

[4] This figure was obtained by dividing the average rural household income in Shaanxi in 2007 (Shaanxi Statistical Yearbook, 2008), by the list tuition prices for Shaanxi four-year public universities found in Table 1. By comparison, the annual list price for four year college in the US is $32,307, about half of the annual income of the median US family (Long, 2008).

expected earnings).[5] If students who choose to apply for a military college due to financial constraints instead become aware that non-military colleges have potentially lower net costs than they previously expected, they may be less likely to apply for an early admissions military college.[6] We thus hypothesize that:

Hypothesis A1. Having greater access to college cost and financial aid information will make students less likely to submit an early admissions choice to go to a military college.

The second outcome that could be affected by college cost and financial aid information is a student's choice to apply to a tier 1 or tier 2 college. Students tend to overestimate the net costs of tier 1 and 2 colleges compared to lower tier colleges (see Section 5.4). This is especially true in China where the government has artificially set the tuition rates of tier 1 and 2 colleges at a level lower than those of lower tier colleges (see Table 1). If students are unaware of the lower rates of tuition associated with attending a tier 1 or 2 college, they may be less likely to apply. Therefore, we hypothesize that:

Hypothesis A2. Having greater access to college cost and financial aid information will increase the likelihood that students apply for a tier 1 or 2 college.

4.2. Information and college attendance

Students may also find the net cost of *attending* college to be prohibitively expensive. If students are overestimating the costs of attending (any) college, in general, they may be less likely to choose to attend college. Following this logic, we hypothesize that:

Hypothesis B. Having greater access to college cost and financial aid information will increase the probability that students will choose to attend college.[88]

4.3. Information and the likelihood of receiving financial aid

There are a few reasons why the probability of students receiving certain types of financial aid may change when they have better access to information. Better information could raise their awareness that aid exists and is quite extensive, help them better prepare for the application process and notify them of their rights. Access to information might also allow students to express grievances if they have unfair experiences.[7] Finally, better information may let low-income students know that they may be able to take advantage of the "green channel" protocols (mentioned in Section 2) that have been set up to aid poor students during the early periods of matriculation into their colleges.

In this paper we look at needs-based grants in particular, since they have the widest coverage by far among the different types of financial aid and are targeted specifically at low-income students. In addition, needs-based grants are a relatively new form of aid.

In the same vein, we also look at the green channel policy. An information intervention may be expected to have an effect because during the baseline, a large proportion of students did not appear to understand this policy.

Following the above discussion, we posit that:

Hypotheses C1 and C2. Having greater access to college cost and financial aid information will increase the likelihood that students receive needs-based grants (C1) and take advantage of the green channel policy (C2).

5. The intervention and research design

To test the hypotheses above, we designed and implemented a cluster-randomized controlled trial (hereafter "cluster-RCT") across 41 counties in Shaanxi province. This section discusses the use of cluster-RCTs to assess information interventions, describes our particular intervention, and presents the research design, data and statistical models.

5.1. Cluster-randomized controlled trials and information interventions

Many scholars consider well-conducted, policy-relevant randomized experiments to be the best platform from which to draw causal inferences (Shadish & Cook, 2009). In addition to potentially minimizing selection bias which often plagues studies involving observational data, randomized experiments can potentially reduce publication bias (Duflo, Glennerster, & Kremer, 2006). Glewwe and Kremer (2006) also argue for the use of randomized experiments to examine the impact of school inputs on student outcomes instead of traditional production function approaches used pervasively in the economics of education.

In this paper, our concern is that students and their families may possess different degrees of information about college costs and financial aid, and this is likely to be correlated with a number of observable and unobservable factors that are in turn associated with college outcomes. A well-designed randomized experiment may help address this selection-bias issue and estimate the true impact of college cost and financial aid information.

Cluster-RCTs differ from individual-RCTs in that intact clusters such as schools are assigned to treatment or control groups and yet the outcomes of individuals who are nested within those clusters are analyzed. There are several reasons why we chose to conduct a cluster-RCT instead of randomizing at the level of individual students. First, running a cluster-RCT enabled us to conduct the intervention in the natural setting of the classroom. A scaled-up

[5] This phenomenon is widely known among the general population in China since early-admission into military colleges has historically always been cost-free.

[6] Also, the early admissions college choice takes precedence over other first, second, third, and fourth tier college choices. Thus, if qualified students choose an early admissions military college, they will not have other college choices.

[7] We examine the outcome "received aid" rather than "applied for aid" because our intervention focuses on helping students prepare well for the entire application process—that is, it informs them about how policymakers intend to target aid, individual student rights, as well as where students can express grievances.

intervention from government agencies would likely provide information through schools directly. Also, the use of a cluster-RCT across 41 "nationally-designated poor counties" from Shaanxi province increased the external validity of our study.[8] Furthermore, by sampling geographically dispersed clusters, we avoided information spillovers that would have compromised experimental validity.

5.2. The intervention

In this study, students in randomly-selected "treatment" classes were primarily given information on college costs and financial aid through a 30-page user-friendly booklet. The booklet contained information related to financial aid, including the target population and explanations about the different financial aid programs supported by the central government (including merit-based scholarships, needs-based grants, tuition waivers, various types of subsidies, loans, work-study options, military and teaching college fee waivers and stipends and the green channel policy). The booklet also detailed the exact process for applying for financial aid, including an explanation of the materials students need to prepare before arriving at university. Other sections of the booklet discussed the timing of receiving financial aid both within and across a student's college years; provided different government agency hotline numbers for further inquiries or to report problems; and listed additional web resources and policy documents to which students could refer. Yet another part of the booklet was devoted to college costs. In particular, we produced tables that illustrated the price ranges that students from Shaanxi would face if they were admitted to different tier universities. These tables also documented the variation in tuition list prices across majors in various provinces and in university tiers across China. Dorm fees and other costs were discussed.

In producing the booklet, we took care to make sure the information was presented in an accessible manner. It was written in a simple, jargon free question–answer format that covered the information in a concise yet thorough manner and designed with clear headings, large fonts, and an attractive color cover. The booklet is available from the authors upon request.[9]

Each treatment class also received a 17–18 min oral presentation that covered the main points of the booklet. The presentations were delivered by trained enumerators who were instructed to give the presentations exactly the same way each time.[10] After the presentation, 5 min were left open for students to ask questions that might be answered using the content of the booklet only.[11] After the question–answer period, the students were asked to fill out an anonymous 5-min feedback form regarding the booklet and presentation.[12] The feedback form was designed to elicit qualitative evidence about whether or not the information intervention was helpful and to examine whether students had further questions about the topics covered or others that were not addressed.[13] Students in treatment classes were also asked to take the booklet home and share its content with their parents.

5.3. Research design

The sample for our cluster-RCT was chosen in a four step process. The first step involved generating a list of the 41 nationally designated poor counties in Shaanxi from which we chose the largest (and sometimes only) high school in each county.[14] The second step involved randomly assigning 20 schools to receive an information treatment intervention and 21 schools to receive no intervention.[15] The third step involved visiting each school and randomly choosing one non-fast track class of third-year students (seniors) from "science track" classes.[16] Our sample is thus fairly representative of senior students in non-fast, science track classes in the largest (and sometimes only) high schools in poor counties in Shaanxi. Students in these classes were given the information intervention (if they were in a treatment school). This enabled us to examine the differences in college-related outcomes between treated and untreated students from science classes to find the main effects of the information intervention.

We were concerned that information given to the treatment group might in some way make its way to students in the control schools. We thus tried to minimize the existence of *uncontrolled* information spillovers and

[8] In 1994, the State Council of China identified 50 "national poor counties" in Shaanxi Province which contained over 5 million people under the national poverty line.

[9] The authors exerted great efforts to ensure the quality of the information intervention (e.g. circulating draft booklets among policy-makers/researchers, piloting in other poor counties, and extensive training of enumerators to ensure a highly-standardized presentation).

[10] The enumerators spent numerous sessions together standardizing the delivery of the intervention under the supervision of the authors and according to a detailed outline. We further conducted two pilots in which the delivery of all enumerators was observed to ensure that the content and delivery was identical. Variation in individual enumerator presentation styles does not likely have much of an effect on student outcomes.

[11] The presenters were asked not to answer questions outside of the content of the booklet to keep the treatment uniform across classes.

[12] Enumerators also briefly introduced themselves to students in both treatment and control groups, gave each student in both groups a small gift (a pen), and briefly thanked all students for participating in the general survey.

[13] Note that students in the treatment classes were not told that they would receive any type of intervention until after they finished their baseline questionnaire.

[14] Out of the 50 nationally designated poor counties in Shaanxi province in Spring 2008, the high schools in 8 counties had already been concurrently chosen as the sites of another RCT about the effects of early financial aid offers on high school senior students' college-going outcomes (see Liu et al., 2011). The high schools in one other poor county in the province were chosen as pilot schools for our financial aid information intervention. We thus excluded these 9 counties from our main research design. The remaining 41 counties represent the majority of poor counties in Shaanxi province.

[15] There were numerous barriers to acquiring adequate information about the characteristics of these high schools before randomization. We were thus unable to use randomization techniques that might have increased power (e.g. pair-matching, see Imai, King, & Nall, 2009).

[16] This type of class prepares students for the *science* (versus the *humanities*) track of the provincially-based college entrance exam. Around two-thirds of admitted college students in Shaanxi in 2008 came from the science track.

other types of unintended externalities when constructing the research design. For example, we decided to randomize at the level of counties to minimize the sharing of information between students in treatment and control groups, as this would likely bias the treatment estimates. Furthermore, as mentioned in Section 2, as it seemed possible that the information intervention could interact with China's complex college and application process (especially since students compete for a limited number of university and major spots), we decided to target the intervention to only one class per treatment school. In this way we avoided creating general equilibrium effects in which the college and major choices of some students could crowd out the choices of students who did not receive the intervention. Similarly, we wanted to avoid the situation in which application for financial aid of the treated students could crowd out efforts of other students to obtain aid.

5.4. Data

Our field experiment took place in one of the poorest provinces of China. Shaanxi ranks 26th out of 31 among provinces in terms of average per capita disposable income for urban dwellers and 28th for rural residents.[17] Shaanxi has 107 counties, but in our study we surveyed only 41 that are officially designated as poor counties. Altogether we collected baseline survey data in April 2008 on 2508 science students. Research teams first asked students in all classes to fill out a short baseline questionnaire.[18] Enumerators also collected baseline information from teachers and principals about classroom and school characteristics.

Data from the baseline survey show that the randomization across schools resulted in treatment and control groups which were reasonably identical in baseline characteristics (see Table 2). The number of females was slightly higher in the treatment group, while the age was slightly lower.[19] Because of this, we control for these covariates (as well as the other covariates) in our later regression analyses.[20]

The data also provide important information about how students overestimated tuition costs. Fig. 1 shows the distribution of students' (baseline survey) estimates of the gross tuition fees for first tier universities (from the 5th to the 95th percentile). From this figure, we see that students tended to overestimate tuition prices: the median estimate of first tier colleges was more than 50% the maximum tuition of a tier 1 university in Shaanxi province.[21] The range of student estimates also varied considerably. Student estimates of tuition prices for all other tiers had similar distributions (i.e. the median prices overestimated actual tuition prices in Shaanxi and varied widely around the median, results not shown). The baseline data show that students overestimate the tuition rates of attending tier 1 or 2 colleges much more than they overestimate the tuition rates of tier 3 colleges. Specifically, the mean estimates of students of the rates of tuition of tier 1 and 2 colleges were approximately 4000 yuan (or 88%) higher than the

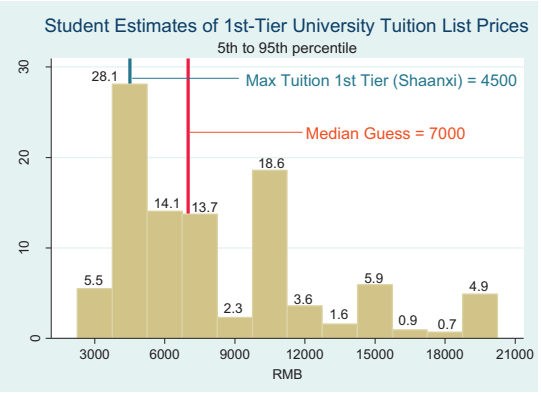

Fig. 1. Student estimates of first tier university tuition prices. Source: Baseline survey responses of students in our sampled high schools in 41 poor counties.

Table 2
Baseline traits for treatment and control groups.

Variable	Treatment	Control	Difference (*p*-value)
Female	.41	.34	.07
Height	1.68	1.68	.63
Parent's education level	6.23	6.01	.31
Father's occupation	.38	.34	.32
No. of siblings	1.73	1.69	.78
Urban	.21	.18	.38
Age	18.7	18.9	.02
Expect can receive needs-based grants	.62	.60	.70
Willing to repeat entrance exam	.51	.48	.53
Class Size	61.6	60.5	–
# Earthquake counties	1	1	–

N = 2486–2503.

[17] Source: China 2007 National Economic and Social Development Statistical Bulletin.

[18] After all the questionnaires were returned, research assistants distributed the information booklet and then began the oral presentation.

[19] Although high school entrance exams are different between different prefectures in Shaanxi province (a prefecture is composed of several counties), we also examined the balance in high school entrance exam scores (after creating *z*-scores for each prefecture) between students in treatment and control schools. Although this is a somewhat crude analysis, we found that students had similar high school entrance exam score distributions between treatment and control groups.

[20] We also compared baseline characteristics of students in attrition and non-attrition groups. Groups were similar on observable variables (e.g. age, gender, urban, test scores, and parent education level). The number of students missing in the treatment group (86) was also similar to that of the control group (82).

[21] The descriptive results of our baseline survey are especially pertinent as most students admitted into college in our sample eventually entered a higher education institution in Shaanxi province.

maximum tuition rate of such colleges in Shaanxi; their mean estimates of the rates of tuition of tier 3 colleges were less, only around 2000 yuan (or 20% higher) than the maximum tuition rates in Shaanxi (table not shown for the sake of brevity). In summary, the baseline data provide support for the idea that students may be overestimating the cost of attending college, in general, and tier 1 and 2 colleges, in particular (compared to tier 3 colleges). Therefore, we believe that if we provide more complete information about college costs and financial aid, this may help students apply more for tier 1 and 2 colleges (Hypothesis A2) and attend college more (Hypothesis B).

The data also indicate that students had little information about financial aid. About 16% of the students in our sample reported that they never heard of needs-based grants. About 75% of students reported that they had never heard of the green channel policy, indicating that students were not familiar with certain types of financial aid.

We followed up with students in December 2008 via both telephone and Internet, locating 93.3% (2341) of students. In the follow-up, we asked students about their educational or occupational status, their score on the college entrance exam, the college choices they made, and whether they applied for and received each of the main types of financial aid. Briefly, we found that over 99% of students in the sample took the entrance exam and 56% attended college.

5.5. Statistical models

We used unadjusted and adjusted ordinary least squares (OLS) regression analysis to estimate how college choices and financial aid receipt changed for students that received the financial aid information intervention relative to students that did not receive the intervention. We first regressed each outcome variable on a treatment indicator, which indicated whether schools received the financial aid information intervention. The basic specification of the "unadjusted model" is:

$$Y_{ij} = \beta_0 + \beta_1 I_j + u_{1ij} \quad (1)$$

where Y_{ij} represents the outcome variable of interest of student i in school j. I_j is a dummy variable that takes a value of 1 if the school that the student attended was in the information treatment arm and 0 if the student was not in the information treatment arm. The symbol u_{1ij} is a random error term.

We also estimated an "adjusted model" which controls for baseline variables:

$$Y_{ij} = \beta_0 + \beta_1 I_j + X_{ij}\beta + u_{2ij} \quad (2)$$

where the additional term X_{ij} in Eq. (2) represents a vector of variables that includes information from the baseline survey. Specifically, these baseline variables include age, gender, parents' highest education level, number of siblings, urban/rural residence, a dummy for father's occupational status (1 = high status, 0 = low status), and a dummy for whether a student had a minimum goal of attending at least a second-tier university ("student aspiration").[22] We also include a dummy variable that notes whether or not a county was affected by the earthquake in May 2008.[23] For the financial aid receipt outcomes, we also added an indicator variable that equaled 1 if students felt they could receive that type of aid. In all regressions, we accounted for the clustered nature of our sample by constructing Huber–White standard errors corrected for school-level clustering (relaxing the assumption that disturbance terms are independent and identically distributed within schools).

In addition to the main analysis, we also conduct an analysis of heterogeneous effects. Specifically, we examine whether female students are affected by the information intervention more than male students. We do this by adding an interaction term of the treatment indicator and an indicator for "female" in Eq. (2). We similarly examine whether students of lower socioeconomic status (SES) are particularly affected by the intervention differently than students from better off families. We measure lower SES by a dummy indicator of whether a student's father's education level is below high school or not. In our sample, 55% of students have a father whose education level is below high school.

5.5.1. Other statistical issues

We paid close attention to statistical power. We tried to minimize across-cluster variation by focusing on poor counties within the same province and choosing the largest high school in each county. We also chose non fast-track classes.

6. Results and discussion

Our main analysis in the first subsection below looks at the effects of the information intervention on college-related outcomes between students in treatment and control science-track classes. The analysis focuses on explaining five binary outcomes: (a) the probability of applying for early admission into a military college; (b) the probability of applying for a first or second tier college; (c) the probability of choosing to attend college; (d) the likelihood of receiving needs-based grants; and (e) the likelihood of qualifying for the green channel policy. We run heterogeneous effect analyses to see whether the

[22] We present results from ordinary least squares (OLS) with robust, school/county-level clustered errors, as is standard in the economics literature (e.g. see Jensen, 2010). Since all of our outcomes are binary variables, we also ran logit models and random effects logit models (with adjusted standard errors for clustering at the school-level, see Hayes and Moulton, 2009). We also ran generalized estimating equations models (with an exchangeable correlation matrix and robust SEs; see Liang and Zeger, 1986). The results from the logit, random effects logit and generalized models are omitted for the sake of brevity. The results, however, are substantively the same as the results from the OLS model (both in terms of the statistical significance and magnitude of our treatment effect estimates).

[23] Two counties in our sample were affected by the earthquake and students from these counties were given additional financial aid assistance by universities.

Table 3A
The effects of financial aid information on student outcomes (*descriptive analyses, unadjusted for covariates*).

	(1) All students	(2) Information arm	(3) Control arm	(4) Difference between information and control arms
Chose military college (%)	9.6	10.5	8.7	1.8
				(2.3)
Chose tier 1 or 2 college (%)	69.1	67.5	70.7	−3.0
				(6.9)
Chose to attend college (%)	56.3	59.7	53.0	6.7*
				(3.5)
Received needs-based grant (%)	14.2	16.1	12.4	3.7*
				(2.2)
Received green channel (%)	3.5	4.8	2.3	2.5*
				(1.4)
Received home-based loan (%)	7.1	10.3	4.0	6.3***
				(2.0)
Received national loan (%)	1.3	1.0	1.6	−0.6
				(0.5)
Received poverty subsidy (%)	4.0	3.8	4.2	−0.4
				(1.0)

Robust standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 3B
Effects of financial aid information on student outcomes (*OLS regressions, adjusted for covariates*).

	(1) Chose military coll. (Y/N)	(2) Chose tier 1 or 2 (Y/N)	(3) Chose attend college (Y/N)	(4) Received needs-based grant (Y/N)	(5) Received green channel (Y/N)
Treatment	0.02	−0.05	0.08**	0.04*	0.02*
	(0.02)	(0.04)	(0.03)	(0.02)	(0.01)
Earthquake county (Y/N)	0.01	0.08	−0.09***	0.09***	0.00
	(0.02)	(0.08)	(0.02)	(0.03)	(0.01)
Age	−0.02**	−0.04***	0.04***	0.01	−0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female (Y/N)	−0.07***	0.01	0.05**	0.04**	0.00
	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Urban (Y/N)	0.01	−0.02	0.04	−0.04**	−0.01
	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)
Parent's education level	0.00	0.02	0.03	−0.01	−0.01
	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Father's occupation	0.02	0.02	0.00	−0.01	−0.02**
	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)
1 sibling	−0.00	−0.04	−0.01	−0.01	−0.00
	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)
2+ siblings	−0.02	−0.02	−0.01	0.02	0.01
	(0.03)	(0.04)	(0.04)	(0.03)	(0.01)
Student aspiration	0.08***	0.30***	−0.09***	−0.00	0.02
	(0.01)	(0.04)	(0.02)	(0.02)	(0.01)
Will choose military	0.05***				
	(0.01)				
Will chose tier 1 or 2		0.16***			
		(0.04)			
Expect need-based grant				0.05***	
				(0.01)	
Expect green channel					−0.00
					(0.01)
Constant	0.34**	1.17***	−0.21	−0.09	0.09
	(0.14)	(0.23)	(0.28)	(0.16)	(0.10)
Observations	2253	2254	2256	2256	2256
R-squared	0.051	0.157	0.025	0.022	0.016

Cluster robust standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

information intervention particularly impacted female students and students of lower socioeconomic status. We also perform several robustness checks for missing data for the analyses in Section 6.2 to examine if our results are affected by the (relatively mild) attrition in our post-intervention data. Finally, in Section 6.3 we explore student feedback (from students in science-track treatment classes) about the intervention.

6.1. Results

In regards to Hypothesis A1, we are unable to reject the null hypothesis that the intervention does not have a significant impact on the choice of early admission to a military college. The estimate from the unadjusted model is small in magnitude and has a large standard error (Table 3A, Row 1). The estimate from the covariate adjusted model is also small in magnitude and statistically insignificant (Table 3B, Column 1). In other words, we find little evidence that the intervention affected the decision to apply to a military college.

In regards to Hypothesis A2, we are also unable to reject the null hypotheses that the intervention does not have a significant impact on the choice of applying to tier 1 or 2 colleges. The point estimate from the unadjusted model is small in magnitude and is statistically insignificant at the 10% level (Table 3A, Row 2). The estimates from the covariate adjusted model are also small and statistically insignificant (Table 3B, Column 2). In other words, we find little evidence that the intervention affected the decision to apply to more selective college tiers.

In regards to Hypothesis B, we find that the information intervention does have a significant impact on the choice of the student to attend (any) college (Tables 3A and 3B). The estimated treatment effect from the unadjusted model is about 6.7 percentage points (12.7 percent) and is statistically significant at the 10% level (Table 3A, Row 2). The estimated effect based on the covariate-adjusted model is slightly higher (7.5 percentage points, Table 3B, Column 2). Based on these results, we can conclude that there is evidence that the intervention does affect the choice of students to attend (any) college.

In addition to impacting the likelihood of choosing to attend college, we find that the intervention may impact the likelihood that students receive financial aid. Specifically, the results indicate that the intervention may affect the likelihood that students receive needs-based grants (Hypothesis C1). The unadjusted and covariate-adjusted estimates are both positive and statistically significant at the 10% level (Table 3A, Row 3; Table 3B, Column 3). The magnitude of the effect is not small: the information intervention increases the likelihood of receiving needs-based grants by about 4 percentage points or 30%.

The results also show that the information intervention may impact the likelihood that students participate in the green channel program (Hypothesis C2). Similar to the results for needs-based grants, the unadjusted and covariate-adjusted estimates are both positive and statistically significant at the 10% level (Table 3A, Row 4; Table 3B, Column 4).[24] The impact is substantial: the information intervention increases the likelihood that students will receive the green channel by about 2.5 percentage points or 109%.

The impact of the information intervention on college attendance and financial aid is more striking for particular subgroups of students. For example, according to our heterogeneous effects analysis, the impact of the information intervention was larger for females than for male students. The intervention, in fact, increased the likelihood that female students chose to attend college by 10.7 percentage points but had no significant impact on male students (table omitted for the sake of brevity). The result is statistically significant at the 5% level. The positive impact of financial aid information on the college attendance decision of female students is consistent with other evidence that shows that female students in China are more responsive to financial offers (perhaps because they have lower opportunity costs of attending schooling than male students—Loyalka, Wei, & Song, 2012).

The information intervention also increased the likelihood that female students received one of type of financial aid. Specifically, female students that received the information intervention were more likely than males to receive needs-based grants. The intervention increased the likelihood that female students would receive needs-based grants by about 9 percentage points (table omitted for the sake of brevity). The result is statistically significant at the 1% level. The result accords with other studies in China which indicate that female university students in Shaanxi are more likely to receive needs-based grants, in general, even after controlling for other background factors (Loyalka et al., 2012). The information intervention did not, however, increase the likelihood that female students would be more likely to choose a military university, choose to apply for more selective college tiers, or qualify for the green channel.

The information intervention also increased the likelihood that students of lower SES received financial aid. Specifically, the results show that the information intervention increases the likelihood that students from lower SES households use the green channel services by 4 percentage points (table omitted for the sake of brevity). The result is statistically significant at the 1% level. The information intervention did not increase the likelihood that students of lower SES status would be more likely to choose a military university, choose more selective colleges, choose to attend college, or receive needs-based grants.

Beyond our main hypotheses, we also explore the effect of the information intervention on other forms of financial aid (Table 4, Panels A and B): the receipt of nationally

[24] In addition to testing the above confirmatory hypotheses (Schochet, 2008), we also explored whether the information intervention affected other outcomes prior to being accepted to college, yet upon which the receipt of financial aid might be conditional. Namely, we found no statistically significant effects of the intervention on the likelihood of taking the college entrance exam, college entrance exam scores (on average and at various quantiles), the likelihood of filling out college choices at all, or the likelihood of being admitted into college.

Table 4
Panel A: Estimates of financial aid information on the receipt of various types of financial aid (without covariate adjustments, using non-imputed data). Panel B: Estimates of the effects of financial aid information on the receipt of various types of financial aid (with covariate adjustments, using non-imputed data).

	(1)	(2)	(3)	(4)	(5)	(6)
	Needs-based grant	Green channel	National loan	Home-based loan	Poverty aid	Tuition waiver
Panel A						
Treatment	0.04*	0.03*	−0.01	0.06***	−0.00	−0.00
	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)
Constant	0.12***	0.02***	0.02***	0.04***	0.04***	0.01**
	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Observations	2337	2337	2337	2337	2337	2337
R-squared	0.003	0.005	0.001	0.015	0.000	0.001
Panel B						
Treatment	0.04*	0.02*	−0.01	0.06***	−0.00	−0.00
	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)	(0.00)
Expect aid+	0.05***	−0.00				
	(0.01)	(0.01)				
Earthquake county	0.09***	0.00	−0.00	−0.05	0.01	0.06***
	(0.03)	(0.01)	(0.01)	(0.05)	(0.02)	(0.02)
Age	0.01	−0.00	0.00	0.00	0.01	−0.00
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Female	0.04**	0.00	0.00	0.00	−0.01	−0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Urban	−0.04**	−0.01	−0.01	−0.03***	−0.01	−0.01**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Parents' education	−0.01	−0.01	−0.00	0.00	0.00	0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Father's occupation	−0.01	−0.02**	0.01	−0.01	−0.01	0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
1 sibling	−0.01	−0.00	−0.00	0.03*	0.02	0.00
	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)
2+ siblings	0.02	0.01	−0.01	0.04**	0.02	−0.00
	(0.03)	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)
Student aspiration	−0.00	0.02	0.01	0.06***	0.01	−0.00
	(0.02)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Constant	−0.09	0.09	−0.05	−0.04	−0.10	0.01
	(0.16)	(0.10)	(0.05)	(0.16)	(0.11)	(0.04)
Observations	2256	2256	2256	2256	2256	2256
R-squared	0.022	0.016	0.003	0.037	0.005	0.025

Robust standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

supported, home-based loans (column 3), the receipt of nationally supported, school-based loans (column 4) and access to special subsidies for poor students (column 5).[25] The results from these analyses indicate that information may positively affect the likelihood of a student being able to obtain a home-based loan (row 1, column 3). The effect is fairly large in magnitude and is statistically significant at the 5% level. The information intervention may have especially impacted the likelihood that students received home-based loans, since the policy of home-based loans was implemented across the nation in the same year that we conducted the information intervention.

There are several possible reasons why we cannot reject the null hypothesis that the information intervention has no effect on the choice of military college or tier 1 or 2 colleges. Specific college application choices are perhaps influenced more by factors besides information on college costs and financial aid. Specifically, elements such as: (a) the returns to different colleges and majors; (b) personal preferences for different institutions and future careers; (c) the influence of family, teachers and peers (informed or not); (d) family background; and (e) performance on the entrance exam may have greater influence on college application decisions. Furthermore, it could be that the intervention was not powerful enough because current policy does not reduce fees sufficiently to influence the decisions of students. It is also possible that the information was not presented over a long enough time or in the proper manner. It is possible that students in the midst of high-pressure preparations for the college entrance exam could not absorb the information from the intervention. Future research might test if earlier interventions affect

[25] These analyses are exploratory as testing multiple hypotheses reduces statistical power (Schochet, 2008), and we thus refrain from drawing strong conclusions from them.

Table 5
Balance between treatment and control groups for non-missing cases.

	(1) Expect aid	(2) Earthquake county	(3) Age	(4) Female	(5) Urban	(6) Parents' education	(7) Father's occupation	(8) No. of siblings	(9) Student aspiration
Treatment	−0.00	0.00	−0.21**	0.06*	0.03	0.06	0.03	0.05	0.01
	(0.02)	(0.07)	(0.10)	(0.03)	(0.03)	(0.04)	(0.04)	(0.17)	(0.10)
Observations	2335	2335	2326	2310	2317	2318	2323	2331	2331
R-squared	0.000	0.000	0.014	0.004	0.002	0.003	0.001	0.000	0.000

Robust standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

specific college application choices. Finally, the impacts of the intervention may have remained undetected due to an absence of statistical power.

Our analysis suggests that information does increase the likelihood that students will attend college more and be more likely to receive certain types of financial aid, notably needs-based aid, the green-channel policy and home-based loans. On our baseline survey, a large proportion of students overestimated the costs of attending (any) college. Students also stated that they were unfamiliar with the green channel policy. Home-based loans were also a relatively new policy that students may not be familiar with. Moreover, it is important to note that home-based loans are best applied for and used prior to the matriculation of students into university. This would also partially explain why our intervention affected this type of aid more than others.

It is important to examine, however, if the impact of the information intervention on financial aid receipt was because of the extra aid receipt of inframarginal students (those who attended college regardless of the information intervention) or extramarginal students (those who attended college because of the information intervention). Briefly, if extramarginal students had the same likelihood of receiving different types of financial aid as students in the control group (14.2% received needs-based grants; 3.5% participated in the green channel program; and 7.1% received home-based loans), then the impact of the information intervention on financial aid through the extramarginal students would (very approximately) be 1 percentage point (7% × 14.2%) for needs-based grants, 0.25 percentage points (7% × 3.5%) for the green channel, and 0.5 percentage points for home-based loans (7% × 7.1%). Instead, by comparing these back-of-the-envelope calculations with the impact results in Table 3A, we see that the impact of the information intervention on the receipt of financial aid is many times higher: 3.7 percentage points (or 3.7 times greater) for needs-based grants, 2.5 percentage points (or 10 times greater) for the green channel, and 6.3 percentage points (or more than 12 times greater) for home-based loans. We thus conclude that the impact of the information intervention on financial aid receipt may partially be due to the increase in the number of extramarginal students but is mostly due to the extra aid receipt of inframarginal students.[26]

6.2. Accounting for missing observations

As mentioned in Section 6, in the follow-up evaluation survey in December 2008, we were able to locate 93.3% of the students. Despite this small proportion of missing observations in the post-intervention survey, balance in observable characteristics is for the most part maintained across treatment and control groups for both types of classes among the students we located (see Table 5). Similar to the situation of the balance in baseline covariates (see Table 2), the proportion of females was slightly higher in the treatment group, while the average age was slightly lower.

We seek to account for missing data in two ways. We first run the analyses without making missing data adjustments—this is the "listwise deletion" approach which is only viable under the missing completely at random assumption (Schafer & Graham, 2002). However, the students that we could not find may be missing non-randomly because of certain factors that also affect the relationship between access to information and one of the college outcomes. As such, we also tested the robustness of our results by using multiple imputation for the missing data. Specifically, we impute the missing outcome values across clusters within treatment and control groups separately. Multiple imputation makes findings robust under a more general missing at random assumption (Schafer & Graham, 2002).

The results of our analysis were substantively similar whether we use listwise deletion or multiple imputation (results omitted for the sake of brevity). Namely, that the intervention has a statistically significant (at least at the

[26] Our conclusion (that the treatment effect on aid is mostly due to the extra aid receipt of inframarginal students) assumes that extramarginal students receive aid at the same rate as inframarginal students. It could well be the case that extramarginal students who attend college because of the promise of financial aid may have higher rates of financial aid take up. However, this likely does not affect the substantive conclusion, since the rate of take-up would have to be much higher for extramarginal students to explain the entirety of the treatment effect.

10% level) and positive effect on the likelihood of choosing to attend college, receiving needs-based aid or the green channel, but no discernible effects on the other outcomes.

6.3. Feedback form results

The feedback portion of the intervention was intended to learn about students' subjective impressions about whether they found the intervention helpful. Approximately 90% of the treated science-track class students said they found the financial aid information intervention helpful (50%) or very helpful (40%). These students gave reasons for why the information was helpful. While more than half of the reasons were limited to general statements such as "I learned more about the university financial aid system and related policies", students also indicated that they learned more about specific types of financial aid such as grants (7%), the green channel (3%), loans (14%), scholarships (9%), work-study (4%) as well as the costs of college (7%). In addition, 94% of all treatment science-track students also said their parents would find the financial aid information booklet helpful (66%) or very helpful (28%). These positive reactions to the intervention support the idea that information may have an impact on the chances that students receive financial aid.

While it is possible that students made positive statements on their feedback forms out of politeness to the enumerators, students also provided feedback about ways in which the booklet and presentation could be improved, as well as whether or not the information would affect their college choices and how. Out of the one-third of the treated science-track students who said the intervention could be improved: about 27% wanted still more detailed information about college costs and financial aid, while about 2% asked that the style and/or quality of the presentation and booklet be improved. Finally, about 25% of the treated science-track students said that the intervention would affect their college choices. Out of these students, about 41% said that they would now choose a college only after further considering aid and expenses (but they did not state specifically how their choices would change), about 20% of them said that knowing about these financial aid policies would allow them to choose a higher-quality college without having to worry about finances, another 11% said they would choose a less-expensive college. Altogether, we find that a significant proportion of students felt information would affect their college choices, albeit in different ways.

7. Conclusion

This study conducted a cluster randomized controlled trial in poor counties in northwest China to evaluate the effects of providing college cost and financial aid information on senior high school students' future college outcomes. The results of the study seem to indicate that such information has little impact on the decisions to apply for early admission at a military university or more selective colleges. Our information intervention does however increase the likelihood that students attend college and receive certain types of financial aid.

Taken together, the findings indicate that policymakers may wish to provide students with college cost and financial aid information early on, before the stage of college enrollment. As we have discussed, information positively affects the decision of whether to enroll in college. In addition, although the impact of the information intervention on financial aid receipt is largely through inframarginal students, the receipt of certain types of financial aid (e.g. home-based loans and perhaps the green channel) generally require students to prepare documentation before coming to college. In other words, both inframarginal and extramarginal students may benefit from receiving information before the stage of college enrollment.

There are important reasons why the information intervention may have affected the likelihood of receiving financial aid for students in general. First, our financial aid information intervention was more detailed than the booklet given (to students admitted into college) by the government regarding the procedures and rights for getting college financial aid. The government booklet was also not often seen by students that entered private colleges. Again, our information intervention was given a few months earlier than the government's financial aid booklet; this allowed treated students more time to overcome bureaucratic hurdles to acquire materials (such as proof of "financial need") from their hometown government offices. This is especially the case for home-based loans for which our exploratory analysis also found significant effects; home-based loans require students to go to the government office in the county seat and complete a number of procedures before leaving for college. Given that admissions letters were sometimes sent to students only a few weeks before the college start-date, many students may have missed the opportunity to apply for these loans. Our results therefore bear some similarity to those of Liu et al. (2011), who find that the timing of financial aid offers for high school seniors in China can impact their college outcomes.

The results differ somewhat from those of Bettinger et al. (2009) who find that a financial-aid "information-only" intervention (particularly one that gives personalized aid estimates and net tuition cost information for a few local public colleges) does not have a significant effect on the likelihood of submitting a FAFSA application for students in the United States. Possible reasons for the difference in findings between the two studies are that students from poor areas in low and middle-income countries lack informational resources to a greater extent and/or that the financial aid process is orders of magnitude more complex in the United States than in China.

Based on the results of this study then, Chinese policymakers who design financial aid instruments may consider improving the way their programs are publicized. In particular, efforts could better target high school students from poor areas in a timely manner (i.e. before the college entrance examination). Similar efforts are, in fact, being pursued in other countries outside of China. For example, a 2005 report to the United States government presented 8 out of 10 relatively costless recommendations to increase access to such information (ACSFA, 2005). The

main goal of such efforts is to increase the educational aspirations and efforts of students concerned about the burden of college costs. Similarly, policymakers in China may want to provide greater access to user-friendly information online; provide cost calculators to help students and their families determine eligibility; and provide standardized curriculum to introduce college cost and aid information in earlier grades.

One limitation of our study was that we only provided information to students in their last semester of high school, when they were busy preparing for the college entrance exam, and at which point they may have already solidified their college choices. Subsequent research could therefore look at the effect of such an information intervention in earlier grades and also examine a broader set of college choices. The concern about college cost and financial aid information is actually part of a broader issue concerning the lack of formal school counseling in pre-tertiary levels in China. Overall there may be considerable room to help students and their families become better informed about their educational choices. We hope this study stimulates exploration into these issues in China and elsewhere.

Appendix A

We use a simple random utility model (RUM) framework to illustrate the potential role of college cost and financial aid information in affecting students' college choices (see Manski, 2007). In our study, we assume that an individual student i chooses between two college choices j or k based on the expected utilities $E[U_i(\,)]$ associated with j and k. The student is also limited in his/her choices by a budget constraint in which the total cost of college cannot exceed the total resources available for investing in student i's college education. Subject to the budget constraint, if $E[U_i(j)] \geq E[U_i(k)]$ then student i chooses j. Otherwise, student i chooses k. For example, a student can choose to go to a military college (j) or not (k), can choose to attend college (j) or not (k), and so on. In a more general situation in which a student's college choice set includes two or more colleges, a student will choose college j over colleges $\neq j$ if the expected utility of choosing j is greater than the expected utility of choosing any other college in the choice set.

More specifically, we assume that the utility associated with a particular college choice can be represented by the following linear specification:

$$U_i(\cdot) = B_i\alpha, + C_i\beta + R_i\delta + \varepsilon_i.$$

In the model, B_i, C_i, and R_i are each vectors representing the different types of perceived benefits, costs, and risks associated with making a particular college choice. That is, students make choices based on perceived rather than actual benefits, costs, and risks (Manski, 1993). $\boldsymbol{\alpha}$, $\boldsymbol{\beta}$, $\boldsymbol{\delta}$, in turn, each represent vectors of coefficients in the relationship between B_i, C_i, R_i, and utility $U_i(\cdot)$. $\boldsymbol{\varepsilon}_i$ represents unobserved factors related to utility. When estimating the coefficients of the model, the college choice literature often assumes that $\boldsymbol{\varepsilon}_i$ is i.i.d. according to an extreme value distribution (DesJardins, Ahlburg, & McCall, 2006; Kim, DesJardins, & McCall, 2009).

We can further specify the perceived benefits, costs, and risks associated with making a particular college choice. We assume that B_i is a combination of the perceived pecuniary and non-pecuniary benefits associated with a particular college choice. C_i is a combination of the perceived net college fees (total college fees F_i minus expected financial aid receipt A_i), opportunity costs O_i, and non-pecuniary costs N_i associated with a particular college choice ($C_i\boldsymbol{\beta} = \boldsymbol{\beta}_1 F_i - \boldsymbol{\beta}_2 p \times A_i + \boldsymbol{\beta}_3 O_i + \boldsymbol{\beta}_4 N_i$). Finally, R_i is a combination of the perceived risks associated both with the future benefits (e.g. future earnings) as well as with the future costs (e.g. net college fees) associated with a particular college choice. More specifically, $R_i\boldsymbol{\delta} = \boldsymbol{\delta}_1 V(E_i) - \boldsymbol{\delta}_2 V(F_i - A_i)$, where $V(E_i)$ is the perceived variation in future earnings and $V(F_i - A_i)$ is the perceived variation in net college fees associated with a particular college choice.

Using the above model, we hypothesize that the college cost and financial aid information intervention mainly affects college choices through perceived costs ($C_i\boldsymbol{\beta}$). For example, in our baseline survey, students tend to overestimate total college fees and underestimate financial aid receipt. The information intervention can thus lower (perceived) total college fees (F_i) and increase expected financial aid receipt (A_i) for college choice j relative to college choice k. This will increase the likelihood that students choose j over k. In the case of military colleges, we assume that students already know that there are no college fees for military colleges and yet that attending a military college carries a high opportunity cost (and perhaps high non-pecuniary cost) of having to work in the military for a number of years after graduation. Students will therefore be less likely to choose a military college (college choice j) versus a non-military college (college choice k) when they learn that the relative total costs might be lower (e.g. F_i is lower and A_i is higher) for a non-military college (k).

In many cases, even when the information intervention affects perceived costs, the effects of the intervention may be theoretically ambiguous. For instance, the information intervention may increase the expected financial aid receipt (A_i) that a student can receive if they gain admission into one of the top six normal colleges. At the same time, the information intervention may increase the perceived opportunity costs O_i from attending a top six normal college (since the new financial aid policy stipulates that a student who benefits from the generous financial aid at the top six normal colleges must also work for several years as a teacher in his/her hometown after graduation). We are therefore unable to predict whether the information intervention will increase the likelihood that a student chooses one of the top normal colleges.

The college cost and financial aid information intervention may also affect expected utility through perceived risks. If we assume that students from poor, rural counties are risk-averse, then a decrease in the perceived variation of net college fees for college choice j relative to college choice k will increase the likelihood that students choose j over k.

Finally, the information intervention can increase the likelihood that a student makes college choice j (over competing choices) by affecting a student's budget constraint. In other words, a student initially may not be able to afford college choice j because of short-term credit

constraints. If the information intervention makes the student feel that he/she has a higher chance of qualifying for a college loan, the intervention may effectively move the student's perceived budget constraint. The student will therefore not abandon a college choice j or a decision to attend college (at least early on, between the time of college admissions and college registration) due to credit constraints.

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