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Giving kids a head start: The impact and mechanisms of early commitment of financial aid on poor students in rural China

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ABSTRACT

We estimate the impact of two early commitment of financial aid (ECFA) programs—one at the start and one near the end of junior high school (seventh and ninth grades, respectively)—on the outcomes of poor, rural junior high students in China. Our results demonstrate that neither of the ECFA programs has a substantive effect. We find that the ninth-grade program had at most only a small (and likely negligible) effect on matriculation to high school. The seventh-grade program had no effect on either dropout rates during junior high school or on educational performance as measured by a standardized math test. The seventh-grade program did increase the plans of students to attend high school by 15%. In examining why ECFA was not able to motivate significant behavioral changes for ninth graders, we argue that the competitiveness of the education system successfully screened out poorer performing students and promoted better performing students. Thus by the ninth grade, the remaining students were already committed to going to high school regardless of ECFA support. In regards to the results of the seventh grade program, we show how seventh graders appear to be engaged in wishful thinking (they appear to change plans without reference to whether their plans are realistic).

1. Introduction

As the economies of developing countries transition from lower value-added to higher value-added industries, their need for human capital increases (Autor et al., 2003; Heckman and Yi, 2012). Higher value-added industries require a labor force with higher levels of skills (Bresnahan, 1999; Bresnahan et al., 2002; Katz and Krueger, 1998). To build a future labor force equipped with higher levels of skills, policymakers in a number of developing countries are expanding access to high school and college (Carnoy et al., 2013). A major challenge still facing policymakers from these countries, however, is how to help disadvantaged students (e.g. poor, rural)—who comprise a large proportion of the future labor force—obtain an education at the level of high school or above.

Unfortunately, disadvantaged students in many developing countries attend high school at a much lower rate than advantaged students (for brevity, we use the term "high school" to refer to both academic or vocational senior high schools). For example, students from poorer backgrounds in Brazil, Mexico, Chile, and Columbia are approximately 5–20 times less likely to attend and finish high school than their non-poor counterparts (Torche, 2010). Similar disparities in access to high school also exist between students from the poorest and richest quantiles in India (Kingdon, 2007). In China, up to 25% of students from poor, rural areas drop out even before completing junior high, compared to fewer than 3% of junior high students from richer, urban areas (Mo et al., 2013; Yi et al., 2012).

Why are disadvantaged students in developing countries dropping out of junior high or not going on to high school? There are many reasons, but the literature has shown that one of the most significant reasons is that poor families cannot afford the costs of sending their children to high school (Banerjee et al., 2000; Gould et al., 2004). High school tuition fees in some developing countries are high, relative to the average income of households from poor, rural areas (Liu et al., 2009). High tuition fees are further accompanied by high (and often rising) opportunity costs of staying in school (Angrist and Lavy, 2009). Opportunity costs are especially a problem for students entering high school, since labor laws in many developing countries permit high school-age students to find employment.

Although students are not required to pay the high costs of high school until they decide to matriculate, high direct and indirect costs can affect disadvantaged students as early as the start of junior high school. Students in junior high forecast their chances of attending high school (Angrist and Lavy, 2009; Eckstein and Wolpin, 1999;

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Oreopoulos, 2007). Because of the high costs of attending high school, poor students who are unable to pay for high school may forecast that their chances to attend are zero, no matter how much effort they exert. As a result, they may be less motivated to work hard or stay in school (see, for example, Bradley and Lenton, 2007). In other words, when junior high students perceive high costs to attending high school, they may give up their plans to attend high school, which in turn may either induce them to drop out or to exert less effort in their studies.

One approach used to address matriculation gaps among poor families is to offer early commitment for financial aid (ECFA). ECFA is a guarantee of financial aid for the next level of schooling (e.g. high school), made to students who are still in a lower level of schooling (e.g. junior high). In the United States, Kane (2007) and Abraham and Clark (2006) found that a tuition-assistance program (which effectively provided early commitment for college financial aid) for high school students resulted in greater college matriculation. In Colombia, Barrera-Osorio et al. (2011) found that ECFA increases high school and college matriculation. However, other studies have shown that ECFA does not necessarily always guarantee that students enroll in the next level of schooling (Schwartz, 2008).

While some studies have evaluated ECFA, and shown that ECFA has worked in some venues but not in others, little is known about how ECFA works. Specifically, few (if any) studies have examined the timing at which it is most effective to give ECFA. ECFA may operate through different channels and have differing effectiveness depending on when it is given. For example, if ECFA were offered a few months before a student matriculates to the next level of schooling, but at a time close to the high school matriculation date (such that there is little time for effort and learning to change), would such a program still increase matriculation? That is, does ECFA work primarily by reducing the liquidity constraints of attending high school? If so, ECFA would primarily help poor students that are already working hard enough to go to the next level of schooling but fail to do so because of high costs of attending. Or, is it possible that in competitive systems where upward mobility depends on strictly-enforced test-taking ability ECFA-like programs are not effective? If the only students who remain in the system have risen there through difficult odds and are known to be in a position to gain the benefits of additional education, cost may not play much of a role.

On the other hand, if ECFA is given earlier in the educational track of the student (e.g., several years before the next matriculation decision is made), does it change how students forecast their future chances? That is, do the plans of students change from dropping out of the schooling system and entering the labor force to continuing on with school? More importantly, do these changes in plans translate to lower levels of dropout and/or higher levels of achievement? If so, an "early-stage" ECFA may help by changing how students forecast their chances for attending high school. Indeed, if an early-stage ECFA motivates students to stay in school who would otherwise drop out by the time they reach the end of junior high, it would have the potential to impact more students than an ECFA intervention given later (after a number of students have already dropped out). However, it is also possible that even (as in the case of older children) when children and their families know about the lower cost of schooling early in the education track, the competitiveness of the system ultimately makes "cost" a secondary barrier to compared to higher grades.

Answers to these questions about ECFA matter for policymakers. If giving ECFA works mainly by driving additional effort from students, ECFA programs offered early in the educational tracks of students could stem dropout rates in junior high and increase academic achievement. If the impact is the same or greater for ECFA programs that are offered near the time of the transition to the next level, then offering ECFA later may be desirable (as it would target self-selected students who remain in school through junior high).

The overall goal of this paper is to understand the mechanisms behind ECFA. Drawing on data from two experiments—designed to allow us to infer the causal impact of ECFA on a number of student outcomes—we seek to accomplish four specific objectives. First, we seek to examine the extent to which poor, rural students perceive financial constraints to further schooling. Second, we examine the effect of an ECFA experiment that is given late in the educational track (a few months before students are eligible for matriculation to high school) on high school matriculation (from henceforth, the *ninth grade ECFA*). In essence, our second objective is to identify whether ECFA works primarily through relieving liquidity constraints (of poor, rural students who, all things being equal, do not move on to the next level of school due to high tuition levels). Third, we seek to estimate the impact of an ECFA program given early in the educational track on poor, rural students' dropout rates, plans to attend high school, and math achievement (from henceforth, the *seventh grade ECFA*). In essence, our third objective is to see if ECFA needs to be given earlier to allow students the chance to respond by working harder. Fourth, we seek to examine how ECFA functions by comparing results from the ninth and seventh grade ECFA experiments noted above.

To accomplish these objectives, we take China as a case study. This choice makes the study an interesting case for several reasons. High school tuition rates are high in China (Liu et al., 2009). The opportunity costs of attending high school are also high and increasing, as the unskilled wage rate has been rising rapidly since the early 2000s (Cai and Du, 2011). Compared to the education systems in the countries in which ECFA programs have been studied in the past, China's education system is likely to be the most competitive.

Our main results show that ninth-grade ECFA has little or no effect on helping students matriculate high school and that seventh-grade ECFA has no effect. The point-estimate for the ninth-grade ECFA (7.9 percentage points) is only significant at the 10% level (and only in a specification which controls for baseline covariates). The 95% confidence interval (CI) for this effect [−0.011, 0.169] not only implies a zero effect but also appears to rule out the larger, positive effects of ECFA found in other studies. Barrera-Osorio et al. (2011), for example, report a much higher point estimate for the impact of ECFA on college matriculation (95% CI of [0.413, 0.497]). Kane (2007) also reports a confidence interval, the lower bound of which is higher than our ninth-grade ECFA point estimate (95% CI of [0.125, 0.195]). Our study thus stands in contrast to prior studies which find positive impacts of ECFA on matriculation to the next highest level of schooling.

The rest of the paper is organized as follows. Section 2 introduces the study design of the ninth grade and seventh grade ECFA experiments, the data collection for the experiments, and the statistical approach. Section 3 reports the results of the two ECFA experiments. Section 4 concludes.

2. Research design, interventions, data collection, and statistical approach

2.1. Research design

We conducted two randomized controlled trials (RCT) in 15 nationally-designated poor counties in Shaanxi and Hebei provinces (see Figs. 1 and 2). Shaanxi is located in northwest China and has a GDP per capita of 27,133 yuan (approximately 4000 dollars). Hebei is located in central China with a GDP per capita of 28,668 yuan (approximately 4230 dollars—CNBS, 2011). Among the 31 mainland provinces, Shaanxi and Hebei rank 14 and 15 in terms of GDP per capita.

The first step of our research design involved selecting a representative sample of schools from the 15 counties. We used official records to create a population frame of all rural, public junior high schools in the 15 counties. From the population frame, we identified and selected 132 schools (71 in Shaanxi and 61 in Hebei) in which seventh grade and ninth grade student enrollments each exceeded 50 students.[1]

[1] There are fewer schools sampled in Hebei because there were 18 schools in Hebei where the number of seventh grade students in these schools was under 50. These schools were excluded on the basis of enrollment because smaller schools were likely to be closed as a part of a government school merger program.

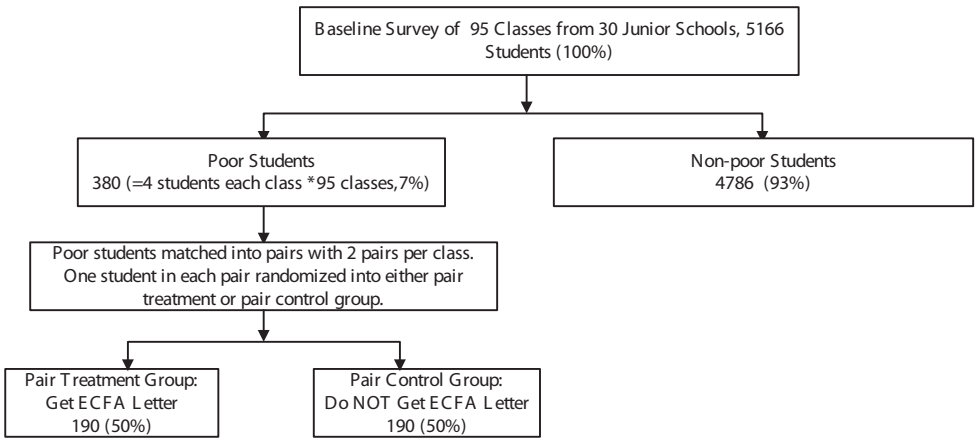

Figure 1. Research design of Ninth Grade ECFA Intervention

Fig. 1. Research design of ninth grade ECFA intervention.

After selecting the schools, we next sampled classes and students. For the ninth grade ECFA experiment (which had a smaller budget), we randomly chose a subset of 30 (out of 71) schools in Shaanxi. We sampled all ninth grade students in these 30 schools (a total of 5166 students in 95 classes). By contrast, for the seventh grade ECFA experiment, we chose all 132 junior high schools in both Shaanxi and Hebei. We sampled all seventh grade students in these 132 schools (a total of 19,797 students in 473 classes).

We then conducted a baseline survey of the ninth and seventh grade students in our sample at the beginning of the school year (in early November 2010). We asked each student to take a standardized mathematics examination. We further collected data on students' plans to attend high school, their perceived costs and returns to going to different types of high school, and individual characteristics like gender, family background, and whether their families possessed various household assets.

Following the baseline survey, we identified the four poorest students in each class. Using data on the household assets owned by each student's family, we created an asset index by assigning a monetary amount to each asset (based on the National Household Income and Expenditure Survey, published by the China National Bureau of Statistics—CNBS, 2007). We then ranked students by this family asset index in each

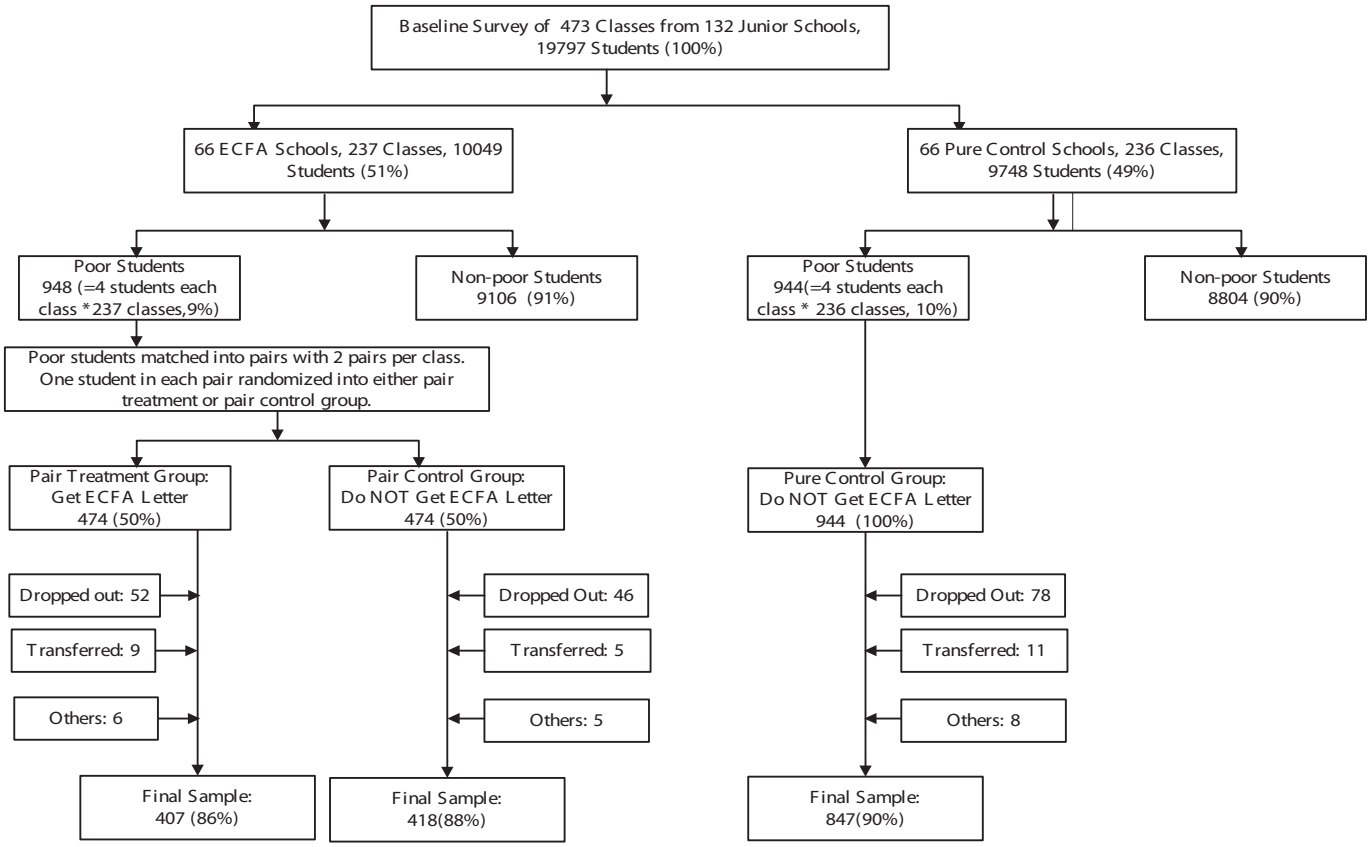

Fig. 2. Research design of seventh grade ECFA intervention.

class. Using the family asset value ranking, we identified the four poorest students in each class (380 students in the ninth grade ECFA experiment and 1892 students in the seventh grade ECFA experiment).[2]

After identifying the poor students, we then assigned our sample schools into two groups. The first group of schools was an *ECFA school group*, which meant that students within the schools would have a chance to receive ECFA. The second group of schools was a *pure control school* group, in which no students would receive any ECFA. In our ninth grade ECFA experiment, the number of schools in our sample was small (30 schools). As such, we assigned all 30 to the ECFA school group (where students would have a chance to receive ECFA). In our seventh grade experiment, we randomly assigned 66 of the 132 sample schools to the ECFA school group and 66 schools to the pure control group.

In the ECFA school group, we randomly assigned the poorest four students within each classroom to either receive or not receive ECFA. To increase statistical power, we first used information from the baseline survey to assign the 948 poor students in the ECFA schools into pairs. Specifically, we blocked on classrooms and then assigned the four students in each classroom into two pairs. The pairs were created through the use of an optimal matching algorithm (Moore, 2012). The optimal matching algorithm chose which students would go into which pair by minimizing the total (Mahalanobis) distance within the matched pairs (Moore, 2012). The Mahalanobis distance measure was based on the following baseline covariates: math achievement, plans to go to academic high school (an indicator variable equal to 1 if a student plans to go to academic high school and 0 otherwise), and plans to go to vocational high school (or VET—an indicator variable equal to 1 if a student plans to go to VET and 0 otherwise).

After matching students into pairs, we randomly assigned one student in each pair to either a pair treatment or pair control group. In our ninth grade ECFA experiment, 190 out of a total of 380 poor students (two per class) were randomly assigned to receive ECFA (known as our *pair treatment group*). In our seventh grade ECFA experiment, 474 students in the ECFA schools were assigned to the pair treatment group. Specifically, students in this group were awarded contracts that guaranteed they would receive 1500 yuan per year (240 dollars per year) for three years of high school (conditional on going to either an academic high school or VET). The remaining students in the ECFA schools were not assigned to receive ECFA (this was our *pair control group*—190 students in the ninth grade ECFA experiment and 474 students in the seventh grade ECFA experiment).

Among the pure control schools, all poor students were assigned to the *pure control group* (a total of 0 students for the ninth grade ECFA experiment and 944 students for the seventh grade ECFA experiment). Because our intervention (providing ECFA) was at the student level within the same classroom, we were concerned about potential spillover effects. On the one hand, if students who did not receive ECFA happened to find out that some of their classmates had received ECFA, they may have felt left out or reduced their interest in attending high school. The voucher intervention would thus have had a negative spillover effect on the control group students. On the other hand, classmates who did not receive ECFA might have been motivated to work harder, thinking that there might be future chances to receive ECFA (a positive spillover). We created the pure control group specifically to test for such spillovers. As students from the pure control group would have no exposure to ECFA recipients, there was no plausible potential for spillovers. As such, we could compare the outcomes of the pair control group with the pure control group to ascertain if there were spillovers.

This approach to random assignment (randomizing students after they were matched into pairs) successfully created a sample that was balanced across a large number of variables. In the ninth grade ECFA, among 14 variables tested, there were no imbalances between the pair treatment and pair control groups (Table 1).

In the seventh grade ECFA, the sample was mostly balanced. There were no imbalances between the pair control and pure control groups. There were also no imbalances between the pair treatment and pure control groups. However, among 14 variables tested, we found two imbalances between the pair treatment and pair control groups in terms of gender and age (Table 2). Pair control students are slightly older (by 0.16 years, statistically significant at the 5% level) and more likely to be female (significant at the 5% level).

In addition, attrition did not bias our sample. For the ninth grade ECFA experiment, we followed up with 100% of our sample in high school to collect measures of whether they matriculated in any high school or not, academic high school, or vocational high school. As such, there was no attrition. In the seventh grade ECFA, attrition also did not bias our sample. Out of 1892 seventh grade students, 220 (12%) did not fill out a survey at the time of our follow-up survey (May 2011). Among these 220 students, most of them (176 students) had dropped out of school. A smaller share of students (25) had transferred to other schools, and 19 students were on sick leave and were not present at the follow-up study (Fig. 1).[3] To examine if attrition affected our survey results for plans to attend high school and academic achievement, we checked for balance among our "non-missing" cases (those in both the baseline and follow-up survey). We find that the pair treatment, pair control, and pure control treatment arms are mostly balanced (Table 3). There were three exceptions. Between the pair treatment and pair control group, there were imbalances in terms of student age and gender (as per those found in the whole sample). Likewise, the pair treatment and pure control groups differed in terms of their standardized math test scores at the baseline.

There are three reasons why imbalances in the seventh grade ECFA experiment do not threaten the internal validity of this study. First, we control for these variables in our subsequent analyses. Second, we examined balance within 14 variables and conducted three t-tests per variable. This is a total of $14 * 3 = 42$ tests. At the 5% level, we would expect to see two statistically significant variables out of chance. Third, in our results below, the point estimates for each outcome do not change significantly with the addition of the control variables, further supporting the argument that the imbalance is not significant enough to threaten internal validity.

2.2. Interventions

Both ninth and seventh grade students in the pair treatment group received our ECFA intervention shortly after the baseline survey (at the start of ninth or seventh grade). Both ninth and seventh grade students were given ECFA according to an identical, standard protocol. In December 2010, we asked school principals to individually inform each ECFA recipient to come to the principal's office on a given date and at a given time (see Fig. 3). We also asked the student's guardian to come to the principal's office at the same time. Once the student, his or her guardian, and the principal were in the office, ECFA offers were given in the form of contracts. The contracts stipulated that our research team would provide 1500 yuan/year in financial aid to roughly cover the costs of three years of high school tuition if the student was actively enrolled in a 3-year vocational or academic high school program by September 2013.

The contract further stipulated that our research team would wire the money to a post office nearest the recipient's high school, where students could conveniently retrieve their money at the start of high school

[2] As a robustness check, we also asked homeroom teachers at the baseline survey to provide a list of the ten poorest students in his or her class. We then cross-validated the list of the ten poorest students by family asset value against the list of poor students provided by the homeroom teacher. Fortunately, in 100% of the cases, students who were poor by family asset value rankings were also on the list of poor students provided by the homeroom teachers.

[3] Note that all students who were present in the classroom completed our survey, resulting in 100% survey completion within the classroom.

Table 1
Student and family characteristics for ninth grade ECFA experiment, by treatment status.
Data source: Authors' survey.

Variable	Pair treatment group	Pair control group	Difference (1) − (2)	t-Test (p-value) H0: (1) = (2)
	(1)	(2)	(3)	(4)
Student characteristics at baseline				
1. Student age, year	15.27 [0.95]	15.36 [0.94]	−0.09 (0.09)	0.30
2. Female student, 1 = yes	0.52 [0.50]	0.48 [0.50]	0.03 (0.05)	0.54
3. Plans to go to acad. high after jr. high, 1 = yes	0.51 [0.50]	0.55 [0.50]	−0.04 (0.03)	0.19
4. Plans to go to voc. high after jr. high, 1 = yes	0.13 [0.39]	0.14 [0.34]	−0.01 (0.03)	0.87
5. Have no plan for future schooling, 1 = yes	0.26 [0.44]	0.23 [0.42]	0.03 (0.03)	0.27
6. Z-score of standardized TIMSS test score	−0.06 [1.00]	0.01 [1.04]	−0.07 (0.10)	0.49
Parents' characteristics at baseline				
7. Mom's years of schooling	5.18 [3.33]	4.88 [2.93]	0.30 (0.34)	0.44
8. Dad's years of schooling	7.13 [3.04]	6.89 [2.80]	0.24 (0.31)	0.43
9. Mom's health status, 1 = good	0.32 [0.47]	0.33 [0.47]	−0.01 (0.03)	0.81
10. Dad's health status, 1 = good	0.39 [0.49]	0.45 [0.50]	−0.06 (0.05)	0.23
11. Mom ever migrated, 1 = yes	0.63 [0.49]	0.66 [0.47]	−0.04 (0.05)	0.42
12. Dad ever migrated, 1 = yes	0.89 [0.31]	0.91 [0.29]	−0.02 (0.03)	0.64
Family characteristics at baseline				
13. Number of siblings, person	0.32 [0.68]	0.27 [0.61]	0.05 (0.05)	0.33
14. Family asset value, 1000 yuan	2.39 [1.33]	2.28 [1.17]	0.11 (0.10)	0.26
Number of observations	190	190	380	

Notes: a) Means with standard deviations reported in brackets; b) Cluster-robust standard errors adjusted for clustering at the school level in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. c) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*. d) The aggregate test for all covariates also shows balance between the pair treatment and pair control groups ($F(14,29) = 1.34$, p-value = 0.24).

(in September 2013).[4] All of the students assigned to the pair treatment group (as well as their parents or guardians) signed the contract.

In April 2011, we called each pair treatment student again to remind them that the contract was still valid. Moreover, we reminded the students not to discuss the ECFA offer with anyone besides their guardians and the school principal. Neither pair control (the seventh grade or ninth grade students in the ECFA schools who did not receive ECFA) nor pure control students (the seventh grade students in the non-ECFA schools) received ECFA. However, students in both control groups filled in the same number of surveys and were visited the same number of times as pair treatment students.

2.3. Data collection

2.3.1. Data collection for the ninth grade ECFA experiment

For the ninth grade ECFA experiment, baseline surveys were administered in four blocks in November 2010. In the first block, students were asked to provide their best guess as to the total costs of going to academic high school, VET, and college. Finally, we asked the student to predict the monthly wage that they could expect to earn by entering the labor market directly after junior high. We collected these measures to understand how students perceived the cost of schooling (both in terms of tuition and opportunity costs).

In the second block, students were asked to provide a checklist of household assets. As noted above, this variable was used to identify the poorest students in each class.

The third block was a 30-minute standardized math test based on items from the Trends in International Mathematics and Science Study (TIMSS). Before the baseline survey, we tested math exam items with over 300 ninth grade students to construct baseline and evaluation math exams. We could ensure that there was no preparation for the examination because we administered and printed the test ourselves. No one in the sample schools knew of the questions beforehand. The enumeration team closely proctored the students in order to minimize cheating, and we strictly enforced time limits for the exams. Finally, the scores were scaled into z-scores by subtracting the mean and dividing by the standard deviation (SD) of the math score distribution of all students tested. These normalized scores are used as our key measure for math achievement.

In the fourth block, enumerators collected data on the demographic and socioeconomic characteristics of students and their families. The data was used to create the control variables in our later analyses. Specifically, we collected data on student gender, age, and ethnicity. We also collected information about each student's family characteristics, such as number of siblings, the health status of parents, years of schooling of parents, and whether parents had ever migrated. Similar variables have been used in previous studies to explain differences in educational outcomes among students (e.g., Behrman and Rosenzweig, 2002; Currie and Thomas, 1995; Yi et al., 2012).

In August 2011 (the beginning of the 2011–2012 academic year), we tracked down our ninth grade student sample to confirm whether students had actually matriculated into either academic or vocational high school. We relied on three procedures to do so. First, the student was given a pre-paid envelope to mail a signed and stamped high school matriculation letter to the research team by August 20, 2011. Second, in August we asked each ninth grade homeroom teacher in the treatment students' junior high about the whereabouts of the students. Third, enumerators visited each high school that students reported attending and personally met each student to confirm their attendance.

2.3.2. Data collection for the seventh grade ECFA experiment

Although data collection procedures for the seventh grade ECFA experiment were largely identical to those used in the ninth grade ECFA experiment, there were two major differences at the baseline. First, we gave seventh grade students a seventh grade math test (that we also piloted with 300 seventh grade students). Second, we added a questionnaire block regarding students' plans to attend high school. In particular, we asked students which track they planned to choose after junior high: academic high school, VET, or the labor market. We allowed the student to say that he or she had no plans. Note that students were only allowed to choose one plan.

In addition, for the seventh grade ECFA experiment, we conducted our follow-up survey at a different date. Specifically, we did not track students into high school in August 2011 (as they were still in junior high at this point). Instead, we conducted a follow-up survey in May

[4] All students and parents understood that Chinese post offices can serve as banks, especially in rural areas.

Table 2
Student and family characteristics for seventh grade ECFA experiment, by treatment status.
Data source: Authors' survey.

Variable	Pair treatment group	Pair control group	Pure control group	Difference (1) − (2)	Difference (1) − (3)	Difference (2) − (3)
	(1)	(2)	(3)	(4)	(5)	(6)
Student characteristics at baseline						
1. Student age, year	13.5 [1.03]	13.6 [1.04]	13.5 [1.06]	−0.13** (0.05)	−0.03 (0.09)	−0.10 (0.08)
2. Female student, 1 = yes	0.48 [0.50]	0.55 [0.50]	0.51 [0.50]	−0.07** (0.03)	−0.04 (0.03)	−0.03 (0.03)
3. Plans to go to acad. high after jr. high, 1 = yes	0.46 [0.50]	0.48 [0.50]	0.45 [0.50]	−0.01 (0.02)	0.02 (0.03)	−0.03 (0.03)
4. Plans to go to voc. high after jr. high, 1 = yes	0.14 [0.34]	0.12 [0.32]	0.15 [0.36]	0.01 (0.02)	−0.01 (0.02)	0.03 (0.02)
5. Have no plan for future schooling, 1 = yes	0.33 [0.47]	0.34 [0.47]	0.33 [0.47]	−0.01 (0.02)	0.00 (0.03)	−0.01 (0.03)
6. Z-score of standardized TIMSS test score	0.00 [0.95]	−0.09 [1.04]	−0.14 [1.03]	0.09* (0.05)	0.14* (0.08)	−0.05 (0.09)
Parents' characteristics at baseline						
7. Mom's years of schooling	5.35 [3.54]	5.32 [3.38]	5.2 [3.42]	0.03 (0.23)	0.15 (0.32)	−0.12 (0.29)
8. Dad's years of schooling	6.94 [3.19]	6.90 [2.85]	7.07 [2.75]	0.04 (0.21)	−0.13 (0.20)	0.17 (0.20)
9. Mom's health status, 1 = good	0.34 [0.46]	0.39 [0.48]	0.38 [0.48]	−0.05 (0.03)	−0.04 (0.03)	−0.00 (0.03)
10. Dad's health status, 1 = good	0.46 [0.49]	0.44 [0.49]	0.48 [0.49]	0.01 (0.03)	−0.03 (0.03)	0.04 (0.03)
11. Mom ever migrated, 1 = yes	0.49 [0.49]	0.47 [0.49]	0.49 [0.49]	0.01 (0.03)	0.00 (0.04)	0.01 (0.04)
12. Dad ever migrated, 1 = yes	0.81 [0.39]	0.77 [0.42]	0.8 [0.40]	0.04 (0.03)	0.01 (0.03)	0.03 (0.03)
Family characteristics at baseline						
13. Number of siblings, person	1.04 [0.84]	0.99 [0.79]	0.99 [0.80]	0.04 (0.06)	0.04 (0.06)	0.00 (0.06)
14. Family asset value, 1000 yuan	3.66 [2.70]	3.78 [2.75]	3.66 [2.60]	−0.12 (0.09)	0.00 (0.40)	−0.12 (0.42)
Number of observations	474	474	944	948	1418	1418

Notes: a) Means with standard deviations reported in brackets. b) Cluster-robust standard errors adjusted for clustering at the school level in parentheses. c) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*. d) The aggregate tests for all covariates generally shows balance between the pair treatment and pair control groups (column 4, $F(14,65) = 1.99$, p-value = 0.03; column 5, $F(14,131) = 0.76$, p-value = 0.71; column 6, $F(14,131) = 1.00$, p-value = 0.46).
* Significant at 10%.
** Significant at 5%.

2011 (at the end of the 2010–2011 academic year). In May, enumerators revisited all the schools in our baseline sample and asked the same students to participate in a follow-up survey. The follow-up survey was identical to that of the November 2010 baseline survey, including a seventh grade math test and questions regarding student plans to attend high school.

In the follow-up survey for the seventh grade ECFA experiment, our enumerators also collected information on enrollment status, making

Table 3
Student and family characteristics of non-missing students for seventh grade ECFA experiment, by treatment status.
Data source: Authors' survey.

Variable	Pair treatment group	Pair control group	Pure control group	Difference (1) − (2)	Difference (1) − (3)	Difference (2) − (3)
	(1)	(2)	(3)	(4)	(5)	(6)
Student characteristics at baseline						
1. Student age, year	13.40 [0.98]	13.56 [1.00]	13.45 [1.03]	−0.16** (0.06)	−0.06 (0.09)	−0.1 (0.08)
2. Female student, 1 = yes	0.49 [0.50]	0.56 [0.50]	0.54 [0.50]	−0.07** (0.03)	−0.05* (0.03)	−0.03 (0.03)
3. Plans to go to acad. high after jr. high, 1 = yes	0.49 [0.50]	0.50 [0.50]	0.48 [0.50]	−0.01 (0.02)	0.01 (0.03)	−0.02 (0.03)
4. Plans to go to voc. high after jr. high, 1 = yes	0.13 [0.34]	0.11 [0.31]	0.14 [0.34]	0.02 (0.02)	−0.01 (0.02)	0.03 (0.03)
5. Have no plan for future schooling, 1 = yes	0.33 [0.47]	0.33 [0.47]	0.32 [0.47]	0.00 (0.03)	0.01 (0.03)	−0.01 (0.03)
6. Z-score of standardized TIMSS test score	0.03 [0.96]	−0.03 [1.03]	−0.10 [1.02]	0.07 (0.05)	0.14 (0.08)	−0.07 (0.09)
Parents' characteristics at baseline						
7. Mom's years of schooling	5.43 [3.51]	5.43 [3.38]	5.27 [3.45]	−0.01 (0.24)	0.15 (0.32)	−0.16 (0.29)
8. Dad's years of schooling	7.09 [3.16]	6.93 [2.85]	7.14 [2.75]	0.15 (0.22)	−0.06 (0.22)	0.21 (0.20)
9. Mom's health status, 1 = good	0.35 [0.47]	0.40 [0.48]	0.38 [0.48]	−0.05 (0.03)	−0.04 (0.03)	−0.01 (0.04)
10. Dad's health status, 1 = good	0.45 [0.49]	0.44 [0.49]	0.48 [0.49]	0.00 (0.03)	−0.04 (0.03)	0.04 (0.04)
11. Mom ever migrated, 1 = yes	0.49 [0.49]	0.47 [0.49]	0.48 [0.49]	0.03 (0.03)	0.01 (0.04)	0.01 (0.042)
12. Dad ever migrated, 1 = yes	0.80 [0.39]	0.77 [0.42]	0.81 [0.39]	0.03 (0.03)	0.00 (0.03)	0.04 (0.03)
Family characteristics at baseline						
13. Number of siblings, person	1.00 [0.84]	1.00 [0.78]	1.00 [0.79]	0.01 (0.06)	0.01 (0.07)	0.00 (0.06)
14. Family asset value, 1000 yuan	3.69 [2.73]	3.79 [2.78]	3.66 [2.59]	−0.1 (0.10)	0.03 (0.42)	−0.13 (0.42)
Number of observations	407	418	847	825	1254	1265

Notes: a) Means with standard deviations reported in brackets. b) Cluster-robust standard errors adjusted for clustering at the school level in parentheses. c) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*. d) The aggregate tests for all covariates generally shows balance between the pair treatment and pair control groups (column 4, $F(14,65) = 1.68$, p-value = 0.08; column 5, $F(14,131) = 0.67$, p-value = 0.80; column 6, $F(14,131) = 1.09$, p-value = 0.37).
* Significant at 10%.
** Significant at 5%.

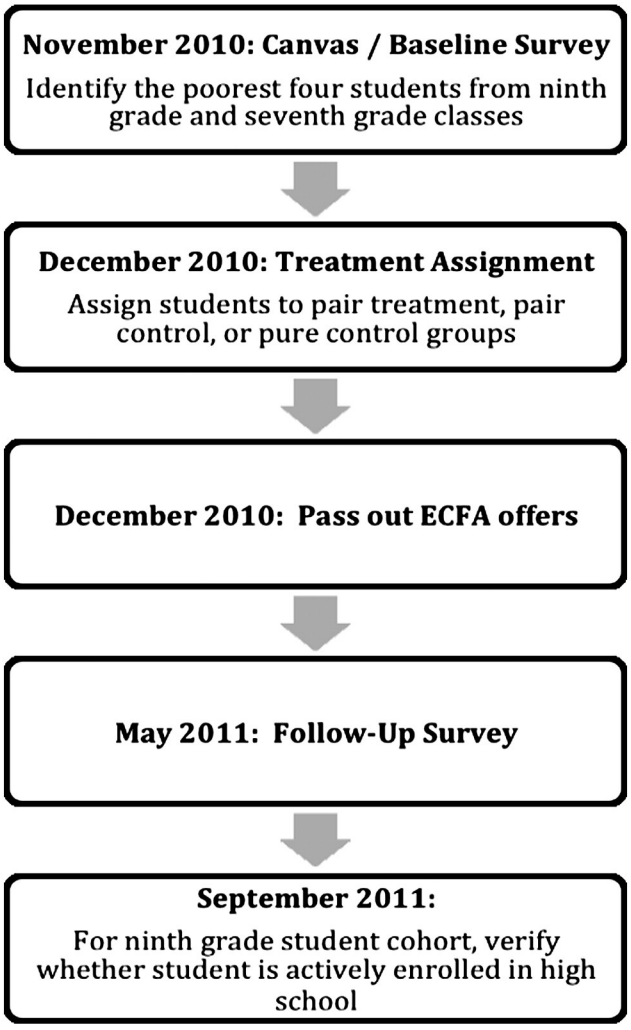

Fig. 3. Timeline of the ECFA intervention.

sure to distinguish students who had dropped out, transferred, or were on leave. Specifically, we defined dropout as whether a student was enrolled full time in a junior high school at the time of our baseline (November 2010) but no longer at our follow-up survey (May 2011). In the context of the seventh grade ECFA experiment, dropouts refer to students who give up before finishing their final year of junior high. In this regard, our seventh grade dropout rates are different than those that are reported in the literature, since those include all dropouts between the first day of seventh grade and the last day of ninth grade (a cumulative dropout rate); our measure does not include dropouts during eighth or ninth grades. It should also be noted that when students finish ninth grade and do not matriculate to high school, we do not consider this to be "dropping out" (since China's education system only mandates nine years of education). Instead, we report a matriculation rate, which is defined as the share of students who finish ninth grade that matriculate to high school.

2.4. Statistical approach

We conducted power calculations to determine the minimum sample size of individuals we would need for each randomized controlled trial. We estimated that we would need approximately 380 students in total (or 190 students per treatment arm) to detect a standardized effect size of 0.20 with 80% power at a 5% significance level. As part of this calculation, we assumed that the correlation of pre-treatment covariates (e.g. baseline math score) with the outcome variable (e.g. evaluation math score) would be around 0.5. Given that we have 380 students in our ninth grade ECFA experiment and 1892 students in our seventh grade ECFA experiment, we have enough statistical power to test our hypotheses.

2.4.1. Statistical approach for the ninth grade ECFA experiment

The primary outcome variables for the ninth grade ECFA experiment were (a) student matriculation into any high school, (b) matriculation to vocational high school, and (c) matriculation to academic high school. We used ordinary least squares (OLS) regression to estimate the impact of ECFA on our outcome variables above. We first ran analyses unadjusted for covariates by regressing the outcome variables on a dummy treatment variable indicating whether individuals received ECFA or not. The basic specification of the model is:

$$Y_i = \alpha + \beta T_i + \varepsilon_i. \quad (1)$$

Where Y_i represents any of the outcome variables of interest of student i. T_i is a dummy variable that takes a value of 1 if the student received an ECFA intervention and 0 if the student was not in the treatment group. ε_i is the random error term. Specifically, β measures the effect of ECFA. For brevity, from henceforth we call this model the *unadjusted model*.

To increase statistical power and address the slight imbalances between treatment and control groups, we also conducted adjusted pair fixed effect analyses, which control for the baseline characteristics of students and their families in addition to the pair that the student was assigned. Our adjusted model is as follows:

$$Y_i = \alpha + \beta T_i + \gamma X_i + \varphi_p + \varepsilon_i \quad (2)$$

where the additional term X_i in Eq. (2) represents a vector of baseline covariates. The baseline variables include student characteristics (age; gender; indicator variables for whether the student planned to go to academic high school, planned to go to VET, or had no plans to attend high school; and math achievement in the baseline survey), parent characteristics (father and mother's years of schooling, indicator variables for whether the father and mother were healthy, and whether the father and mother had ever migrated), and family characteristics (number of siblings, family asset value). The descriptive statistics of these variables are shown in Appendix Table 1. In addition, we include φ_p, a pair fixed effect term. Note that since there were two pairs of treatment and control students in each class and there were 95 classes in the sample, the matrix φ_p actually is made up of 95 *2 "pair" dummy variables.

2.4.2. Statistical approach for the seventh grade ECFA experiment

For the seventh grade ECFA experiment, the primary outcome variables were (a) student dropout, (b) changes in plans to attend high school (three binary variables, changes in plans to go to academic high school, changes in plans to go to VET, changes in having no plans to attend high school), and (c) math achievement.

As with the ninth grade ECFA experiment, we first conducted unadjusted analyses. In contrast to the unadjusted model in the ninth grade ECFA experiment (Eq. (1)), we added a dummy variable for whether the individuals were pair control students or not. We included this variable to test for spillovers, as it is akin to including a dummy variable for whether the student was in a school with other ECFA recipients but did not receive ECFA him or herself. The unadjusted model for the seventh grade ECFA experiment is therefore:

$$Y_i = \alpha + \beta T_i + \tau P_i + \varepsilon_i. \quad (3)$$

In Eq. (3), P_i is a dummy variable that takes a value of 1 if the student was in the pair control group and 0 if the student was not in the pair control group. τ measures the spillover effect of ECFA on pair control students.

We also conducted adjusted analyses, which control for baseline student and family characteristics. The equation and variables controlled are identical to the ninth grade ECFA experiment (Eq. (2)). However, we do not include a pair fixed effect, as it would limit the sample to the students in ECFA schools. Instead, we keep the term P_i to indicate whether a student is a pair control student. In doing so, we are able to increase statistical power by including the pure control students in our sample:

$$Y_i = \alpha + \beta T_i + \gamma X_i + \tau P_i + \varepsilon_i. \quad (4)$$

3. Results

3.1. The perceived costs of attending high school

According to the baseline survey results from both the ninth and seventh grade ECFA experiments, the perceived costs of going to high school far exceeded the value of family assets of poor students in rural areas (that is, of the combined sample of 2366 ninth and seventh grade poor students). According to our data, the average value of family assets among the poor students in our sample was 3686 yuan (585 dollars) in 2011.[5] On average, poor students expected to spend 8344 yuan (1323 dollars), or 2.3 times the value of family assets, per year to attend VET. Moreover, students expected to spend 13,074 (2075 dollars), or 3.5 times the value of their family assets, per year to attend academic high school. Therefore, poor students were under the impression that the direct cost of attending high school exceeded the value of their family assets. These perceived direct costs would be exacerbated by indirect costs (opportunity costs). On average, junior high students perceived that they would earn 1248 yuan (198 dollars) per month if they entered the labor market immediately after graduating from junior high school. That is to say, the average student perceived he or she would lose 44,928 yuan (7131 dollars) in income while attending three years of high school.

Likely because the perceived costs of schooling exceeded student family assets, at the baseline 40% of students were either undecided about whether to attend high school (33%) or planned to enter the labor market after graduation (7%). In other words, there is evidence to suggest that junior high students are in fact giving up because they think the chances of attending high school are slim (as a result of high costs).

4. Impacts of early commitment of financial aid on student outcomes

4.1. Main results from the ninth grade ECFA experiment

The interpretation of the results examining the impact of the ninth grade ECFA intervention is probably most accurately stated as having no impact or at most only a relatively small impact. In the unadjusted model, although the coefficient is positive, it is not statistically significant (Table 4, column 1, row 1). When we add the pair fixed effect term and adjust for baseline covariates, the coefficient increases to 0.079. However, the coefficient is only significant at the 10% level (the 95% confidence interval or CI is [−0.011, 0.169]—see Table 4, column 2, row 1). In other words, in the only result that is even modestly significant, providing the ECFA intervention in ninth grade raised the share of students matriculating high school by 7.9 percentage points.

Our results also show that the ninth grade ECFA intervention did not encourage students to attend either vocational or academic high school (Table 4, columns 3–6). None of the coefficients in the unadjusted or the adjusted models are significant. The magnitudes of the coefficients (0.041; 0.038) are also small.

[5] Although students were not asked to list all of the family asset items, information on the main and popular family assets in rural China was collected in our survey and used to measure each student's family asset value. Furthermore, even if the value of the family assets we measured were doubled, that family asset value would still fall below the students' perceived annual cost of continuing schooling after junior high.

Table 4
Impact of ninth grade ECFA intervention on matriculation rates.
Data source: Authors' survey.

	Go to any high school		Go to VET		Go to acad. high	
	(1)	(2)	(3)	(4)	(5)	(6)
	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Get ECFA, 1 = yes	6.8	7.9*	4.2	4.1	2.6	3.8
	(4.9)	(4.6)	(3.3)	(3.3)	(4.8)	(4.2)
Student characteristics controlled		Yes		Yes		Yes
Parents' characteristics controlled		Yes		Yes		Yes
Family characteristics controlled		Yes		Yes		Yes
Pair fixed effect	Yes	Yes		Yes		Yes
Constant	79.9***	88.0*	14.6	37.8	65.4***	50.2
	(19.8)	(53.1)	(13.4)	(37.4)	(19.4)	(48.5)
Observations	380	380	380	380	380	380
R-squared	0.23	0.36	0.16	0.26	0.21	0.44

Notes: a) Cluster-robust standard errors in parentheses. b) The covariates controlled in the analysis are those described in Table 1. c) Results for binary outcomes reported in percentage points for clarity (all coefficients multiplied by 100). d) For the ninth grade ECFA experiment, we were able to follow up with 100% of our sample. As such, there was no attrition.
* Significant at 10%.
*** Significant at 1%.

4.2. Main results from the seventh grade ECFA experiment

We present the effects of the seventh grade ECFA intervention in two parts. First, we present effects on enrollment outcomes, which are not subject to any attrition. Second, we present effects on plan changes and math achievement.

Our results show that the effect of the seventh grade ECFA intervention on dropout rates is both small in magnitude and not statistically significant. Although the unadjusted model shows that ECFA increased dropout rates by 2.5 percentage points, there is no statistically significant difference in terms of dropout rates between pair treatment (ECFA recipients) and both pure and pair control students (the 95% CI is [−1.2, 6.2]—see Table 5, column 1). When controlling for variables such as student age, gender, and baseline math achievement in our adjusted model, the results are similar (column 2). The proportion of students who receive ECFA and drop out is in fact 3 percentage points higher than those in the pair control group albeit not statistically different from zero (95% CI [−0.53, 6.53]).

The effect of the seventh grade ECFA intervention on other enrollment outcomes (including transfers to other schools or other enrollment outcomes, such as taking sick leave) was also negligible. Specifically, the unadjusted model shows that pair treatment (ECFA recipients) students were 0.7 percentage points more likely to transfer to other schools compared to non-ECFA recipients (Table 5, column 3). The adjusted results are identical (column 4). However, neither result is statistically significant (the 95% CI is [−0.7, 2.1]). In terms of other enrollment outcomes (for example, taking sick leave), both our unadjusted and adjusted results show that pair treatment students were identical in outcome to pair and pure control students (columns 5 and 6). Taken together, the seventh grade ECFA intervention had no impact on enrollment outcomes.

In terms of changes in student plans, we find that ECFA significantly increases the proportion of students planning to attend academic high school, has no impact on student plans to attend VET, and reduces the proportion of students who have no plans for future schooling. Specifically, the unadjusted model shows that ECFA significantly increases the proportion of students planning to attend academic high school by 17 percentage points (95% CI [9.2, 24.1]), has no impact on plans to attend VET, and decreases the proportion of students with no plans by 14

Table 5
Impact of seventh grade ECFA intervention on enrollment outcomes after one academic year.
Data source: Authors' survey.

	Dropped out		Transferred		Other	
	(1)	(2)	(3)	(4)	(5)	(6)
	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Treatment variable						
Get ECFA, 1 = yes	2.5	3.0	0.7	0.7	−0.2	−0.2
	(1.9)	(1.8)	(0.7)	(0.7)	(0.4)	(0.4)
Pair control group, 1 = yes	1.1	1.1	−0.1	−0.2	0.2	0.3
	(1.7)	(1.6)	(0.6)	(0.6)	(0.5)	(0.5)
Student characteristics controlled		Yes		Yes		Yes
Parents' characteristics controlled		Yes		Yes		Yes
Family characteristics controlled		Yes		Yes		Yes
Constant	8.6***	−5.3***	1.2***	5.3	0.6**	6.6*
	(1.0)	(14.1)	(0.4)	(3.7)	(0.2)	(3.4)
Observations	1892	1892	1892	1892	1892	1892
R-squared	0.00	0.10	0.00	0.01	0.00	0.01

Notes: a) Cluster-robust standard errors adjusted for clustering at the school level in parentheses. b) The covariates controlled in the analysis are those described in Table 2. c) Results for binary outcomes reported in percentage points for clarity (all coefficients multiplied by 100). d) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

percentage points (95% CI [8.2, 19.6]—Table 6, columns 1, 3, and 5). When adjusting for covariates, the results are essentially the same. Students receiving ECFA are 15 percentage points (95% CI [9.3, 21.1]) more likely to plan to attend academic high school than paired control students. They are 1 percentage point more likely (95% CI [−3.6, 5.4]) to attend VET (not statistically significant), and 14 percentage points less likely to say they are undecided (95% CI [8.6,18.8]—columns 2, 4, and 6). The results for plan changes to academic high school and plan changes away from having no plans are significant at the 1% level.

Although ECFA increased student plans to attend high school, ECFA had no discernible impact on math achievement. The unadjusted model shows that students who received ECFA scored 0.07 standard deviations higher in math achievement relative to students who did not receive ECFA (Table 6, column 7). However, this finding is not statistically significant (the 95% CI is [−0.09, 0.23]). The adjusted model yields results that reverse in direction and attenuate in magnitude: when controlling for covariates, ECFA reduces student math achievement by 0.02 standard deviations (Table 6, column 8). Again, this finding is not statistically significant (the 95% CI is [−0.09, 0.13]).

We find no evidence of spillovers when we compare outcomes among the paired control and pure control groups. We see no statistically significant impacts on any of the outcome variables, regardless of whether we use the unadjusted or adjusted models (Tables 5 and 6, row 2). As such, we conclude that there were no significant spillover effects that may have biased our main results.

We also run a robustness check to examine if our results for plan changes and math achievement remain consistent when we use multiple imputation to account for missing data arising from attrition (Appendix Table 3). One concern might be that our current interpretations are driven by existing observations, but if we were to include data from the missing students our results would change. While multiple imputation cannot fully reconstruct the missing data, we conduct the analysis to determine how sensitive our existing analysis is to missing data. While we do present the tables in our appendix, we omit a thorough discussion of the results from these additional analyses for brevity. Indeed, the results are substantively similar to and support the main results above: ECFA has no significant impact on dropout, increases the proportion of students planning to attend academic high school, has no impact on the proportion of students planning to attend VET, reduces the proportion of students who are undecided, and has no impact on math achievement.

4.3. Comparing the ninth and seventh grade ECFA experiments

Taking the two experiments together, we find that neither program had what can be called a significant and/or strong impact on behavior.

Table 6
Impact of seventh grade ECFA intervention on student plans and achievement.
Data source: Authors' survey.

	Plans to go to acad. high schools at follow-up survey		Plans to go to voc. high schools at follow-up survey		Having no plan for future schooling at follow-up survey		Math achievement	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Treatment variable								
Get ECFA, 1 = yes	16.6***	15.2***	0.3	0.9	−13.9***	−13.7***	0.07	−0.02
	(3.8)	(3.0)	(2.4)	(2.3)	(2.9)	(2.6)	(0.08)	(0.06)
Pair control group, 1 = yes	5.6	4.8	−1.8	−1.1	−2.6	−2.8	0.03	−0.01
	(3.9)	(3.0)	(2.0)	(2.0)	(3.4)	(2.9)	(0.09)	(0.06)
Student characteristics controlled		Yes		Yes		Yes		Yes
Parents' characteristics controlled		Yes		Yes		Yes		Yes
Family characteristics controlled		Yes		Yes		Yes		Yes
Constant	46.5***	68.0***	15.0***	−13.0	29.9***	26.4*	−0.12**	0.32
	(2.4)	(17.9)	(1.3)	(14.4)	(1.9)	(15.9)	(5.2)	(30.2)
Observations	1672	1672	1672	1672	1672	1672	1672	1672
R-squared	0.02	0.28	0.00	0.10	0.02	0.12	0.00	0.39

Notes: a) Cluster-robust standard errors adjusted for clustering at the school level in parentheses. b) The covariates controlled in the analysis are those described in Table 2. c) Results for binary outcomes reported in percentage points for clarity (all coefficients multiplied by 100). d) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

The only result that is robustly significant is one where seventh grade students respond by making changes in plans (from having no plans to planning to attend academic high school) but with no concomitant changes in behavior.

Why might it be that ECFA is not able to change behavior in ninth grade? One reason may be that the ninth grade students are self-selected on a variety of observable background characteristics. They are also almost certainly more motivated. Given high dropout rates between the seventh and ninth grade (measured by others—such as Yi et al., 2012), it perhaps should not be surprising that there were systematic differences in the sample of the students that participated in the ninth grade ECFA program and those that participated in the seventh grade ECFA program. According to our baseline data collected in November 2010 (Table 7), students in the ninth grade ECFA program are older (15.3 years compared to 13.7 years—row 1); more intent on going to academic high (53% versus 43%—row 3); and clearer about their plans (only 25% of ninth graders said they had no plans versus 38% of seventh graders—row 5). These differences are all significant at the 1% level.

In addition, the economic status of families appeared to favor those in the ninth grade ECFA program (Table 7, rows 7 to 14). For example, ninth grade ECFA program students were from families that had higher levels of human capital (compared to seventh grade ECFA program participants). Specifically, ninth grade students (on average) had mothers with more years of education (a difference of 0.79 years, statistically significant at the 1% level). Compared to seventh grade ECFA students, ninth grade ECFA students were also likely from families of higher economic status as they had fewer siblings (0.73 fewer siblings on average—statistically significant at the 1% level).

Since our sample students for the two programs were chosen the same way and were from schools that were randomly chosen from the same sampling frame, the differences in the characteristics of the students are almost surely due to the fact that the set of ninth grade ECFA program students are self-selected (compared to seventh grade ECFA program students). The differences in characteristics are consistent with the characteristics of dropouts (as described in Yi et al., 2012): dropouts tend to be older, with lower educational aspirations, and from families with lower human capital. A group of seventh grade students that stayed in school would, by ninth grade, be relatively younger, have higher aspirations to stay in school, and be better off (with parents that have higher human capital) than the students who dropped out. This almost exactly summarizes the differences between the ninth grade ECFA program students and seventh grade ECFA program students. Therefore, given the fact that the students in our ninth-grade ECFA program are more motivated and have parents that (because of their higher levels of human capital) are likely more committed to giving their children an education, it is perhaps not surprising that the ECFA offer did not change behavior. Students and families in this group already made a commitment to try to attend high school, if possible. The ECFA offer did not change their behavior (or at most changed behavior only modestly).

4.4. Realistic or wishful thinking? Examining patterns of change in seventh graders' plans

If ECFA caused seventh grade students to change their plans to attend academic high school and, if the offer of financial aid was the key in making a difference in whether a student could go onto more schooling, the expectation should be that they would persist in school and work harder to improve their scores. However, despite the fact that we observe changes in plans among students, we do not find changes in their behavior. One possible explanation for this finding is that many of the seventh grade students that changed their stated plans are really, in fact, only wishful thinkers. For example, we seem to find that ECFA shifted student plans from “no plans” to plans to attend academic high school (instead of VET). If students who had “no plans” at the baseline had poor academic achievement (in our case, low math achievement test scores), such a finding would suggest that they were not being realistic. This is because entry to academic high school is highly competitive and requires the highest academic achievement as compared to all other possible plans. If “no plans” students had low academic achievement, they would have little chance to attend academic high school even after planning to (wishful thinking).

A second possibility is that the changes in plans of ECFA students to go to academic high school were in fact realistic. If ECFA caused higher achieving students who had “no plans” at the baseline to change their plan to attend academic high school, they would be considered enlightened by the treatment (rather than wishful thinkers, in the sense that they would be making a rational decision).

Table 7
Student and family characteristics in the same schools in Shaanxi, by grade.
Data source: Authors' survey.

Variable	Ninth grade	Seventh grade	t-Test H0:(1) = (2)
	(1)	(2)	(3)
Student characteristics at baseline			
1. Student age, year	15.30 [0.95]	13.70 [1.19]	−1.61*** (0.07)
2. Female student, 1 = yes	0.50 [0.50]	0.50 [0.50]	0.00 (0.03)
3. Plans to go to acad. high after jr. high, 1 = yes	0.53 [0.50]	0.43 [0.50]	−0.10*** (0.03)
4. Plans to go to voc. high after jr. high, 1 = yes	0.13 [0.34]	0.13 [0.33]	−0.01 (0.02)
5. Have no plan for future schooling, 1 = yes	0.25 [0.43]	0.38 [0.48]	0.13*** (0.03)
6. Z-score of standardized TIMSS test score	−0.02 [1.02]	−0.04 [1.00]	−0.02 (0.08)
Parents' characteristics at baseline			
7. Mom's years of schooling	5.05 [3.15]	4.26 [3.48]	−0.79*** (0.24)
8. Dad's years of schooling	7.02 [2.93]	6.68 [3.02]	−0.34 (0.21)
9. Mom's health status, 1 = good	0.33 [0.47]	0.29 [0.46]	−0.04 (0.03)
10. Dad's health status, 1 = good	0.42 [0.49]	0.41 [0.49]	−0.02 (0.03)
11. Mom ever migrated, 1 = yes	0.64 [0.48]	0.62 [0.48]	−0.02 (0.04)
12. Dad ever migrated, 1 = yes	0.90 [0.30]	0.88 [0.32]	−0.02 (0.02)
Family characteristics at baseline			
13. Number of siblings, person	0.29 [0.65]	1.02 [0.81]	0.73*** (0.04)
14. Family asset value, 1000 yuan	2.39 [1.59]	2.20 [1.32]	−0.18 (0.14)
Number of observations	960	380	

Notes: a) Means with standard deviations reported in brackets. b) Cluster-robust standard errors adjusted for clustering at the school level in parentheses.
*** Significant at 1%.

There is a third possibility: while there was no net increase in students planning to attend VET, it could be that ECFA caused some students with "no plans" to plan for VET (which has no formal academic requirement) but simultaneously caused the same number of students to shift their plans away from VET to academic high school. In this case, even if we assume "no plan" students had low math achievement, they would be thinking realistically about the level of schooling they could attain when changing their plans to attend VET. Since VET has fewer academic requirements than academic high school, they may not have needed to work as hard. This would also support the idea that students had realistic expectations (as opposed to wishful thinking). Note that, for this interpretation (that students are being realistic) to be true, the VET students who shifted plans to attend academic high school needed to already be high achievers (and, hence, would not have to work as hard and were never planning to drop out).

The fact that there are three possibilities (and perhaps even more) suggests our need to go beyond the aggregate results to examine the patterns of change in seventh grade student plans. To do so, we pursue a two-step analytical plan. The first step is to compare the math achievement distributions of different subgroups of students by the nature of their plans at the time of the baseline survey: those who plan to go to academic high school, those who plan to go to VET, those who plan to go directly into the labor force, or those with no plans. We use this step to determine what types of students—high achievers or low achievers at the baseline—were part of which category of plans. The second step involves running regressions for each of these four subgroups of students. These analyses are meant to help us identify the impact of ECFA on the plans of students in each subgroup separately. This step might help us see if there were offsetting effects (e.g., did "no plans" students shift into VET plans and VET plans students shift into academic high school plans, leaving the net impact to be zero).

Our first step is to split students into four subgroups based on their baseline plans. We calculate each subgroup's average baseline math achievement (see Appendix Fig. 1) and rank them as follows:

- Rank 1: the subgroup of students with plans to go to academic high school at the baseline (highest baseline achievement)
- Rank 2: the subgroup of students with no plans at the baseline
- Rank 3: the subgroup of students with plans to go to VET at the baseline
- Rank 4: the subgroup of students with plans to go into the labor market at the baseline (lowest baseline achievement).

We find that students with no plans at the baseline demonstrate higher math achievement (on average) than students planning for VET at the baseline. This finding suggests that students with no plans were being reasonable when they changed their plans to attend academic high school as a result of ECFA.[6]

Our second step is to examine the impact of ECFA on the plans of each rank separately. In this analysis, we first limited the sample to those students with a particular set of baseline plans (Ranks 1–4) and regressed student plans at the follow-up survey on an indicator for ECFA treatment and our standard set of control variables (identical to our adjusted model).

We find that, among students whose baseline plans were to attend academic high school, ECFA recipients were 8.7 percentage points more likely to maintain their plans at the follow-up survey (compared to students that were planning for academic high school at the baseline but that did not receive ECFA). The rise of 8.7 percentage points is statistically significant at the 5% level (95% CI [2.2, 15.2]—Appendix Table 4, row 1, column 1). The results of the same regression exercise (that is, limiting our sample only to students that said they planned to go to academic high school at the baseline) show that ECFA also reduced the number of students reporting no plans by the follow-up survey (by 6.1 percentage points and significant at the 5% level—row 1, column 2, 95% CI [1.2, 11]). In other words, among students with plans to attend academic high school at the baseline, ECFA caused students who would have otherwise turned to "no plans" to maintain their original plans (to attend academic high school).

Among students whose baseline plans were "no plans," ECFA recipients were more likely at the follow-up survey to plan to go to academic high school (a rise of 21.9 percentage points, significant at the 1% level or a 95% CI [13.1, 30.7]—Appendix Table 4, row 1, column 4). They were also 23.8 percentage points less likely to have no plans at the follow-up survey (significant at the 1% level or a 95% CI [14.6, 33.0]—row 1, column 5). ECFA did not cause any statistically significant shifts to VET. As such, we conclude that "no plans" students who would otherwise maintain their trajectory ("no plans") turned to plans for academic high school as a result of ECFA. Having access to ECFA appears to be significantly useful in helping seventh grade junior high students who were not sure of their future plans to solidify their plans—and solidify them in a way that made them plan for academic high school.

Among students whose baseline plans were to attend VET, the only statistically significant finding was that ECFA recipients shifted away from having no plans (by 11 percentage points compared to the non-ECFA group whose baseline plans were also to attend VET). This difference is significant at the 10% level (95% CI [−0.6, 23.0]—Appendix Table 5, row 1, column 8). This means that the ECFA treatment (compared to the control) kept students with plans to attend VET at the baseline from becoming uncertain about future plans (and thus becoming part of the no plan group at the follow-up survey). So what do the ECFA recipients who had plans at the baseline to attend VET do? While the coefficient is not statistically significant, there is some evidence (using point estimates) that students mainly shifted to plans from VET towards academic high school (by 9.6 percentage points, 95% CI [−4.9, 24.1]—row 1, column 7).

Among students whose baseline plans were to enter the labor market, ECFA had no statistically significant effects. In other words, ECFA did not significantly change the plans of students who wanted to enter the labor market.

In summary, these decomposition results help to explain our aggregate findings for the seventh grade ECFA experiment (ECFA increases plans for academic high school, has no impact on plans for VET, decreases "no plans," and has no impact on plans to enter the labor market). In fact, ECFA caused students to solidify their plans (or kept them from becoming uncertain about their future plans). Specifically, ECFA induced students who were originally planning on attending high school to keep those plans. It also induced students with no plans (who actually had higher math achievement, on average, than students planning to attend VET) to plan for academic high school. Finally, ECFA also kept students who were planning on attending vocational schools from becoming less certain about their future plans and becoming "no plan" students.

Taken together, these patterns of changes in student plans (as a result of ECFA) hint at an interpretation that the reaction to the ECFA treatment is one in which students changed their plans in a way that might enhance their future human capital (i.e. attend high school). However, more information is needed before we can say that students are being realistic. We need to know the type of student (from what part of the distribution within each subgroup) who shifted his or her plan. For example, if students shifting their plans from "no plan" to academic high school were from the bottom end of the test score distribution, it could still be wishful thinking.

As such, our next step is to understand where plan-changing students fall in the achievement distribution. Realistic students who receive ECFA would tend to change their plans to attend academic high school if their math achievement was high compared to their peers (i.e. they had a reasonable chance to attend high school). Wishful thinkers who receive ECFA, on the other hand, might change their plans to attend academic high school without regard to their ability to actually attend.

In fact, we ultimately find evidence that students are being wishful thinkers. In Appendix Fig. 2, we juxtapose the math achievement of

[6] Note that this exercise by itself only examines average academic achievement without identifying if the plan changers (from no plans to academic high school) had high or low academic achievement—whether plan changers were wishful thinkers or those with realistic expectations.

students (at the follow-up survey) of three groups who were subject to the ECFA treatment:

a.) those who changed from "no plan" to "plan to go to academic high school";
b.) those who changed from "plan to go to VET" to "plan to go to academic high school"
c.) those who changed from "plan to go to the labor market" to "plan to go to academic high school".

We find that on average, students in all three groups (groups a, b and c) who were offered ECFA and changed their plans to attend academic high school had scores that were below average. Importantly, these scores were the scores that the students had achieved at the time that they were telling us they were changing the plans (the follow-up survey). Because China's education system is so competitive, one would have to wonder if these students would ever be able to make it into academic high school despite their stated intentions (new plans). It is for this reason that we conclude that the students (on average) are wishful thinkers.

The idea that our ECFA treatment mainly convinced wishful thinkers to change their plans is supported by the other results in our findings (Table 6). Because they were wishful thinkers (and hence, not thinking realistically about their plans), it is also not unexpected that most students would not materially change their behavior. Indeed, ECFA had no impact on student dropout rates or math achievement among our seventh grade sample (Table 5). In short, the seventh grade ECFA intervention changed the wishful thinkers' minds but did not change their behavior.

5. Conclusions

In this study, we sought to estimate the impact of providing two early commitment of financial aid (ECFA) programs at different times. The ninth grade ECFA experiment was designed to allow us to examine the impact of ECFA on the dropout rates, actual high school matriculation rates, and math achievement of poor ninth grade students in rural China. The seventh grade ECFA experiment was almost identical in design, with exception to examining plans to attend high school in lieu of matriculation rates. Moreover, the seventh grade ECFA experiment was designed to ascertain the presence of any spillovers.

When we executed the ninth grade ECFA experiment, we found no significant impacts on high school matriculation. The program was not able to significantly increase matriculation into high school (either VET or academic high school). According to the findings, there were also no impacts on student dropout rates or academic achievement (but, this not particularly surprising because the intervention was given so near the time when students have to make choices about future schooling).

The seventh grade ECFA intervention also had no substantive impact. Specifically, we found no effect on student dropout rates. And, although the results showed that the intervention increased the proportion of students planning to attend academic high school by 15 percentage points, the intervention: a.) had no effect on student plans to attend VET; b.) decreased the proportion of students without plans by 14 percentage points; and, c.) had no effect on math achievement. In sum, the seventh grade ECFA changed students' plans to attend academic high school largely by solidifying student plans (reducing the number of students with no plans) but yielded no material changes in student behavior.

By failing to find a positive impact of ECFA on matriculation, the findings of our study differ from those of prior studies. Even the 95% CI of our most optimistic point estimate (the impact of ninth grade ECFA after controlling for baseline covariates—[-0.011, 0.169]) appears to rule out the larger positive effects found in Colombia (95% CI of [0.413, 0.497]—see Barrera-Osorio et al., 2011) and the United States (95% CI of [0.125, 0.195]—see Kane, 2007).

What is it that might have led to such anemic results? It is likely that China's school system is so competitive that performance is the overwhelming criteria for high school matriculation and that ECFA-like funding is of secondary importance. By the time the ninth grade ECFA program was implemented, there had been considerable dropout. Since it is mostly the least competitive, vulnerable students (those that are older for their grade, with lower aspirations, with parents with lower human capital) that drop out, this means that most of the ninth grade students were already committed to going on to high school no matter if they received ECFA funding or not. This is perhaps why the results of our unadjusted model showed no significant impacts from ECFA and the results of our adjusted model showed that (at most) only a small share (around 7 percent) of students lacked financial support (or a strong signal). Hence, the ninth grade ECFA program had a small effect—if any.

If the seventh grade ECFA intervention changed the plans of students, why did the plan changes fail to translate to behavioral changes? Our results suggest that one reason ECFA did not materially change the behavior of students was because they were (on average) wishful thinkers who changed their plans without regard to whether they could actually accomplish their plans. Perhaps the students did not understand how competitive the education system is (see, for example, Loyalka et al., 2013). Or perhaps the students were not equipped (as a result of youth or inexperience) to think about the effort needed to achieve their goals three years into the future. Because ECFA does not drive material changes in student behavior, we conclude that ECFA (at seventh grade) is unlikely to accomplish its intended impact of increasing enrollment to high school.

In terms of policy implications, our results suggest that if the government is interested in providing poor students opportunities to go to high school, the interventions to get them to go to high school need to be more creative and focus on other activities rather than offering ECFA-like funding during junior high school. Actions that might make poor rural students more competitive in junior high school or even elementary school might be more effective in competitive systems such as those in China. Of course, more research is needed before the effectiveness of such programs can be validated.

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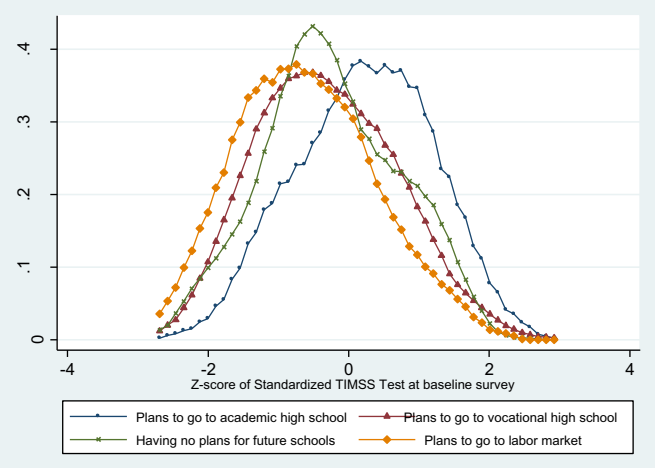
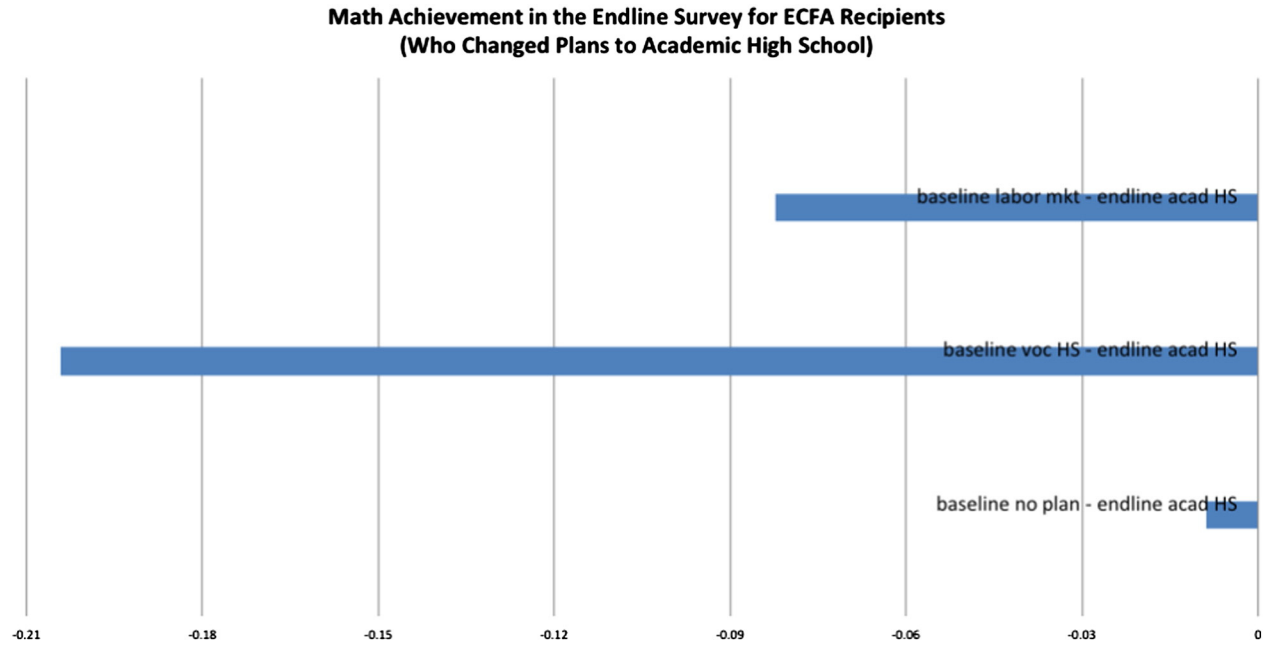
Appendix A



Appendix Fig. 1. Distribution of Z-score of standardized TIMSS test at baseline survey, by students' plans.



Appendix Fig. 2. Math achievement in the follow-up survey for different student subgroups.

Appendix Table 1
Description of variables in ninth grade ECFA experiment.
Data source: Authors' survey.

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Matriculated into academic or voc. high at follow-up survey	380	0.51	0.50	0.00	1.00
Matriculated into academic high at follow-up survey	380	0.12	0.33	0.00	1.00
Matriculated into voc. high at follow-up survey	380	0.39	0.49	0.00	1.00
Treatment variable					
Get ECFA, 1 = yes	380	0.50	0.50	0.00	1.00
Pair control group, 1 = yes	380	0.50	0.50	0.00	1.00
Controlling variables collected at baseline survey					
1. Student age, year	380	15.31	0.94	13.00	19.00
2. Female students, 1 = yes	380	0.50	0.50	0.00	1.00
3. Plans to go to acad. high, 1 = yes	380	0.53	0.50	0.00	1.00
4. Plans to go to voc. high, 1 = yes	380	0.13	0.34	0.00	1.00
5. Have no plan for future schooling, 1 = yes	380	0.25	0.43	0.00	1.00
6. Z-score of standardized TIMSS test	380	−0.02	1.02	−3.63	2.11
7. Mom's years of schooling	380	5.04	3.00	0.00	16.00
8. Dad's years of schooling	380	7.02	2.84	0.00	15.00
9. Mom's health status at baseline survey, 1 = good	380	0.33	0.45	0.00	1.00
10. Dad's health status at baseline survey, 1 = good	380	0.42	0.49	0.00	1.00
11. Mom ever migrated at baseline survey, 1 = yes	380	0.64	0.46	0.00	1.00
12. Dad ever migrated at baseline survey, 1 = yes	380	0.90	0.30	0.00	1.00
13. Number of siblings at baseline survey, person	380	0.29	0.65	0.00	3.00
14. Family asset value at baseline survey, 1000 yuan	380	2.34	1.25	0.00	10.08

Note: After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*.

Appendix Table 2
Description of variables in seventh grade ECFA experiment.
Data source: Authors' survey.

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Dropout	1892	0.09	0.29	0.00	1.00
Plans to go to acad. high at follow-up survey	1672	0.15	0.35	0.00	1.00
Plans to go to voc. high at follow-up survey	1672	0.51	0.50	0.00	1.00
Having no plan for future schooling at follow-up survey	1672	0.26	0.44	0.00	1.00
Z-score of standardized TIMSS test at follow-up survey[a]	1672	−0.04	0.90	−3.96	3.13

(continued on next page)

Appendix Table 2 *(continued)*

Variable	Obs	Mean	Std. Dev.	Min	Max
Treatment variable					
Get ECFA, 1 = yes	1892	0.25	0.43	0.00	1.00
Pair control group, 1 = yes	1892	0.25	0.43	0.00	1.00
Pure control group, 1 = yes	1892	0.50	0.50	0.00	1.00
Controlling variables collected at baseline survey					
1. Student age, year	1892	13.54	1.05	10.81	18.62
2. Female students, 1 = yes	1892	0.51	0.50	0.00	1.00
3. Plans to go to acad. high, 1 = yes	1892	0.46	0.50	0.00	1.00
4. Plans to go to voc. high, 1 = yes	1892	0.14	0.34	0.00	1.00
5. Have no plan for future schooling, 1 = yes	1892	0.33	0.47	0.00	1.00
6. Z-score of standardized TIMSS test	1892	−0.09	1.01	−2.72	2.72
7. Mom's years of schooling	1892	5.26	3.43	0.00	20.00
8. Dad's years of schooling	1892	6.99	2.90	0.00	19.00
9. Mom's health status at baseline survey, 1 = good	1892	0.38	0.47	0.00	1.00
10. Dad's health status at baseline survey, 1 = good	1892	0.46	0.49	0.00	1.00
11. Mom ever migrated at baseline survey, 1 = yes	1892	0.48	0.49	0.00	1.00
12. Dad ever migrated at baseline survey, 1 = yes	1892	0.79	0.40	0.00	1.00
13. Number of siblings at baseline survey, person	1892	1.01	0.81	0.00	5.00
14. Family asset value at baseline survey, 1000 yuan	1892	3.69	2.66	0.00	17.36

Notes: After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*.
[a] Variable mean and standard deviation not equal to 0 and 1 because it was standardized across the entire sample of poor and non-poor students.

Appendix Table 3
Impact of seventh grade ECFA intervention on student outcomes—Imputation results.
Data source: Authors' survey.

	Plans to go to acad. high schools at follow-up survey		Plans to go to voc. high schools at follow-up survey		Having no plan for future schooling at follow-up survey		Z-score of standardized TIMSS test at follow-up survey	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Get ECFA, 1 = yes	14.48***	12.88***	−0.07	0.69	−11.51***	−11.19***	0.08	−0.01
	(2.83)	(2.46)	(2.33)	(2.23)	(2.52)	(2.45)	(0.06)	(0.05)
Pair control group, 1 = yes	5.54*	4.51*	−1.97	−1.12	−2.12	−2.29	0.02	−0.01
	(2.92)	(2.54)	(2.13)	(2.09)	(2.80)	(2.71)	(0.06)	(0.05)
Observations	1892	1892	1892	1892	1892	1892	1892	1892

Notes: a) Imputations = 8. b) Cluster-robust standard errors in parentheses. c) The covariates controlled in the analysis are those described in Table 2. d) After matching students in ECFA treatment schools into pairs, we randomly assigned one student in each pair to either a *pair treatment group* (students that were assigned to receive ECFA) or a *pair control group* (students that were not assigned to receive ECFA). Students in schools in which no student received ECFA, by contrast, were designated the *pure control group*.
* Significant at 10%.
*** Significant at 1%.

Appendix Table 4
Impact of seventh grade ECFA on student plans in the follow-up survey for subgroups of students who had different baseline plans: Part 1.
Data source: Authors' survey.

	Students with Plans to go to acad. HS in the baseline (Rank 1)			Students with no plans in the baseline (Rank 2)		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Plan acad HS	No plan	Plan VET	Plan acad HS	No plan	Plan VET
Treatment variable						
Get ECFA, 1 = yes	8.7**	−6.1**	−1.2	21.9***	−23.8***	3.5
	(3.3)	(2.5)	(2.1)	(4.5)	(4.7)	(4.1)
Student characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Parents' characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Observations	817	817	817	545	545	545
R-squared	0.07	0.03	0.03	0.13	0.07	0.03

Note: Cluster-robust standard errors in parentheses.
*** $p < 0.01$.
** $p < 0.05$.

Appendix Table 5
Impact of seventh grade ECFA on student plans in the follow-up survey for subgroups of students who had different baseline plans: Part 2.
Data source: Authors' survey.

	Students with plans to go to Voc. HS in the baseline (Rank 3)			Students with plans to go to labor Mkt. in baseline (Rank 4)		
	(7)	(8)	(9)	(10)	(11)	(12)
Variables	Plan acad HS	No plan	Plan VET	Plan acad HS	No plan	Plan VET
Treatment variable						
Get ECFA, 1 = yes	9.6	−11.2*	2.4	12.6	−13.2	12.3
	(7.4)	(6.0)	(8.2)	(10.1)	(9.6)	(10.4)
Student characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Parents' characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics controlled	Yes	Yes	Yes	Yes	Yes	Yes
Observations	212	212	212	96	96	96
R-squared	0.06	0.12	0.09	0.23	0.09	0.09

Note: Cluster-robust standard errors in parentheses.
* $p < 0.1$.

Appendix B. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jdeveco.2014.11.002.

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