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Early commitment on financial aid and college decision making of poor students: Evidence from a randomized evaluation in rural China

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ABSTRACT

Many educational systems have struggled with the question about how best to give out financial aid. In particular, if students do not know the amount of financial aid that they can receive before they make a decision about where to go to college and what major to study, it may distort their decision. This study utilizes an experiment (implemented by the authors as a Randomized Control Trial) to analyze whether or not an alternative way of providing financial aid—by providing an early commitment on financial aid during the student's senior year of high school instead of after entering college—affects the college decision making of poor students in rural China. We find that if early commitments are made early enough; and they are large enough, students will make less distorting college decisions.

1. Introduction

Over the past decade opportunities to go to college (or university—although in this paper we exclusively use the term *college* for sake of clarity) have risen dramatically in China (Ministry of Education, 2006a). The expansion in college education, however, has not been free for students and their families. Among other things, it has come at the cost of soaring tuition and fees. Tuition rose by four times between 1997 and 2006, increasing from 1620 yuan to 4500 yuan per student per year (Cui, 2007; Yu, 2008). And, tuition is only about half of the cost that college students are expected to assume for their college education. Most college students spend between 10,000 and 12,000 yuan per year on tuition and fees, books and rooms and board (Cui, 2007). For a rural family living at the poverty line, which has an income of around 1000 yuan per capita (National Bureau of Statistics, 2008), paying for a four year college education is equivalent to almost 50 per capita incomes.

So how have the parents of the students from poor rural families financed their child's college education? According to Liu, Luo, Liu, and Zhang (2007), in addition to their own savings, parents of students from poor rural areas often go heavily into debt—borrowing up to 62% of the necessary funds for their children's college education from family, friends and fellow villagers. Survey results also show that in some cases families liquidate household assets. There are even reports of younger siblings that are forced to drop out of school to work in order to earn money for the tuition for their elder (or younger) siblings (China Youth Daily, 2007).

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What has been the government response? In the initial years after the new tuition policy (the late 1990s and early 2000s), the answer was: "not much." Even as late as 2007, for example, according to one report, only a minority of students in China's college system were receiving financial aid (Economic Information Daily, 2007). Recently, however, government-supported aid has gradually risen. By 2008, according to the State Council (2007), financial aid was available for more than 3 million students. The average size of the scholarship grant was also rising, from around 1500 yuan/student/year to 2000 yuan/student/year.

While the government's new effort to provide financial aid unambiguously is a positive event, there is still a puzzle. With all of this aid, why is it that students in high school and their parents still perceive that funding is a serious constraint? According to Liu et al. (2007), in the poorest parts of Shaanxi Province, one of China's poor provinces, more than 60% of the senior students in high school (who were in their last semester at a point of their education that they would soon be making decisions about college) said they were concerned that they would not get any or enough financial aid in college. Although 2000 yuan per year (the current average level of award from government financial aid sources) is welcome, it still covers less than 20% of total expenditures.

Are there any other problems with the system besides the volume of financial aid being insufficient? In fact, it is possible that, even though financial aid volumes are improving, the *manner* in which the aid is being dispensed may be causing distortions. According to the Ministry of Education (2005), and according to information obtained during interviews of scores of colleges during 2007 and 2008, because of the timing of the national testing and application/selection process (henceforth, College Entrance Exam System), scholarship funds are typically not given out to students until some point of time during the second semester of the first academic year in college. Moreover, most scholarships are given out only one year at a time. Many scholarships are given on the basis of merit; few are greater than 2000 to 3000 yuan (MOE, 2007a).

Evidently, students and their parents from poor areas believe this system of financial aid allocation holds so many risks and uncertainties that it can affect the way that they make their college application decisions (Liu et al., 2007). In many cases, without regard to student interest, ability or dreams, there is always a great deal of attention paid to national and regional programs that provide free/reduced tuition and fees if students choose to enter and are admitted by either normal colleges or programs that offer majors for defense-related fields (MOE, 2007b; State Council, 2007).[1] Field interviews found that many students from poor areas, who were from families with low levels of household income, were feeling pressure (from their family and from themselves) to choose to go to the less expensive teaching colleges even when they were uninterested in teaching.

[1] For example, there is a national program that offers free tuition if students apply for and are accepted into one of six national normal colleges (State Council, 2007).

Therefore, even though the "amount of new funding" from the new government programs is welcome, there are still fundamental questions about "how" China's financial aid is being given. Are the financial aid awards large enough? Is the manner in which scholarships are being allocated (only allocated to students during the second semester of the first academic year—long after students have made their decisions about which college and major they should attend) distorting the decision making efforts of students? Are there alternative ways/timings to distribute funds? When students do not know if they can receive a scholarship or not, does it lead them to abandon their college plans (even when they are admitted)? In short, does the way that China's financial aid system is being operated affect the effectiveness of the aid; or is the availability (and volume) of support all that is important?

The overall goal of this paper is to report the results of our study that takes advantage of one of the first efforts (anywhere—inside or outside of China) to experimentally try to understand if there are ways to improve the manner in which financial aid is being allocated. The randomized controlled trial (RCT) was conducted by ourselves in Shaanxi Province between 2007 and 2008. The RCT was designed with the primary objective of analyzing whether or not an alternative way of providing an early commitment for financial aid (ECFA) to students affects the effort that high school students (in their third and final year of high school) put out in preparing themselves for the college entrance exam (CEE). In addition, we designed the RCT to test the hypotheses that ECFA affects the ability of poor rural students to matriculate into college (conditional on testing into college) and their choice of college. Finally, the design of the RCT also allows for understanding if the size of the scholarship was effective in helping students make undistorted decisions about college choice.

2. Literature review

Internationally, researchers have been exploring answers to questions about the effect of financial aid on the college decisions of students. Most of the studies in this area, however, are focused on the effects of additional volumes of aid on increasing enrollment in higher education (e.g., Avery & Hoxby, 2004; Linsenmeier, Rosen, & Rouse, 2006; Long, 2004; Singell, 2004). For example, some scholars have found positive impacts of financial aid programs in increasing the decision to enroll into college in the United States (e.g., the HOPE scholarship program in the state of Georgia—Dynarski, 2000), the Cal Grant program in California (Kane, 2003) and the Tuition Assistance Grant program in the District of Columbia (Abraham & Clark, 2006).

Some researchers have gone further, exploring the impact of the composition of the financial aid packages (combinations of tuition support, need-based aid, merit-based aid and work-study) on the enrollment decisions of college applicants. For example, using a sample of high ability students, Avery and Hoxby (2004) find that students largely respond to financial offers in a rational manner. In other words, students go to college with greater probability when they receive more lucrative financial aid packages.

This positive impact of financial aid on enrollment seems quite intuitive as financial aid softens the burden of the high cost of college (Balderston, 1997).

Unlike studies that have focused mainly on whether or not access to or the size of the financial aid grant affects (the relatively more simple decisions of) college enrollment or not, fewer studies have examined the influence of financial assistance on the *college choice* of the students. There are several studies, however. Notably, Schwartz (1985) finds that the more publicly provided untied financial aid that students from lower income households receive, the less likely it will be that they will go to a lower-ranked public college. Instead, they will choose to attend higher-ranked private college.

Despite the lessons that can be learned from these studies, caution often has to be exercised when interpreting the results. In many cases data sets are used and statistical approaches are adopted that might be producing biased estimates of the effects of financial aid on college decisions. There are many possible statistical problems. Researchers are inferring their effects across students of unequal quality. Often there are many unobservable attributes of students that are not being accounted for. To overcome this challenge in identifying the impact of financial aid on college going decisions, it would be helpful (from a statistical point of view) if there was a random allocation of financial aid across study participants. Having access to results from an RCT on the effect of different ways to give financial aid would avoid these statistical problems. Unfortunately, according to our reading of the literature, there has never been an RCT that has focused on this set of questions.

This study is unique in that it is able to utilize an RCT in an actual setting to accurately identify the impact of providing an ECFA on the study effort, matriculation, and college choice of poor rural high school students (in their third and final year of high school). Additionally, the design of the RCT also allows us identify the impact of providing ECFA of different sizes/timings on the college choice of poor rural high school students.

3. China's college entrance exam system

The most fundamental feature of China's college entrance exam (CEE) system is that a student's admission into a college is based almost exclusively on two things: one is the performance of the student on the CEE itself (henceforth, the *gaokao*, a "super SAT-like" test); the other is how the student fills out the college admissions form (called the *zhiyuan* in Chinese).

The CEE system includes five distinct stages (or types of activities). We outline the CEE using Shaanxi in 2008 as an example. First, students work hard for three years in senior high school. Usually in the second year of high school, students have to choose between two tracks—a science/engineering track (*li-ke* track) or a social science track (*wen-ke* track). Students following either of the tracks need to study three common subjects: Chinese, Mathematics and English. However, there is one subject—which is called the comprehensive subject—that differs by track. In satisfying the comprehensive part of the wen-ke track, wen-ke students study three subjects—political ideology, history and geography. In satisfying the comprehensive part of the li-ke track, li-ke students study three other subjects—chemistry, physics and biology.

In the second stage of the CEE system students take the province-wide standardized gaokao. In recent years the gaokao is taken over a two-day time period on June 7 and 8. There are two exams, one for wen-ke students and the other for li-ke students. Each student takes exam on four subjects. While li-ke and wen-ke students both take the same Chinese and English examinations, they take different exams for mathematics and for the comprehensive subjects.

During the third stage of the CEE process, students fill out and submit their admission application by filling out a copy of the zhiyuan. On the evening after the last day of the gaokao (the evening of June 8), the official answers to the questions on all sections of the exam are posted on newspapers or booklets by the education officials in each province. All high schools have printed out copies of the answer keys and make them available for their students. After reviewing the answer keys, students estimate the score that they believe they achieved on the gaokao (the final, official scores do not come out until the end of June, long after the zhiyuans are submitted). Using their estimated scores, and whatever criteria that they have decided to use (for example, the cost of the colleges for which they are applying), the students have to fill out their zhiyuan form by a certain deadline. In 2008 college-bound students in Shaanxi Province were required to submit their zhiyuan electronically (on the provincial department of education website) by June 13, only five days after the gaokao.

In completing their zhiyuan form, the college-bound student has to fill out three sections (which correspond to three different tiers of colleges—in Chinese *pi-ci*). The three tiers of colleges include: (a) the "tier for colleges that allow/require advanced placement" (*advanced placement tier* or *tiqian pi-ci*); (b) tier one colleges (*diyi pi-ci*); and (c) tier two colleges (*dier pi-ci*). Although the zhiyuan form allows a student to apply for up to four different colleges in each tier, when deciding on which college to enter for each tier, one of the most important decisions a student makes is that of the first choice.[2] In this stage students also have to choose what major they want to pursue at each college, but for convenience/tractability in the rest of the paper we only consider the choice of college.

A key part of the strategy in filling out one's zhiyuan form involves deciding about which tiers to fill out choices. There is almost never a penalty for a student that applies for

[2] Theoretically, if a student is not admitted (because his/her score was too low for that college) to the college that was his/her first choice, he/she is eligible to be admitted the college that was his/her second (third/fourth) choice. However, in practice in recent years only the first choice matters. In other words, if the student chose as his/her first choice a college with a minimum test score of 500 and his/her test score was below that (say 485), the student would not only not be admitted to the student's first choice of college for that tier, he/she would likely not be admitted to any other college in that tier (mainly because the admission departments of the other colleges would not consider their applications—perhaps believing the students were not interested in coming to their college).

both tier one and tier two colleges. Since tier one colleges always dominate tier two colleges, if a student gets into a tier one college, he/she does not need to be considered for a tier two college (and, indeed is not—since college-bound students only get one and only one admission offer). If a student does not get into a tier one college, his application is always considered by tier two colleges. However, students must be careful in making the decision about whether they want to apply for colleges in the advanced placement tier. These applications are considered, as the name implies, in advance of being considered by any other colleges. Moreover, not all colleges in the advanced placement tier are preferred over tier one colleges. However, if a student is accepted by an advanced placement college (either a normal college or a defense-related college), his/her zhiyuan form will not be considered by tier one colleges. The only decision a student gets to make after a college has admitted them to an advanced placement college (or any other college) is whether he/she wants to attend or not.

In the fourth stage of the CEE process colleges and students begin the matching process. In late June gaokao exams have been graded and scores are posted (although from the student's point of view all of the decisions on their part has been made—they have to wait for the decision of others). Information on the distribution of scores is available to college admission officials. It is at this time that colleges set their cutoff scores. Once the cutoff scores are set, all zhiyuan forms that applied for advanced placement are considered. This happens around the first week of July. After the advanced placement colleges complete their admissions process, students who scored above a minimum tier one cutoff score (typically pegged at a level of the lowest score of any of the tier one colleges) are considered by tier one colleges. This happens around mid-July. Finally, in late July tier two colleges get to pick from all students (that applied for their college) that scored above the tier two cutoff level and which had not been admitted by an advanced placement or tier one school.

How is the match made between college and student? Although it is a bit more complicated (see Loyalka, 2008, for a complete discussion), in its most basic form a student that has received a gaokao score which is above the cutoff score of the college of his/her first choice is admitted—conditional, that is, on the college having sufficient slots (which is strictly regulated by the Ministry/Department of Education). When a college accepts a student, college officials send a letter to the student with an offer of admission. As stated above, for college-bound students, they only receive one offer of admission. Their decision is: attend that college or none at all.

In the fifth and last stage students take their admissions letter and report to the school. This is typically in late August. Upon reporting, students are required to pay their tuition and a number of their fees. On average, students must pay more than 5000 yuan at this time (Cui, 2007). If they are able to pay this amount, they become enrolled. If not, they are dropped from the college's admissions list. There are no deferrals of admissions. Although there are programs for poor students who are unable to come up with enough funds to pay tuition and fees (especially during the past several years—MOE, 2006b), at least in the past there have been reports of students from poor rural areas that—despite passing all of the hurdles of the CEE system—were denied admissions at this stage because they could not pay. At this point of time—if the student is admitted and enrolled; if the student is admitted and is unable to enroll; or if the student failed to be admitted—the CEE process is over. For those fortunate enough to have been admitted and who were able to be enrolled, college life begins.

4. The early commitment for financial aid experiment

During all five stages of China's CEE described in the previous section, there is one set of activities that was never mentioned. There is no mention of financial aid. There is no mention of financial aid because there is no institutionalized part of the CEE process that helps students to address questions about how their families will finance college. Almost all scholarships and grants are allocated by the college *after* the student is enrolled. Therefore, it is at least implicitly expected that the student goes through all of the five stages of the CEE process—including the filling out of the zhiyuan form—with no knowledge of how much financial aid will be forthcoming from the government or college.

Since it is easy to understand (logically and according to the literature) how the college choice decisions of students from poor rural areas (and their families) would be distorted with less than perfect information about financial aid during the CEE process, we are interested in testing three specific hypotheses.

Hypothesis 1. Early commitment for financial aid (ECFA) will increase the work effort of high school students.

Hypothesis 2. Conditional on testing into a tier one or tier two college, ECFA scholarships will break the liquidity constraints of households and give them the resources to pay tuition and fees and enroll.

Hypothesis 3. ECFA (either the size of the scholarship and/or its timing) will affect the college choice decision of high school students when filling out the zhiyuan.

4.1. The experimental design

To test these hypotheses, the authors in collaboration with the IET/CORE Foundation implemented an Early Commitment for Financial Aid (ECFA) program. Instead of channeling financial aid resources to students through colleges and providing them with aid *after* they matriculate into college, we are interested in understanding how providing students with information about financial aid *during the CEE process* would affect the decisions, effort and outcomes of high school seniors/prospective college students in poor rural areas. Patterned after programs such as the CalGrant program in the state of California in the United States, we focused on running an ECFA program in a set of experimental high schools by informing students of their financial aid grant awards during their senior year and

before the time that they fill out their zhiyuan form.[3] We also looked at the effect of providing financial aid grants of different sizes. We call this set of activities an Early Commitment for Financial Aid (ECFA) pilot project.

To run the experimental ECFA pilot, we take the following four steps.

4.2. Step 1: establishing the sample frame

What could be more difficult than finding poor students who were entering their last year of high school? Although it may not sound difficult, in fact, because there is no program that tracks poor students through China's high school system, it was one of the most time consuming parts of our work. To do so, we started by working with a collaborator from Northwest University of Xi'an in Shaanxi Province—one of China's poorest provinces. In order to find a relatively high concentration of students from poor families, we centered our attention on the poorest counties in the province.

To identify the students, the initial step included conducting a canvas survey during the late spring of 2007 (before the students in our sample reached their third year in senior high school (*gaosan*); they were still second year students—*gaoer*). In the canvas survey, eight poor counties were randomly selected to represent four major areas of Shaanxi: Hengshan and Mizhi in Yulin prefecture, Yanchang and Yichuan in Yan'an prefecture, Zhashui and Danfeng in Shangluo prefecture, and Ziyang and Ningshan in Ankang prefecture (Fig. A.1). Yulin and Yan'an are located on the Loess Plateau in northern Shaanxi. Zhashui and Ankang are in the mountainous areas of southern Shaanxi. Olivia et al. (2008) demonstrate in a poverty mapping exercise that indeed we have chosen the province's poorest regions.

The sample senior high schools were randomly selected according to a random sampling procedure. In 6 counties, one senior high school was randomly selected from each county. In the other two counties (Hengshan in northern Shaanxi and Danfeng in southern Shaanxi—which were much larger in a population sense), two senior high schools were randomly selected from each county. Altogether we sampled 10 senior high schools. Within each senior high school, the survey team randomly chose two classes of grade two. All the students in the sample classes make our sample frame of students, a total of 1177 students (more than 50 students per class). When we carried out our survey, no one in the school (including the principal and Homeroom teachers) knew that the students involved in the survey were going to be part of the ECFA pilot program. The students were told this was a survey by the Chinese Academy of Sciences that was being used for a general study on education. In fact, even the enumerators did not know about the details of the program in order to avoid any leakage of this information.

The next step of the sampling procedure focused on identifying the poorest students in the schools. To do so, we ran a canvas survey in all of the sample classes. Enumerators from our survey team, which were mostly recruited from Northwest University undergraduate and graduate students, executed a survey instrument that was filled out by each of the students. Questionnaires were also filled out by the Homeroom Teacher of each class (2 survey forms/school) and the director in charge of student affairs (*xueshengchu chuzhang*—1 survey form/school).[4]

Although the questionnaire gathered a number of other pieces of information (see Liu et al., 2007, for more details on the survey), in this study we mainly use three pieces of information coming from the three independent surveys to identify the poor students. The first piece of information comes from a section of the student survey where each student was asked to fill out a check list of durable assets owned by his/her family. The second piece of information comes from the part of the Homeroom Teacher survey that asked the Homeroom Teacher to provide a list of poorest students in his/her class. The last piece of information comes from the part of the survey form of the director in charge of student affairs that also asked for a list of poor students in each of the sample classes. These three pieces of information show that in total 592 students in our sample were from poor rural families.[5] Our discussion hereafter focuses mostly on these 592 poor students.

4.3. Step 2: creating five identical groups of students

Fig. 1 describes the process of how we randomly divided the 592 poor students into five distinct groups. Four of the groups were called treatment groups. As is shown below students in these groups were awarded promises of financial aid grants (conditional on testing into a tier one or tier two college) of different amounts at different times. One group was a control group. The students in this group did not receive a conditional promise of a scholarship (and, in fact, they did not know that they did not receive such a conditional promise since the treatment was awarded to students without their applying and was not announced).

Before proceeding with the ECFA experiment, we needed to make sure that all of the groups of students were as statistically identical as possible. This step, called balancing, is important since we want to make sure that

[3] CalGrant program makes decisions on the amount of financial aid a household receives during the senior year in high school so they will have this information available at the time that the college application decisions are made.

[4] In most of China's schools, each entering cohort of students is assigned to different class of about 50 students per class. Each class is assigned a teacher that is in charge of all of the administrative matters for the students in the class. He/she also often acts as a counselor for personal matters. We call this teacher the Homeroom Teacher (in Chinese the teacher is called the *banzhuren* or "director of the class"). Because a Homeroom Teacher typically follows the students for all three years of their high school careers, by the end of the second year, the Homeroom Teacher is quite familiar with all of the students in his/her class.

[5] To identify the poor students, we first used 7600 yuan as the asset level cutoff. In other words, those students who come from households that have a family asset value less than 7600 yuan are identified as being asset poor. Then we cross validated the list of asset poor students against the lists of poor students provided by the banzhurens and xuesheng chuzhangs, respectively, only those students who appear on three lists simultaneously enter our final list of poor students.

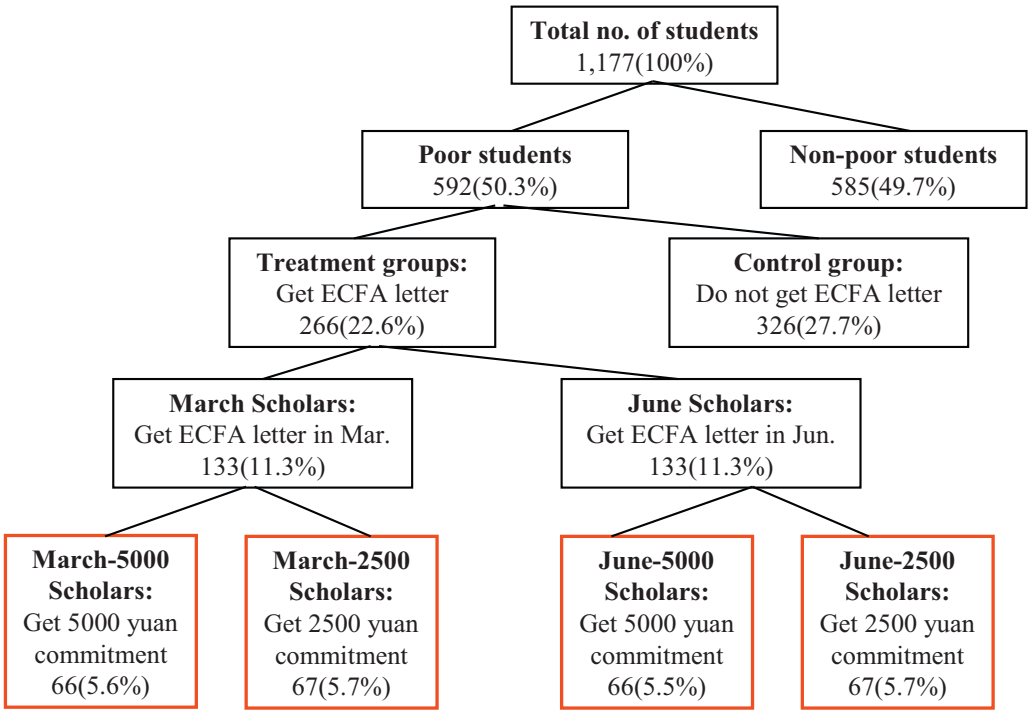

Fig. 1. Study design.

any difference observed after the experiment is due to the early commitment for financial aid, not due to initial differences among the characteristics of the groups. Bruhn and Mackenzie (2008) provide details on why this step is key in carrying out convincing RCTs. After randomizing our sample into the five groups six different times, we found sets of students in which the levels of a number of key variables of any given group were statistically indistinguishable from the others. Table 1 presents the summary statistics for the 592 sample students when they were separated into the four treatment groups and one control group. As seen from the table, on average, the students in each of the groups are the same age (row 1); they come from families with the same number of family members and siblings (rows 4 and 5); their parents (father and mother) look similar in terms of age, education, occupation, location of residence (living at home or away from home) and migration status (rows 7–16). The values of the family's assets of the students in the groups are statistically equal (row 6). In the survey of the director in charge of student affairs, we asked for the score of each student on their high school admissions exam (*zhongkao* in Chinese, which was prefecture-wise standardized and taken before the students entered high school at the end of the ninth grade year).[6] Our data show that zhongkao scores are slightly different across groups (row 3). Additionally, gender patterns differ between those in the treatment groups and those in the control groups (row 2).[7] These differences appeared in our treatment and control groups by chance (that is, even though the students were randomly assigned to the treatment and control groups). Because of these differences, when analyzing the impact of the ECFA program on student outcomes, we will need to control for these factors in the regression analysis below.

4.4. Step 3: giving out the ECFA scholarship offers

The key step that ultimately allows us to test our hypotheses involves the design of the treatment. We treat the different treatment groups with different combinations of financial aid grant commitment amounts and different timings. We decided since the typical level of scholarships that colleges award to their students has been moving up from 1500 yuan to 2000 yuan that we would give financial aid grant awards at one level which would seek to simulate current levels of scholarship (2500 yuan). We also decided

[6] In what follows, zhongkao scores are normalized relative to the distribution of the zhongkao scores in the control group in the same prefecture.

[7] The slight "imbalance" in terms of student gender and normalized zhongkao scores does not mean that our evaluation design was fundamentally flawed. We were mainly interested in designing a program that could improve the manner in which college financial aid is being allocated to poor students. Such a program should be easy to implement. Our priority in implementing the program was to ensure the pre-balance of poverty status. Unfortunately, even though the individual students were randomly assigned to the treatment and control groups, we were unable to pre-balance on all variables. In particular, initial test scores of those in treatment and control schools differed. There are also differences in gender status. Because of these differences, we control for these differences when we undertake the statistical analysis.

Table 1
Student and family characteristics, by treatment group, pre-treatment.

	Control group	Treatment groups				Test of mean difference
		March scholars		June scholars		H0: (1) = (2) = (3) = (4) = (5)
	(1)	March-5000 (2)	March-2500 (3)	June-5000 (4)	June-2500 (5)	Test stats: *p*-value (6)
Student characteristics						
1. Age, year	18.1 (0.8)	18.2 (0.7)	18.2 (0.7)	18.2 (0.8)	18.2 (0.8)	0.6049
2. Female, 1 = yes	0.49 (0.5)	0.65 (0.48)	0.36 (0.48)	0.44 (0.5)	0.42 (0.5)	0.0096
3. Normalized senior high school entrance test score	0 (1)	−0.28 (0.84)	0.2 (0.91)	0.04 (0.87)	0.07 (1.06)	0.0702
Family characteristics						
4. Family size	4.8 (1.1)	4.5 (1)	4.7 (1.3)	4.8 (1.1)	4.7 (1.1)	0.4589
5. Number of children	2.6 (0.9)	2.4 (0.9)	2.4 (0.9)	2.6 (0.9)	2.6 (0.9)	0.3631
6. Family asset, valued in Yuan	5150 (7795)	6832 (13881)	5176 (10077)	5588 (10065)	5102 (3618)	0.7148
Father attributes						
7. Age	45.7 (5.4)	45.9 (4.8)	45.7 (5.5)	46.4 (5.7)	46.5 (5.2)	0.7374
8. Senior high school or above graduate, 1 = yes	0.25 (0.43)	0.33 (0.48)	0.21 (0.41)	0.24 (0.43)	0.30 (0.46)	0.4807
9. Major occupation is farming, 1 = yes	0.55 (0.5)	0.5 (0.5)	0.51 (0.5)	0.58 (0.5)	0.49 (0.5)	0.7896
10. Living at home, 1 = yes	0.55 (0.5)	0.5 (0.5)	0.45 (0.5)	0.55 (0.5)	0.46 (0.5)	0.4886
11. Migrant worker, 1 = yes	0.50 (0.5)	0.55 (0.5)	0.61 (0.49)	0.55 (0.5)	0.54 (0.5)	0.5431
Mother attributes						
12. Age	43.7 (4.9)	43.5 (4.2)	43.8 (5.2)	43.3 (4.9)	43.9 (4.4)	0.9408
13. Senior high school or above graduate, 1 = yes	0.14 (0.35)	0.15 (0.36)	0.06 (0.24)	0.11 (0.31)	0.10 (0.31)	0.3707
14. Major occupation is farming, 1 = yes	0.66 (0.47)	0.58 (0.5)	0.7 (0.46)	0.73 (0.45)	0.66 (0.48)	0.4177
15. Living at home, 1 = yes	0.78 (0.41)	0.79 (0.41)	0.76 (0.43)	0.79 (0.41)	0.78 (0.42)	0.9954
16. Migrant worker, 1 = yes	0.23 (0.42)	0.17 (0.38)	0.24 (0.43)	0.3 (0.46)	0.22 (0.42)	0.4793
Number of observations	326	66	66	67	67	

Note: standard deviations in brackets.

to offer financial award grants at another substantial higher level ($2 \times 2500 = 5000$ yuan).

Timing also differed in the issuance of the award letters. Two treatment groups (one group that were offered 2500 yuan financial aid grant offers) and one group that were offered 5000 yuan financial aid grant offers) received news that they had been awarded the financial aid grant in early March 2008. This was a period of time during the first days of the second semester of the final year of the sample students. Two other treatment groups (also one group that was offered 2500 yuan and also one group that was offered 5000 yuan) received news that they had been awarded the financial aid grants on June 9, 2008, the first day after the students finished the gaokao, but still four days before the deadline for filling out the zhiyuan form. The reasons for differences in timing were twofold. First, we wanted to know if access to ECFA would affect the effort of students during their final semester of high school (in addition to affecting their college choice on their zhiyuan form—that is to test Hypothesis 1). Second, we wanted to know if students needed the information for a relatively longer period of time (that is, at least several months) so they could have time to factor the financial aid receipt into their decision making calculus (part of Hypothesis 3). Since the homes of many of poor rural students are located far from the high school, students will rarely return home, especially in the busy days during the period of time immediately before the gaokao. If the news of the award offer comes too late, the students and their parents may have already made the final decision on their decisions regarding how to fill out the zhiyuan form.

It is important to note that students were not given the funds at this time. They were given a letter of conditional commitment. The award letter, which was printed on letterhead of the Chinese Academy of Sciences and which was presented to the student in conjunction with the school's principal (since we wanted the students to be confident that this was a true award), told the student

that if they scored high enough on the gaokao and applied and was accepted by a tier one or tier two college, they would receive an award of 2500 yuan (5000 yuan). The letter promised the students that payment would be made as soon as a photocopy of the offer letter of admissions was mailed/faxed or emailed to the CAS contact address (physical address/fax number/email address). The letter explicitly said the student should receive the payment by August 20, at least 1 week before tuition and fees were due.

The time line summarizes the steps needed to implement the ECFA experiment on a timeline that tracks the key steps in China's CEE system (Fig. A.2). This illustration makes our points of intervention clearer and can be used to clarify how the design of the RCT will help us test the main hypotheses. Specifically, Hypothesis 1 (ECFA will increase the work effort of high school students) is tested by comparing the scores of March scholarship awardees or scholars (both March-5000 and March-2500 scholars) with those of June scholars (June-5000 and June-2500 scholars) and/or the students in the Control Group. Hypothesis 2 (conditional on testing into a tier one or tier two college, scholarships will break the liquidity constraints of households and give them the resources to pay tuition and fees and enroll) is tested by comparing the rate of enrollment of March and June scholars (either 2500 yuan award winner or 5000 yuan award winners) and the rate of enrollment of those students in the Control Group. The final hypotheses, Hypotheses 3a and b (scholarships will affect the college choice decision) are tested by comparing the decisions of those who are awarded ECFA financial award grants (either March scholars or June scholars/either 2500 yuan award winners or 5000 yuan award winners) with the decisions of the students from the Control Group. In particular, we are interested in whether ECFA allows poor rural students who had originally decided to go to a normal college or a defense-related college (or might otherwise have considered doing so) for financial reasons to make other choices and apply for colleges that are closer to their interests or academic strengths (that is, a college that was not a normal college).

4.5. Step 4: evaluating the impact of the ECFA program

After all of the steps of the ECFA program were implemented, we needed to run one more data collection exercise. The goal of the survey was to collect information on our dependent variables. In mid-August—at the same time that we were making payments to the students that had been awarded EFCA grants AND had been admitted to a tier one or tier two college, we also established a collaborative agreement with the Homeroom Teachers. From a survey form that included the name of all of their students (all treatment groups, control group and non-poor students), we collect information about who passed their college admissions exam and who were admitted to a tier one or tier two colleges. We also collected data on the students, including each student's college entrance exam score and their choices of college. In fact, this information is not from recall. In 19 of the 20 classes that were surveyed, the Homeroom Teachers were able to get hard copies of zhiyuan and gaokao score of the students, which allowed us to observe his/her actual gaokao test scores and the exact colleges that were included by rank in each tier. Finally, we also had to contact all of the students themselves (those that had received an offer of admission) and find out whether they were able to matriculate.

There are two points that need to be made at this point in the paper. First, we planned to give out ECFA scholarship offers to the 266 poor students that were randomly assigned to the four treatment groups by the sample design. As it turned out, however, 18 of them (about 7%) did not claim the offers as they were absent from school on the days we gave out the offers in May and June. Student absence patterns do not systematically differ between the four different treatment groups. Second, we later found out that the gaokao information for 23 students was missing. Student gaokao information missing patterns do not vary across the 5 groups (4 treatment groups + the control group). We had to drop these 20 students from our analysis. This left us with 551 (=592 − 18 − 23) students for empirical analysis, of which 60 in each of the two March scholarship groups, 61 in each of the two June scholarship groups, and the rest 309 in the control group.

5. Empirical strategy

As implied by our hypotheses discussed above, we define three sets of outcome variables: (a) the test score in the College Entrance Exam (CEE) or *gaokao score*. As the CEE is standardized for the same major track within Shaanxi Province, in what follows, all gaokao scores are normalized relative to the distribution of the gaokao scores in the control group in the same major track to make them comparable across majors; (b) *Matriculation*, which is defined as a dummy variable indicating whether a student actually matriculates into a tier one or tier two college conditional on being admitted into such a college; (c) College choice conditional on having applied for either advanced placement, tier one or tier two college, which contains two variables: One dummy variable indicating whether a student applies to any one of the free normal colleges (*Normal College*); and the other dummy variable indicating whether a student applies to any defense-related college (*Defense College*).

Given our experimental setup, measuring the overall impact of ECFA on the college decisions of students can be as forward straight-forward as comparing the means of outcome variables that we defined above across the appropriate treatment and control groups.

In addition to comparing the means of the outcomes, we also conducted a regression analysis, conditioning our results on a set of predetermined individual characteristics, in order to increase the estimation efficiency of the treatment effects. Specifically, we use two empirical models. Model (1) simply includes the dummy variables for being in the treatment groups relative to the control group. Model (2) includes additional controls for a set of pre-determined variables, such as normalized zhongkao scores and family assets.

Formally, the models to be estimated are:

$$\text{Model (1)}: \quad Y_i = \alpha + \delta Z_i + \varepsilon_i$$

$$\text{Model (2)}: \quad Y_i = \alpha + \delta Z_i + \gamma X_i + \varepsilon_i$$

where i is an index for the student. Y_i can be any of the three outcome variables that were defined above; Z_i is the vector of treatment variables (which make δ the vector of our parameters of interest). The term X_i is a vector of covariates that are included to capture the characteristics of students, parents and households in 2007 (before the treatment). The matrix, X_i, includes normalized zhongkao scores, the gender of the student, family assets (measured in thousand yuan), number of siblings, the father's migrant status and the mother's education (measured in years of attainment). Throughout our analysis, X_i also includes a set of prefecture dummy variables. We run the regression analysis with robust standard errors to capture the possible presence of heterogeneous treatment effects.

6. Main program effects

6.1. The impact of ECFA on gaokao scores

Since the June-scholars did not get the ECFAs until they finished the gaokao, identifying the impacts of ECFA on gaokao scores boils down to identifying the impact of ECFAs in March 2008 on gaokao scores (on the March-5000 and March-2500 groups) compared to all other students in our sample (or the other three groups—the June-2500; the June-5000 and the control group). A simple F-test of equality of means across the groups does not show any differences in normalized gaokao scores across the groups. The F-test statistic is 0.2, with a p-value of 0.1118. Without controlling for individual characteristics, it appears that ECFA does not have any impact on the gaokao scores of poor students in rural Shaanxi.

The same basic result holds when we run models (1) and (2) using the normalized gaokao score as our outcome variable, and March-5000 and March-2500 as the treatment variables. Regression results from the simple model (model 1) do not find that poor students who got ECFAs in March are significantly more likely to have higher gaokao scores (consistent with the F-test mentioned above) (rows 1 and 2, column 1, Table 2). The inclusion of the control variables (Model 2) does not significantly alter this result; none of the two treatment variables can be shown to produce impacts on the gaokao scores that are significantly different from zero (rows 1 and 2, column 1). In other words, our data do not provide any evidence in support of Hypothesis 1 that "College entrance exam scores of March scholars (both March-5000 and March-2500 scholars) will be higher than June scholars (June-5000 and June-2500 scholars) and control students."[8]

Table 2
Impact of ECFAs on gaokao scores.

Dependent variable: normalized standardized gaokao scores	Model (1)	Model (2)
Treatment variables		
1. March-5000 yuan, 1 = yes, 0 = no	−0.263 (−1.76)	−0.061 (−0.50)
2. March-2500 yuan, 1 = yes, 0 = no	0.094 (0.76)	0.093 (0.99)
Student characteristics		
3. Female, 1 = Yes, 0 = No		−0.028 (−0.39)
4. Normalized zhongkao score		0.565*** (13.70)
Family characteristics		
5. No. of siblings		0.030 (0.71)
6. Family assets, 1000 yuan		−0.010* (−2.21)
7. Mother senior high school graduate, 1 = yes		0.022 (0.21)
8. Father migrant worker, 1 = yes		−0.038 (−0.52)
Prefecture dummies		
9. Yulin		−0.207* (−2.15)
10. Shangluo		0.171 (1.79)
11. Ankang		0.332** (2.66)
Constant	0.049 (1.02)	0.040 (0.34)
R-sqr	0.008	0.351
#Obs	551	551

Source: Authors' survey.
Note: t-statistics based on robust standard errors in parenthesis.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

So why is it that providing ECFA for students in early March—before the CEE, instead of after the CEE in mid-June—did not affect their gaokao scores? In fact, students in each of these groups scored statistically identical, on average. When thinking about this, it may be that the lack of impact is due to our project design. Perhaps we offered the scholarships too late to affect performance. Since there was only three months left in the final year of the student's high school years, any additional effort induced by the extra incentive of the scholarship may not have been able to materially affect the scores. Alternatively, the amount that we offered may have been too small. By the time most students received the offer, their families had, on average, spent more than 20,000 yuan on high school-related expenses. The opportunity cost of going to high school (and foregoing of an unskilled wage for three years) is two to three times higher than this. Hence, when compared to these figures, 2500 yuan and 5000 yuan, the levels of our ECFA offers, are relatively small. Moreover, the incentive for students to work hard due to the size of the prospective gains from going to college may swamp any additional incentive effect.[9]

[8] While not directly the focus of our analysis, the results of the regressions produced several noteworthy (and mostly logically consistent) findings. First, the higher one's zhongkao score, the better one performed on the gaokao. Second, the better-off one's family is in terms of assets value, the lower their gaokao scores are. Finally, compared with students in Yan'an prefecture, students in Yulin prefecture tend to perform worse whereas those in Ankang prefecture tend to perform better in gaokao. None of the coefficients on the other control variables were significant.

[9] Using twins data from urban China, Li et al. (2005) show that one year of schooling at the college level increases an individual's earnings by as large as 10%. Fleisher et al. (2007) also have shown that returns to college are as high as 23%.

6.2. The impact of ECFA on matriculation

Our data show that providing students ECFA and disbursing the funds to them before the time that they actually entered college (assuming they passed their exam) and had to pay fees did NOT affect the rate of matriculation. In other words, we do not find any evidence in support of Hypothesis 2 "March scholars and June scholars are more likely to go to tier one or tier two colleges than control students (conditional on testing into a tier one or tier two colleges)." Why? Because 100% of students that passed the exam and were admitted to a tier one or tier two college ended up going to the college (Table A.1).[10] As the matriculation rates do not vary either within group or across groups, there is no need to conduct regression analysis in this case.

So why is it that providing ECFA for students did not affect matriculation rate? In some sense the logic is the same as above. When a student—especially one that has made it through the third year of high school—was able to test into a college, the parents had *already* made up their mind and had already prepared some way to pay the fees—even if they had to borrow or liquidate their assets. Those families that had any doubts about being able to afford college most likely had already pulled their child out of school and had him or her enter the labor market. In other words, according to our results, there was no one in our sample—even those in the control group or those without scholarship access in the form of our ECFA offers—that did not matriculate provided that they were admitted to a tier one or tier two college.

6.3. The impact of ECFA on college choice

6.3.1. Decision to go to free normal colleges

While there was no support found for either Hypothesis 1 or 2, the findings from our data support Hypothesis 3. Conditional on having applied for either advanced placement, tier one or tier two college, while four percent of students who did not get scholarship commitments (the control group) decided to attend a free normal college, not one (as in 0) who got a 5000 yuan ECFA offer in March applied for free normal college (Section A, Table A.2). Importantly, the difference in the means of the groups is statistically significant (at the 1% level). This result implies that if students had the time (they received the ECFA offers in March) and they had enough resources (they received a 5000 yuan offer), the application decision of the students in the ECFA program changed radically.

Although the difference between the other March treatment (March-2500) and the control group was not statistically significant, the point estimates suggest that the share of March-2500 scholars that opted for free normal college (2%) was lower than the share of those in the control group (4%). The share, however, was higher than that of the March-5000 scholars (0%).[11] Such a pattern of findings is consistent with the idea that the size of the scholarship may matter. Having access to smaller scholarships (while certainly welcome—compared to the situation in which a student would not receive anything) may not be important enough to influence a student's college decision.

The fact that both the shares of those choosing to go to the free normal colleges (conditional on having applied for either advanced placement, tier one or tier two college) who had received June treatments (June-2500 and June-5000) are slightly higher than the share of those in the control group also seems to suggest that the timing of the ECFA grants matters. When students received the grant offers in March (the 5000 yuan one, at least), the share that opted to apply for free normal colleges was much lower (and significantly so) than the share of June-5000 scholars that opted to apply for free normal colleges. In follow-up interviews with students (who had been offered June ECFA grants), we were told several times that the timing of the grant was important. The students were informed of their receipt of the grant less than four days before they had to fill out their zhiyuan. During these four days, however, they told us they had little time to consider the implications of the grant. One problem was that they were so busy trying to calculate their expected gaokao scores that this left little time to think of other issues. More significantly, a number of students told us that they had already made the decision (free normal college or not) before taking the CEE. This decision had been made with their parents (and others) after a lot of discussion. In the short time between being informed about the ECFA grant and the time limit for filling out the zhiyuan, few students had time or opportunity to discuss the matter with their parents. Especially in the case of poor students, their parents lived far away and most did not have easy access to phones. In other words, the decision had already been made by early June. When the ECFA was given in March, it entered into the college decision calculus. When it was given on June 9, it was too late. Hence, according to our findings both the size and timing of ECFA grants are important.

6.3.2. Decision to go to defense-related colleges

Our data show similar results for the choice to go to a defense school. Conditional on having applied for either advanced placement, tier one or tier two colleges, while eight percent of students who did not get ECFA offers (the control group) decided to attend a defense-related college, only three percent of those who got a 5000 yuan ECFA offer in March applied for defense-related college (Section B, Table A.2). Although the difference between the other March treatment (March-2500) and the control group was not statistically significant, the point estimates suggest that the share of March-2500 scholars that opted for defense-related college (7%) was almost the same as the share of those in the control group (8%). However, both the shares of those choosing to go to defense-related colleges (conditional on having applied for either advanced placement, tier one or tier two college) who had received June treat-

[10] Overall, 18% of the students tested into tier one or tier two colleges.

[11] As there is no variation within the March-5000 yuan group in terms of choosing free normal colleges conditional on having applied for either advanced placement, tier one or tier two college, there is no need for us to undertake regression analysis in this case.

ments (June-2500 and June-5000) are slightly higher than the share of those in the control group. It is important to note, however, that the difference is not significant across any of the groups. The same basic result holds when we run models (1) and (2) (Table A.3). Neither of the four treatment variables is significant in either of the two models. In other words, unlike the decision to go to free normal colleges, our data do not provide any evidence that ECFA has any impact on the student's decision to go to a defense-related college.

7. Policy implications

This paper provides experimental evidence that if ECFA are made early enough; and they are large enough, students will be able to make less distorted decisions when deciding on what collage to attend. Despite the critical importance of this financial aid issue for the educational policy in both developed and developing countries, there is surprisingly little rigorous evidence addressing it. To our knowledge, this paper provides the first experimental evaluation of the impact of ECFA (and indeed a part of the financial aid protocol) on the decision to attend college in China or any other context.

This conclusion has important policy implications for China's education system. The government should be recognized for the effort they have made to first expand tertiary education and then to mobilize the financial resources for supporting those that have trouble paying. According to our findings, however, there may be a better way implement the program to disperse the funding. In the same way that the CalGrant program in the US allowed students to know the extent of their financial aid before the being the application process, China should consider implementing and ECFA program. The results show, however, that the offers need to be given early enough. Smaller grants appear to have little effect, perhaps because the overall cost of going to college is so high these days.

Is this important? The literature—at least outside of China—is clear; when students are being forced to make college admissions decisions that direct them away from those areas for which they are best qualified, not only does the welfare of the student and his/her family fall, the nation suffers from the inefficiencies created by less than optimal matches between students and their interests (e.g., Baum & Schwartz, 1988). ECFA appears to be able to offer a solution to a problem that is distorting decisions now, but, with a bit of effort can be overcome.

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Appendix A.

See Figs. A.1 and A.2; Tables A.1–A.3.

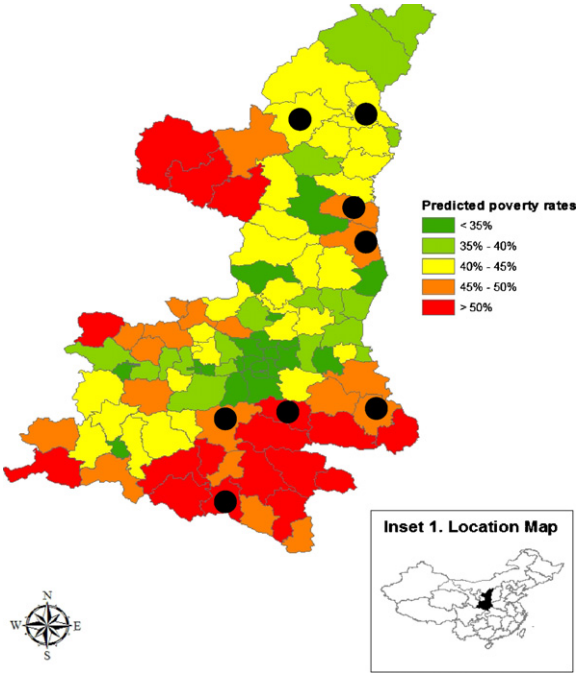

Fig. A.1. Location of the eight sample counties in Shaanxi Province.

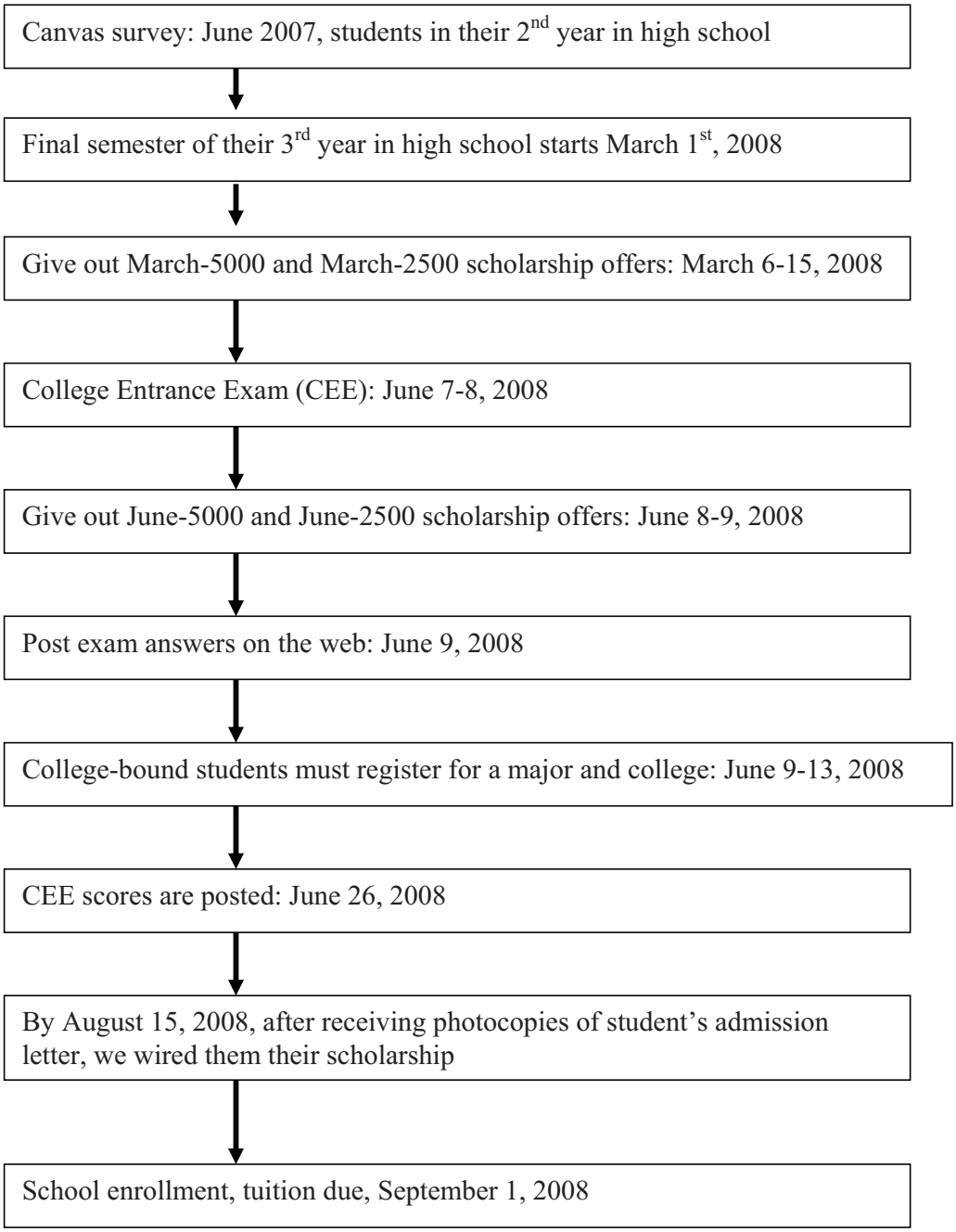

Fig. A.2. Timetable of the ECFA randomized intervention.

Table A.1
Impact of ECFA on matriculation.

Matriculated conditional on being admitted by a tier 1 or tier 2 college? (1 = yes, 0 = no)	Control group	Treatment groups			
		March scholars		June scholars	
		March-5000	March-2500	June-5000	June-2500
	(1)	(2)	(3)	(4)	(5)
Mean (s.d.)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)
No. of students got admitted by tier 1 or tier 2 colleges	56	8	13	9	14

Source: Authors' survey.

Table A.2
Impact of ECFA on college choice.

	Control group	Treatment groups				Test of mean difference
		March scholars		June scholars		H0: (1) = (2) = (3) = (4) = (5)
	(1)	March-5000 (2)	March-2500 (3)	June-5000 (4)	June-2500 (5)	Test stats: p-value (6)
A. Decision to go to free normal colleges (conditional on having applied for advanced placement, tier 1 or tier 2 college)						
Applied for free normal college? (1 = yes, 0 = no)						
Mean (s.d.)	0.04 (0.18)	0 (0)	0.02 (0.15)	0.07 (0.25)	0.12 (0.32)	0.0216
B. Decision to go to defense-related colleges (conditional on having applied for advanced placement, tier 1 or tier 2 college)						
Applied for defense-related college? (1 = yes, 0 = no)						
Mean (s.d.)	0.08 (0.27)	0.03 (0.17)	0.10 (0.30)	0.07 (0.25)	0.12 (0.32)	0.7010
No. of students who have applied for advanced placement, tier 1or tier 2 colleges	199	34	42	45	43	

Source: Authors' survey.

Table A.3
Probit regression analysis of the impact of ECFA on decision to go to defense-related college.

Dependent variable: applied defense-related college conditional on having applied for either advanced placement, tier 1 or tier 2 college (1 = yes, 0 = no)	Model (1) dF/dx	Model (2) dF/dx
Treatment variables		
1. March-5000 yuan, 1 = yes	−0.487 (−1.08)	−0.311 (−0.76)
2. June-5000 yuan, 1 = yes	−0.099 (−0.31)	−0.150 (−0.48)
3. March-2500 yuan, 1 = yes	0.093 (0.31)	0.081 (0.27)
4. June-2500 yuan, 1 = yes	0.209 (0.74)	0.223 (0.78)
Student characteristics		
5. Female, 1 = yes, 0 = no		−0.409* (−1.97)
6. Normalized zhongkao score		−0.025 (−0.22)
Family characteristics		
7. No. of siblings		0.065 (0.63)
8. Family assets, 1000 yuan		−0.008 (−0.71)
9. Mother senior high school graduate, 1 = yes		−0.218 (−0.68)
10. Father migrant worker, 1 = yes		−0.203 (−0.99)
Prefecture dummies		
11. Yulin		−0.112 (−0.38)
12. Shangluo		−0.104 (−0.43)
13. Ankang		−0.536 (−1.21)
Constant	−1.402*** (−10.84)	−1.062*** (−3.57)
#Obs	363	363

Source: Authors' survey.
Note: *z*-statistics based on robust standard errors in parenthesis.
* $p < 0.05$.
*** $p < 0.001$.

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