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School Dropouts and Conditional Cash Transfers: Evidence from a Randomised Controlled Trial in Rural China's Junior High Schools

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ABSTRACT *The overall goal of this study is to examine if there is a dropout problem in rural China and to explore the effectiveness of a Conditional Cash Transfer (CCT) programme on the rate of dropping out. To meet this goal, we conduct a randomised controlled trial (RCT) to assess the impact of the CCT using a sample of the poorest 300 junior high school students in a nationally-designated poor county in Northwest China. We find that the annual dropout rate in the study county was 7.8 per cent and even higher, 13.3 per cent, among the children of poor households. We demonstrate that a CCT program reduces dropout by 60 per cent. The programme is most effective among students with poor academic performance, and likely more effective among girls and younger students.*

1. Introduction

Poverty is closely related to high dropout rates (Brown and Park, 2000; Filmer, 2000). In 2002, 113 million children of primary school age around the world were not enrolled in school (UNDP, 2003); 94 per cent of the elementary school dropouts lived in developing countries (UNESCO, 2002). In 2000 secondary gross enrollment rates were almost all over 95 per cent in developed countries, while it is only 47 per cent in South Asia (World Bank, 2003). With limited resources to pay for costs of an already low-quality education, poor families are much more likely to consider dropping out (Banerjee et al., 2000; Gould et al., 2004).

Competitive education systems are also closely related to dropout, even when schooling is free (Glewwe and Kremer, 2006). Competitive educational systems that are characterised by limited space in schools, quality-based tracking, and high-stakes entrance tests have been found to be associated with high dropout rates (Clarke et al., 2000; Reardon and Galindo, 2002). Poorly performing students invest less time and energy into schooling because they have lower expectations of success (Valenzuela, 2000). Orfield and Wald (2001) show that students from poor families tend to invest fewer resources in education because they cannot compete with richer students in securing limited spots in future school systems.

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The literature has also shown that rising opportunity costs as a result of increasing wages in the unskilled labor market also often pull students out of school. When wage rates rise, students may reduce their targeted levels of educational attainment even when schooling is free (Angrist and Lavy, 2009; Fiszbein and Shady, 2009). Gender and age can thus be critical factors in dropout. In fact, girls may have higher enrolment rates than boys when the unskilled wage rate is rising (Glewwe and Kremer, 2006), probably because boys may be more likely to leave home for work (at earlier ages relative to girls). Moreover, older students attend school less frequently than younger students, if older children are more likely to find jobs that have relatively higher rates of pay (Barrera-Osorio et al., 2008; Hanushek et al., 2008).

In recent years governments facing dropout and other educational problems have effectively employed conditional cash transfers (CCT). In its most basic form a CCT programme provides payments, or cash transfers, to parents conditional on their child's enrolment or attendance in school. The World Bank (2009) reports that more than 20 developing countries have some type of CCT program in place. Several studies conducted in various parts of the developing world have demonstrated that CCT programmes raise schooling rates (de Brauw and Hoddinott, 2010; Chaudhury and Parajuli, 2008; de Janvry et al., 2006; Heinrich, 2006; Gertler, 2004; Schultz, 2001; among others).

China may also be facing a dropout problem in rural areas. The official rate of dropouts reported in the 2006 China Yearbook of Education is 2.6 per cent (MOE, 2006). Although this is a very low dropout rate, it is a national average. As such, rural areas may have much higher rates of dropout. Indeed, recent anecdotal studies suggest that dropout rates may be higher and actually increasing over time, at least in poor rural areas (Li, 2010; Tong, 2010).

Reports suggesting higher dropout rates may have credence based on the fact that China is a country that has many of the characteristics that are found in other countries with high rates of dropout. Substantial poverty remains a challenge, as tens of millions rural absolute poor still live under $1 consumption per day (Olivia et al., 2011). In rural areas across China less than half of the junior high school students can score high enough to test into high schools, because they are confronted with highly competitive entrance exams in order to be promoted from junior high school to high school (Liu et al., 2010; Chen, 2008). Moreover, the opportunity cost of attending schools in China is rising as wages for low-skilled jobs are increasing by 8 to 9.8 per cent per year (Park et al., 2007). Huang et al. (2011) shows that during the late 2000s virtually all young, able-bodied rural individuals were able to find a job off the farm in China's coastal provinces, even for children younger than 15 years old (Sina News, 2010, 2011).

Unfortunately, there is little empirical evidence available to understand the extent of dropout and potential solutions to reduce dropout in rural China. Aside from newspaper reports and anecdotes, there have been no systematic studies of dropout in rural China. Furthermore, as the world's largest developing country, China has been conspicuously absent from the list of countries that have experimented with CCTs as a way to improve educational outcomes.

While there have been evaluations of CCTs in other countries, this study of a CCT in the rural Chinese context is interesting to the field. To our knowledge CCTs have never been implemented and evaluated in the context of a country like China, where the economy continues to grow rapidly and parents traditionally have placed high value on education. These special characteristics make it difficult, ex ante, to predict the effectiveness of CCTs. On the one hand, CCTs seem to be designed to offset poverty and/or rapidly rising opportunity costs, which should make CCTs effective in a country like China. On the other hand, when there already is a strong education ethos, the decision to allow a child to drop out and work off the farm far from the village as a migrant is likely to have been well thought out. As such, CCTs which offer payments to keep children in school may not be as effective. Hence, adding a rigorous impact analysis from an (East) Asian context should be of interest to development economists and educators.

The overall goal of this study is to better understand dropout and to explore the effectiveness that CCT programmes might have on dropout. To meet this broad goal, we have two specific objectives. First, we document the extent and nature of dropouts among junior high school

students. Second, we measure the impact of a CCT intervention on reducing dropout rates and assess if a CCT is more or less effective with certain subgroups of students.

One of the main limitations of our study is that it is restricted to one county due to limited funding and organisational resources. Although we cannot be assured that the results are generalisable to other regions of China, the location of the study is arguably representative of China's poor western areas. In 2008, the average annual rural income in the county was 1024 Yuan (297 USD in Purchase Price Parity terms – World Bank, 2008), a level of per capita income close to those of other poor rural counties. As with other poor western areas, the county has few agricultural resources, high rates of migrant worker outflow and poor transportation infrastructure (Guo and Zhang, 2008).

The rest of the article is organised as follows. Section 2 explains the design of the study, describes the dataset, and reviews the study's statistical approach. Section 3 presents the results of the analysis. Section 4 concludes.

2. Research Design, Data and Statistical Approach

We conducted a randomised controlled trial (RCT) to assess the effectiveness of a conditional cash transfer (CCT) programme using a sample of students in schools in a poor county in North-West China (Figure 1). The county is located in a remote, mountainous region on China's Loess Plateau. All 10 junior high schools (serving students in grades 7 to 9) in the county participated in our survey. There were a total of 1507 grade 7 students in the sample schools.[1]

Our sampling methodology is as follows. Among the more than 1500 students in the county's grade 7 classes, we chose the poorest 300 students to participate directly in the RCT.[2] Three months before students in this county began grade 7, we visited every grade 6 class in every elementary schools in the county. When we were in these schools, our enumerator teams independently elicited two rankings. One ranking was from grade 6 homeroom teachers (the teacher who supervises the student's performance and activities and reports to the parents). The other ranking was from the school's principal. If a student appeared in either one of the rankings as one of the poorest ten students in the class, he or she became part of our list of the poorest students in the county. In this way we developed a sampling frame of the 328 poorest students in the county. We then randomly chose 300 students to be part of the RCT sample. After these

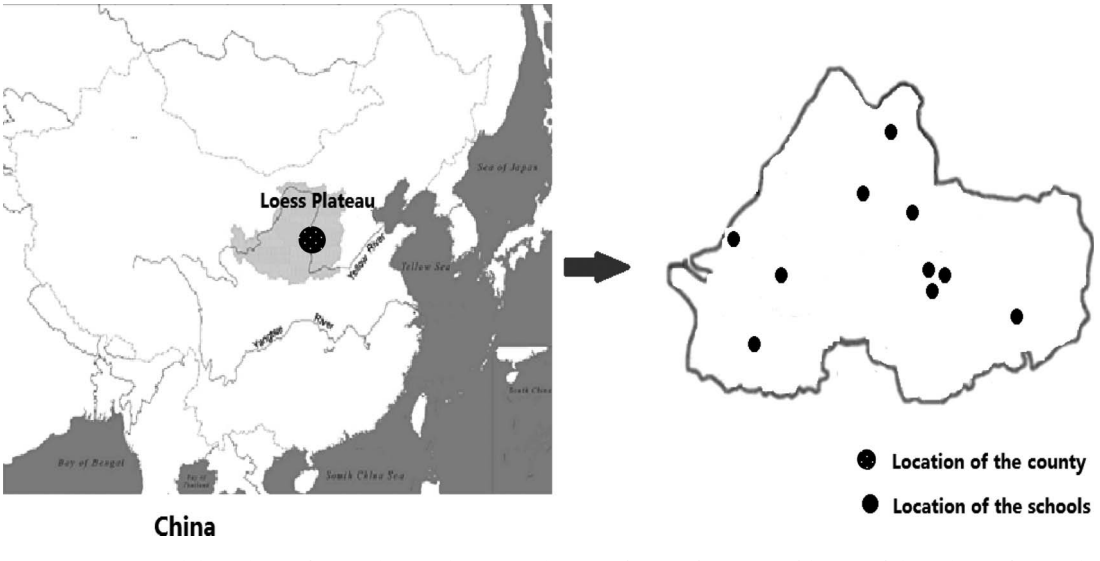

Figure 1. General location of experimental county in North/North-West China and location of sample junior high schools in the county.

grade 6 elementary school students matriculated into junior high school, there was an average of 30 'poor students' (defined in our sample as the poorest grade 7 students in the county) in each junior high school. Implementing this canvas survey to select participants was step one in our methodology (Figure 2, Step 1).

After the students entered junior high school in September 2009, the research team conducted a baseline survey of all 1507 junior high school students, including the 300 sample students (Figure 2, Step 2). During the survey we collected data from students, teachers, and the school principals (for more details, see the Data Collection subsection below). The baseline was completed before the study participants were assigned to either the treatment or control group. As such, the students and enumerators were blind about an individual's assignment status at the time of the baseline survey.

Following the baseline survey, our research team randomly assigned half of the 300 students to the treatment group and half to the control group (Figure 2, Step 3). The students in the treatment group were enrolled in the CCT programme in October 2009 (for more details, see the Intervention subsection below). The students in the control group received no CCT payments. We called these 150 students under the control condition 'Control Group 1'.

We also followed the other 1207 non-poor students, categorising them under the title 'Control Group 2', an alternative control group. Although by construction the students in Control Group 2 are less poor and likely differ in other ways, we still were interested in the dropout behaviour of students in this group.[3] The students in the control groups were not aware of the CCT programme.

Using baseline data, we ensured that the treatment and the control groups were balanced; that is, statistically identical with respect to certain key variables (for more details about these variables, please see the section of Data Collection). When comparing the means of a set of control variables between students from the Treatment Group (Table 1, column 1) and Control Group 1 (column 2), the differences (column 4) are all statistically insignificant (all P-values in column 5 are greater than 0.05). The control variables in Table 1 include measures of poverty (row 1), student characteristics (rows 2 to 5), family characteristics (rows 6 to 8) and the characteristics of the homeroom teachers of the students in the treatment and control groups (rows 9 to 11).

Although there are statistical differences between students from the Treatment Group (column 1) and Control Group 2 (column 3), which can be seen by the large differences (column 6) and relatively low P-values (column 7), such results are not unexpected. In fact, the much higher proportion of students who did not live in cave or adobe houses (our proxy for poverty – see

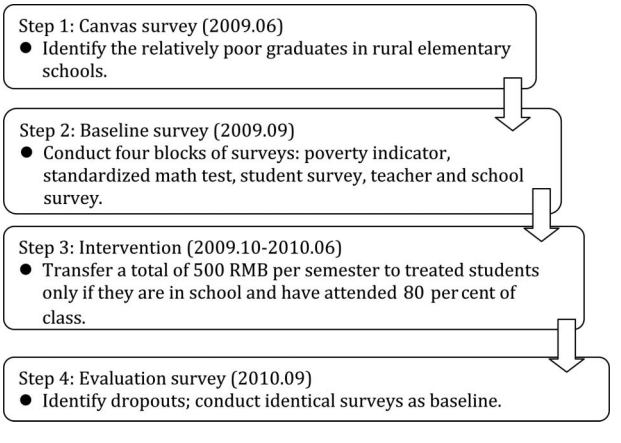

Figure 2. The flow and experimental design of the conditional cash transfer randomised controlled trial in North/North-West China's junior high schools.

below for more details) in Control Group 2, relative to the Treatment Group (row 1) means that those students in the Treatment Group and Control Group 1 were indeed relatively poor.

A year after the intervention in September 2010, we implemented the evaluation survey (Figure 2, Step 4). During this survey we identified students who dropped out, distinguishing them from those who transferred out, repeated a grade, or were temporarily absent. At the time of the baseline survey we surveyed 1507 grade 7 students in the 10 junior high schools in the study county. Among the 300 poor students assigned to either Control Group 1 or the Treatment Group, 270 were surveyed during the evaluation survey. Among Control Group 2, 1085 of the 1207 students were surveyed. We also collected other data (see below for more details) to assist us in evaluating the impact of the CCT programme. To summarise our research design, Figure 3 depicts the flow of participants through each stage of the study.[4]

The Conditional Cash Transfer (CCT) Programme

We began implementing the CCT programme within three weeks of the baseline survey. First, students were informed of their selection into the CCT programme. A staff member from the principal's office asked each treatment student to come to the school office on a one-to-one basis (and not through a public announcement). This was always done immediately after school was let out for the day to minimise the disruption to the daily schedule of the students. Only the parent of the treated student, the treated student himself/herself and the principal were present at the meeting. We included the principal in the programme in order to increase the confidence of the parents that this was a bona fide schooling activity and not a commercial scam. The programme was described as a new programme being implemented by an NGO and the Chinese Academy of Sciences that were providing financial aid for poor students. Principals were asked to treat these students exactly the same as other students.

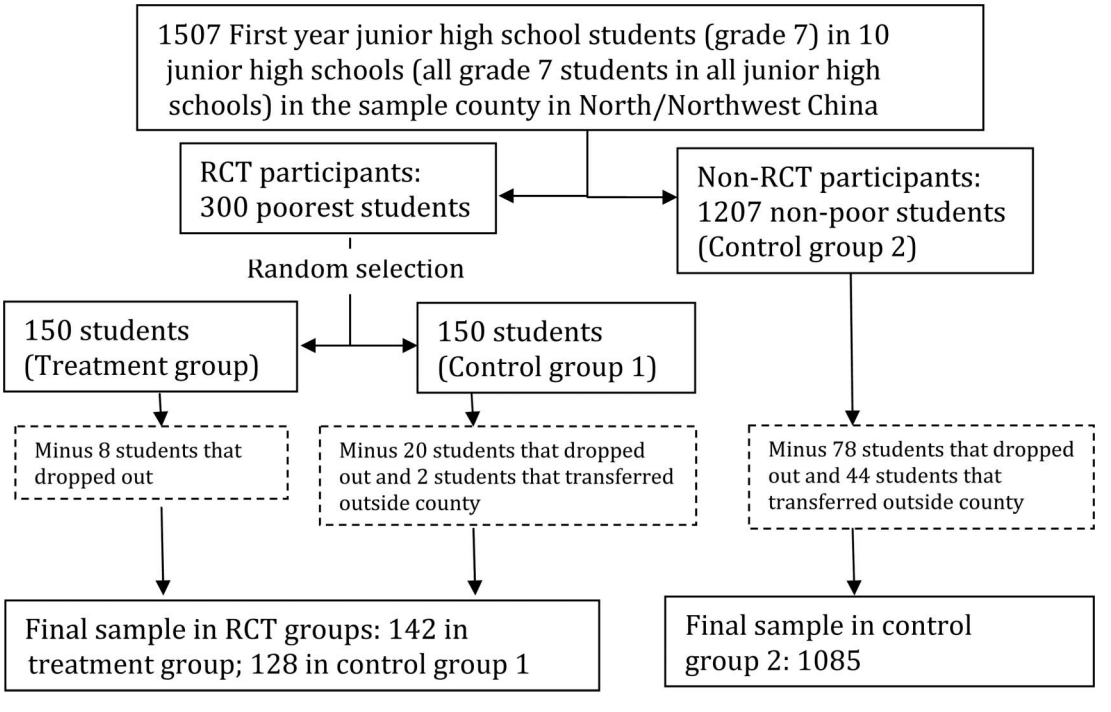

Figure 3. A flow chart tracking the formation of the sample from initial sample selection to the final sample used in the analysis.

Each family was offered 500RMB if their child was still in school at the end of each semester with attendance rates of over 80 per cent. No parents turned down the offer; as such, the enrolment rate in the programme was 100 per cent. Our non-governmental organisation (NGO) partner conducted attendance checks throughout following semesters. However, the NGO did not spend any additional time with the CCT programme enrollees. For treatment students that attended school during the first year, the cash transfer was given directly to the parents in cash. The amount of the transfer was 500 RMB for each semester. This amount is a significant proportion of the average annual income of a farmer in this county. However, it is less than the average 1400 RMB per month a student might earn working in a coastal factory if he or she dropped out of school (China National Bureau of Statistics, 2009).[5]

Data Collection. As mentioned, we visited each junior high school in the county and undertook a two-part survey effort: a baseline survey conducted before the announcement of the programme and an evaluation survey conducted one year after the intervention.

The student baseline survey consisted of three blocks. In the first block students were asked to answer a series of questions about the type of housing that their family lived in. Dwelling characteristics have often been used as a poverty indicator to proxy the 'basic needs' of the poor households and identify the extremely poor/marginalised households among the rural poor (Lalive and Kattaneo, 2009; Hagenaars and de Vos, 1988). Specifically, students indicated whether they lived in loess caves or adobe houses.[6] These dwellings are typically homes of the poorest people, unable to afford brick or concrete homes. This variable was an attempt to capture the poverty level of the household (*Poverty Indicator*).

In the second block all students were given a standardised maths test. The students were required to finish the test in 30 minutes. The students were closely proctored and time limits were strictly enforced. When normalised, these maths scores became a measure of student academic performance before the intervention.[7]

In the third block, we collected data on student characteristics. We included questions about age, gender and whether they repeated a grade during elementary school. We also collected data on the students' family characteristics, including whether the student had siblings and the education levels of each student's parents. Similar variables have been used in other studies to explain inter-student differences in academic performance and schooling rates (Behrman and Rosenzweig, 2002; Coleman et al., 1966; Currie and Thomas, 1995; Fryer and Levitt, 2004).

The teacher survey asked for each teacher's gender, teaching experience in years, and whether teachers would be given a bonus if students in his/her class performed well. Instead of including variables to measure school-level characteristics, differences in school resources and quality were controlled by including school dummy variables.

The evaluation survey contained questions that were identical with the baseline survey. Importantly, we also identified the number of students who dropped out from the Treatment Group, Control Group 1, and Control Group 2 respectively. Because students may transfer to other schools or remain at home for periods of time, we carefully confirmed each case of student dropout.

In addition, we created a set of other outcome variables based on the questions on each student's schooling characteristics. Specifically, we asked if students planned to go to high school/vocational school or join the labour force after graduation from junior high school. We asked whether students purchased any learning-assistance materials, the commuting time between home and school using the student's most frequently utilised means of transportation and their diets.

Statistical Approach. We analyse our data in three steps. First, we examine the correlates of dropout to better understand which kinds of students are more likely to drop out of junior high school in rural China. Second, we calculate the impact of the CCT intervention on the dropout rate. In this part of the analysis we also examine heterogeneous effects among subgroups of

Table 1. Comparisons of student characteristics, family characteristics and homeroom teacher characteristics between Treatment and Control Group 1 and Treatment and Control Group 2, based on baseline survey, 2009

	Treatment Group [1]	Control Group 1 [2]	Control Group 2 [3]	Group comparison			
				Difference [1]-[2]	P-value	Difference [1]-[3]	P-value
Poverty indicator							
1. Housing (1 = lives in cave/adobe house; 0 = lives in house of brick/concrete)[a]	0.19	0.22	0.09	−0.03	0.47	0.10	0.00
Student characteristics							
2. Pre-test score (units of standard deviation)[b]	−0.71	−0.72	0.18	0.01	0.95	−0.89	0.00
3. Gender (1 = boy)	0.51	0.48	0.54	0.03	0.57	−0.03	0.53
4. Age of student (number of years)	12.87	12.81	12.91	0.06	0.58	−0.05	0.61
5. Grade retention (1 = repeated a grade during elementary school; 0 = never repeated a grade)							
Family characteristics	0.32	0.25	0.21	0.07	0.20	0.11	0.00
6. Sibling (1 = has sibling; 0 = only child)	0.99	0.98	0.96	0.01	0.65	0.03	0.07
7. Father's education (1 = finished elementary school or higher education; 0 = otherwise)	0.9	0.88	0.94	0.02	0.58	−0.04	0.07
8. Mother's education(1 = finished elementary school or higher education; 0 = otherwise)	0.81	0.84	0.92	−0.03	0.45	−0.12	0.00
Homeroom teacher characteristics							
9. Gender (1 = male)	0.47	0.4	0.53	0.07	0.25	−0.06	0.17
10. Teaching experience (number of years)	8.25	7.95	15.84	0.3	0.76	−7.59	0.00
11. Teacher incentives (1 = get awarded if students perform outstandingly, 0 = otherwise)	0.67	0.73	0.15	−0.06	0.26	0.52	0.00
12. Dropout rate[c]	5.3%	13.3%	6.5%	−8%	0.02		

Notes: [a]The variable of housing equals 1 if the student lives in a loess cave or adobe house. A loess cave is a distinct form of dwelling in the sample that is made by burrowing out the soil from a Loess Plateau cliff formation. Adobe houses are dwellings made from sand, clay and water. These dwellings are typically homes of the poorest people, unable afford brick or concrete homes.

[b]Pre-test score is the score on the standardised maths test that was given to all students in the sample county (to all grade 7 students in all junior high schools) before treatment.

[c]The average dropout rate in among the grade 7 students in the county is 7.8 per cent. In order to calculate the average dropout rate for the sample area as if there were no CCT programme, we need to exclude the Treatment Group (which would have had a lower dropout rate if the CCT programme was effective) and replace those observations with the identical values of those in the Control Group 1. In other words, we use the 150 observations in Control Group 1 twice and do not use the 50 observations in the Treatment Group.

students. Third, we seek to identify the mechanism by which the CCT programme affects dropouts. To do this, we analyse how the CCT affects a number of outcome variables.

To explore the correlates of dropouts, we estimate a linear probability model:

$$y_{is} = \beta_0 + \beta_1' X_{is} + \phi_s + \varepsilon_{is}. \quad (1)$$

where y_{is} is the dropout status of student i in school s; y_{is} equals 1 if the student drops out and 0 if otherwise. *Xis* is a vector of variables that includes the baseline characteristics of students (Table 1, rows 1–5). *Xis* also includes family characteristics and homeroom teacher characteristics (Table 1, rows 6–11). The symbol represents school fixed effects, captured by a series of school dummies. We run the regression on data exclusively from Control Groups 1 and 2, as they are not affected by the CCT. We use a linear probability model instead of a probit or logit model because it is more tractable and flexible in handling unobserved heterogeneity, and it allows for straightforward interpretation of coefficients (de Janvry et al., 2006). White's heteroskedasticity-robust standard errors are computed in all regressions.

In the second part of analysis, we include treatment dummy variables to estimate how the CCT programme affected dropout rates among treatment students relative to control students. The basic specification, without control variables, is:

$$y_i = \beta_0 + \beta_1 T_i + \varepsilon_i. \quad (2)$$

In order to reduce idiosyncratic variation and improve the efficiency, we also estimate a specification with control variables:

$$y_{is} = \beta_0 + \beta_1 T_i + \delta' X_{is} + \varphi_s + \varepsilon_{is}. \quad (3)$$

In both Equations (2) and (3), T_i is a CCT treatment dummy that takes the value of 1 if the student was in the Treatment Group and 0 if the student was in the Control Group 1. The vector *Xis* is the same as defined in Equation (1). School-level fixed effects are also included.

In this step of the analysis, we also examine heterogeneous effects of the CCT programme. We do this by including interaction terms between treatment and student characteristics such as pre-test scores, housing, gender and ages.[8]

In the third part of our analysis, we measure the impact of CCTs on five alternative outcomes, so as to explore possible mechanisms by which the CCT programme affects students (see the description of these variables in the last paragraph of the section of Data Collection). Both Equations (2) and (3) are used to estimate the CCT treatment effect on these outcomes. Ordinary Least Square (OLS) with heteroskedasticity-robust standard errors is also used.

3. Results

Correlates of Dropout. The dropout rate of the whole sample of junior high school students is 7.8 per cent (Table 1, row 1). We arrive at this statistic by first assuming that students in the Treatment Group, if not exposed to the CCT programme, would drop out at the same rate as Control Group 1. Under this assumption, a total of 118 students dropped out or would have dropped out.[9] Dividing the total number of observations (1507) by 118 yields the 7.8 per cent dropout rate.[10] This level of dropout, just in the first academic year of junior high school, is three times higher than the officially recognised level for all three grades of junior high: 2.6 per cent.

The results of our multivariate correlation analysis suggest that the dropout rate is correlated with academic performance, housing (as a poverty indicator), student gender, and age (Table 2). Better-performing, richer, female and younger students are less likely to drop out. The magnitudes and the significance levels remain mostly stable even when we control for other student, family, homeroom teacher characteristics or school dummies (rows 1 to 4; columns 1 to 4).

Table 2. OLS regression results examining the correlates of dropping out of grade 7 sample junior high school students in North/North-West China.[a]

	Dependent variable: Dropout, 1 = yes, 0 = no			
	[1]	[2]	[3]	[4]
1. Pre-test score (units of deviation)[b]	−0.04***	−0.04***	−0.03***	−0.03***
	[−5.68]	[−5.51]	[−4.35]	[−3.24]
2. Housing (1 = lives in cave/adobe house; 0 = lives in house of brick/concrete)[c]	0.07**	0.07**	0.06**	0.05*
	[2.24]	[2.24]	[2.10]	[1.81]
3. Gender (1 = boys; 0 = girls)	0.03*	0.03*	0.02*	0.03*
	[1.87]	[1.88]	[1.76]	[1.89]
4. Age of student (in years)	0.03***	0.03***	0.03***	0.03***
	[4.06]	[3.94]	[3.89]	[3.76]
5. Other student characteristics	Yes	Yes	Yes	Yes
6. Family characteristics[d]	No	Yes	Yes	Yes
7. Homeroom teacher characteristics[d]	No	No	Yes	Yes
8. School dummies	No	No	No	Yes
9. Constant	−0.35***	−0.35***	−0.31***	−0.15
	[−3.72]	[−3.36]	[−3.03]	[−0.81]
10. Obs.	1357	1357	1357	1357
11. R-sq	0.07	0.07	0.07	0.09

Notes: [a]In order to estimate the correlates of dropping out, we only included 1357 observations, or the students in the Control Group. Those in the Treatment Group (n = 150) were excluded.
[b]Pre-test score is the score on the standardised maths test that was given to all students in the sample county (to all grade 7 students in all junior high schools) before treatment.
[c]The variable, Housing, equals 1 if the student lives in a loess cave or adobe house. A loess cave is a distinct form of dwelling in the sample county (which is located on the Loess Plateau) that is burrowed out of cliff made of loess soil. An adobe house is a dwelling made from sand, clay and water. These dwellings are typically homes of the poorest people, unable to afford brick or concrete homes.
[d]Other student characteristics include whether or not the student repeated a grade or not; family characteristics include if the student had siblings; and the father's and the mother's levels of education; homeroom teacher characteristics include the teacher's gender; teaching experience and teacher incentives.
Significance levels: * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.
T-statistics are in brackets. All the regressions use robust standard error

The Impact of Conditional Cash Transfer Programmes on Dropout Rates. The descriptive statistics suggest that the CCT programme is successful in reducing student dropout rates (Table 1, row 12). This effect is seen most clearly when we compare the dropout rates of the students in the two RCT groups that were identical at the baseline – the Treatment Group ($n = 150$) and Control Group 1 ($n = 150$). Whereas the dropout rate of the Treatment Group was 5.3 per cent, the dropout rate of Control Group 1 was 13.3 per cent (row 12). The 8 per cent difference between these two groups is statistically significant (P-value of 0.02).

The results of the multivariate model also suggest that the CCT is effective. (Table 3). When using different regression specifications, the CCT treatment consistently reduces dropout rates by 8 percentage points (Table 3, row 1, columns 1 to 4). Significantly, even when including school level fixed effects, the reduction in dropout rate remains largely the same in magnitude (7 percentage points) and is still statistically significant (row 1, column 5).[11]

The multivariate analysis examining heterogeneous effects on pre-test scores suggests that effect differences exist among various subgroups of students (Table 4). However, the level of significance is low in the case of several interaction terms.[12] For example, the CCT tended to be less effective with better performing students, reducing the dropout rate by only 3 percentage points. The interaction term in the case of pre-test scores is significant. The CCT also seems to be more effective with richer students, girls, and younger students. However, the coefficients on the interaction terms are insignificant in all three cases. Additional tests using Equation (3) among

Table 3. OLS regression results of the impact of the Conditional Cash Transfer (CCT) treatment on dropping out from the grade 7 sample junior high school students in North/North-West China

	Dependent variable: Dropout, 1 = yes, 0 = no				
	[1]	[2]	[3]	[4]	[5]
1. Treatment (Conditional Cash Transfer – CCT = 1)	−0.08**	−0.08**	−0.08**	−0.08**	−0.07**
	[−2.40]	[−2.53]	[−2.52]	[−2.53]	[−206]
Student characteristics					
2. Pre-test score (1 = higher than the median, 0 = lower than median)[a]		−0.02	−0.03	−0.02	−0.02
		[−1.44]	[−1.43]	[−1.27]	[−1.08]
3. Housing (1 = lives in cave/adobe house; 0 = lives in house of brick/concrete)[b]		0.14***	0.15***	0.15***	0.12**
		[2.61]	[2.71]	[2.73]	[2.41]
4. Gender (1 = boys; 0 = girls)		0.04	0.04	0.04	0.03
		[1.22]	[1.21]	[1.10]	[0.90]
5. Age of student		0.01	0.01	0.01	0.01
		[0.30]	[0.42]	[0.51]	[0.64]
6. Other student characteristics[c]	No	Yes	Yes	Yes	Yes
7. Family characteristics[c]	No	No	Yes	Yes	Yes
8. Homeroom teacher characteristics[c]	No	No	No	Yes	Yes
9. School dummies	No	No	No	No	Yes
10. Constant	0.13***	−0.02	−0.07	−0.06	−0.24
	[4.79]	[−0.10]	[−0.25]	[−0.20]	[−0.87]
11. Number of observations	300	300	300	300	300
12. R-sq	0.02	0.09	0.1	0.11	0.17

Notes: [a]Pre-test score is the score on the standardised maths test that was given to all students in the sample county (to all grade 7 students in all junior high schools) before treatment.
[b]The variable, housing, equals 1 if the student lives in a loess cave or adobe house. A loess cave is a distinct form of dwelling in the sample that is made by burrowing out the soil from a Loess Plateau cliff formation. Adobe houses are dwellings made from sand, clay and water. These dwellings are typically homes of the poorest people, unable to afford brick or concrete homes.
[c]Other student characteristics include whether or not the student repeated a grade or not; family characteristics include if the student had siblings; and the father's and the mother's levels of education; homeroom teacher characteristics include the teacher's gender; teaching experience and teacher incentives.
Significance levels: *significant at 10 per cent; **significant at 5 per cent; *** significant at 1 per cent.
T-statistics are in brackets. All the regressions use robust standard errors.

each subgroup of students suggest that the CCT is also more effective with richer students, girls, and younger students.[13]

The results from the analysis also raise several other issues. For example, why is it that it appears that relatively rich students are more affected by the CCT. In addressing this issue, there are several things to consider. First, to think that the CCT did not help students who were relatively poor might be misleading. It must be remembered that all 300 individuals in our sample were the poorest students living in a very poor county. Hence, even the least poor in our sample are extremely poor. The findings clearly show that the CCT did have an impact on part of the students (all of whom were very poor).

Given this result, however, raises another question. Why is it that the poorest of the poor were less affected by the CCT? One possible reason might be that the poorest of the poor have higher opportunity costs. Given the nature of the labour markets, however, it is not clear that this is so. There may be some reason beyond a difference in opportunity costs per se. An alternative reason may be that the level of the payment (RMB 500/semester) was simply not enough to induce those students at the very bottom end of the wealth spectrum to stay in school. Although we cannot say for certain (that is based on our statistical analysis), during interviews after the endline surveys, in several cases we found that some of the poorest students were from households in which one or even both parents were disabled. In such a case, the CCT payment would not do as

Table 4. Heterogeneous effects of the Conditional Cash Transfer (CCT) treatment on dropping out from grade 7 sample junior high school students in North/North-West China (OLS)

		Dependent variable: Dropout, 1 = yes, 0 = no			
		[1]	[2]	[3]	[4]
1	Treatment (Conditional Cash Transfer—CCT = 1)	−0.07**	−0.08**	−0.07*	−0.09**
		[−2.05]	[−2.36]	[−1.87]	[−2.07]
2	Treatment*Pre-test score	0.04*			
		[1.76]			
3	Treatment*Housing		0.05		
			[0.45]		
4	Treatment*Gender			0.01	
				[0.17]	
5	Treatment*Age				0.04
					[0.65]
6	Pre-test score (1 = higher than the median, = 0 otherwise)[a]	−0.04	−0.02	−0.02	−0.02
		[−1.62]	[−1.15]	[−1.13]	[−1.26]
7	Housing (1 = lives in cave/ adobe house, 0 = otherwise)[b]	0.13**	0.10	0.13**	0.13**
		[2.48]	[1.36]	[2.47]	[2.46]
8	Gender (1 = boy)	0.03	0.03	0.03	0.03
		[1.05]	[0.95]	[0.51]	[0.95]
9	Age of student (1 = older than or equal to 13; 0 = younger than 13)	−0.01	0.00	0.00	−0.02
		[−0.18]	[−0.11]	[−0.10]	[−0.40]
10	Control variables[c]	Yes	Yes	Yes	Yes
11	School dummies	Yes	Yes	Yes	Yes
12	Obs.	300	300	300	300
13	R-sq	0.174	0.169	0.168	0.169

Notes: [a]Pre-test score is the score on the standardised mathsest that was given to all students in the sample county (to all grade 7 students in all junior high schools) before treatment.
[b]The variable, Housing, equals 1 if the student lives in a loess cave or adobe house. A loess cave is a distinct form of dwelling in the sample that is made by burrowing out the soil from a Loess Plateau cliff formation. Adobe houses are dwellings made from sand, clay and water. These dwellings are typically homes of the poorest people, unable to afford brick or concrete homes.
[c]Control variables include (a.) other student characteristics include whether or not the student repeated a grade or not; (b.) family characteristics include if the student had siblings; and the father's and the mother's levels of education; and (c.) homeroom teacher characteristics include the teacher's gender; teaching experience and teacher incentives.
Significance levels: * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.
T-statistics are in brackets. All the regressions use robust standard errors.

much to help those students (and their families) as would the earnings from an off-farm job (that could produce more than RMB 1000/month).

Another result that deserves discussion is why it appears as if it is the relatively worse performing students who are benefiting more from the CCT. The interaction term 'treatment*pre-test scores' in Table 4 is positive, suggesting that better performing students were less affected by CCT (in reducing dropout). The answer to this is likely that there are high returns to high school and college education (Luo et al., 2012). Since it is likely that better performing students have a higher expectation of success in the educational system (and a higher chance of accessing the higher returns that come with higher educational attainment), no matter how poor they are, such students were much less likely to plan to drop out anyway (with or without CCT). Indeed, Table 2 (testing the determinants of dropout) has shown that the better performing students were less likely to drop out in general. As a result, CCT may not be expected to have much of an impact on those students.

Table 5. OLS regression results of the impact of the Conditional Cash Transfer Treatment on other outcomes of grade 7 sample junior high school students in North/North-West China

	Post-test score (units of standard deviation)[a]		Plan to continue education after junior high school (1 = yes; 0 = work)[b]		Purchased learning assistance materials (1 = yes; 0 = no)[c]		Commuting time between home and school (minutes)[d]		Never have meat in diet (1 = never; 0 = have meat in diet)	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
1. Treatment (Conditional Cash Transfer—CCT = 1)	−0.04	0.01	0.08*	0.09**	0.16***	0.16***	−18.97**	−19.07**	−0.08***	−0.07***
	[−0.34]	[0.10]	[1.85]	[2.18]	[2.97]	[3.07]	[−2.39]	[−2.52]	[−3.05]	[−2.82]
2. Control variables[e]	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
3. School dummies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
4. Obs.	268	268	268	268	268	268	268	268	268	268
5. R-sq	0.00	0.33	0.01	0.16	0.03	0.16	0.021	0.195	0.036	0.091

Notes: [a]Post-test score is the score on the standardised maths test that was given to all students in the sample county (to all grade 7 students in all junior high schools) after treatment.
[b]Students who plan to continue education after junior high school include those who expressed their will to attend high school or vocational school after graduation from junior high school; the rest of the students expressed their will to join the labour force.
[c]Learning assisted materials typically include reference and practice books.
[d]Commuting time refers to the length of time students spend on their way from home to school by their usual transportation means.
[e]Control variables include Pre-test score, Housing, Gender and Age as well as: (a.) other student characteristics include whether or not the student repeated a grade or not; (b.) family characteristics include if the student had siblings; and the father's and the mother's levels of education; and (c.) homeroom teacher characteristics include the teacher's gender; teaching experience and teacher incentives.
Significance level: * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.
T-statistics are in brackets. All the regressions use robust standard errors.

Potential Mechanisms. In this final subsection we seek to understand some of the potential mechanisms that are driving the CCT programme's impact on dropout. To do so, we examine the impact of the CCT programme on a number of intermediate variables including post-intervention standardised maths scores, plans for continuing education after junior high school, expenditures on learning-assistance materials, commuting time, and the expenditures on meat (which is a proxy for an improved diet).

The CCT may motivate students to study harder and thus improve their academic performance. In turn, increased academic performance encourages students to stay in school. However, according to our analysis, the CCT has no impact on post-test standardised math scores (Table 5, columns 1 and 2). Using the model in either Equation (2) or (3), we find that students' maths scores did not show improvement. Although we do not know if the CCT had any impact on in-class grades or in other subjects, this finding is consistent with CCT impact evaluations from other countries (e.g. Behrman et al., 2005; Filmer and Schady, 2009).

The CCT may also decrease dropout rates by enabling families to spend more on books, transportation, and food. Why might this be? One explanation is that the CCT treatment may have relaxed the liquidity constraint of the families. With the additional income, they could increase their expenditure on these items. These expenditures, in turn, may signify to the student that schooling is important to his or her family and increase their expectation of success in the competitive education system, leading him or her to reconsider dropping out. Although unable to confirm the existence of this mechanism, we find that the CCT increases spending on learning-assistance materials (columns 5 and 6). Our results show that the treatment enabled students to spend less time in commuting between home and school (columns 7 and 8). In post-survey interviews with students, we found that with the additional money, some students rode the bus to school rather than walked. Others told us that they bought a bicycle with the CCT money, which made commuting easier. The treatment also improved the diet of the students (columns 9 and 10). Indeed, our calculations show that the CCT encourages students to plan for more years of future schooling (Table 5, columns 3 and 4).

4. Summary and Conclusions

Although official statistics report dropout rates of 2.6 per cent for China's junior high schools, recent anecdotal reports suggested that dropout rates may be higher and actually increasing over time. Therefore, the overall goal of this study was to document the extent and nature of dropout and explore the effectiveness that a CCT programme could have on dropout using a systematic set of data.

According to our data, 7.8 per cent of students dropped out between grades 7 and 8. Should China revise its national average? Because there are no official, disaggregated statistics on dropout rates that we can use as a point of comparison, we can only speculate. If this sample county is representative of China's poor rural areas, the rate *after only one year* of junior high (7.8%) is already threee times the national average (2.6%) for three years of junior high. Furthermore, dropout rates during junior high school may accelerate over time. Several principals told us that they believed the dropout rates between grade 8 and grade 9 and during grade 9 would be even higher. If so, up to 20 per cent of students in poor rural China might not be finishing junior high school.

Although the dropout rate might seem low if we compare it with that of sub-Saharan Africa (Glewwe and Kremer, 2006), it is much higher than that of the developed countries and many developing countries. The gross lower secondary (equivalent to junior high in China) completion rates of the developed countries are almost all over 95 per cent (UNESCO, 2010). Many of the middle-income countries have achieved high completion rates as well, such as Peru (98%) (UNESCO, 2010). These statistics have suggested that China has not solved the dropout problem of junior high students (at least those in poor rural areas).

The dropout rate also poses a challenge to China's economic growth. As China continues to grow and moves up the productivity ladder, it will need a skilled labour force that will support its modern industries (Liu et al., 2009). The large proportion of uneducated younger generation may not provide the human capital that China needs for a smooth transition towards modernisation (Rozelle, 2012).

Who is dropping out? When looking at different subgroups of individuals, the dropout rates are even higher. Students with poor academic performance drop out at a rate of 12.5 per cent. Those living in poor housing, which is a proxy for poverty, drop out at a rate of 15 per cent. Boys and those that are older also drop out at significantly higher rates (8.8% and 13.3% respectively).[14] These findings are consistent with what is known about the relationship between dropout and competitive educational systems, poverty, and rising opportunity costs.

One way to effectively reduce this dropout rate in rural China may be to employ CCT programs. Students in the Control Group 1 dropped out at a rate of 13.3 per cent, 7 to 8 percentage points more than the Treatment Group (5.3%). Although this result is only for one county, this effect size should encourage education officials in China to continue exploring the effectiveness of additional CCT programmes.

The importance of our findings is underlined by the importance of keeping students in school. If the social return to a junior high education is high, China's future economic growth and stability depends on reducing dropout. Unfortunately, once students drop out from junior high school, it is very unlikely that they will return. Adult education is limited in China, has not received significant investment, and is presently deemed ineffective in most developing countries (UNESCO, 2009). As such, measures to reduce dropout should be tested and implemented as soon as possible.

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Notes

1. So why did we only include grade 7 students in our sample? The main reason is the absence of financial resources. The NGO that provided the funding only had enough to fund 150 CCT transfers. Power considerations demanded that 150 is the minimum size of the Treatment Group that is needed to achieve a level of statistical power of 80 per cent.
2. We chose 300 students to be in the study (150 in the Treatment Group and 150 in control group) based on our power calculations. With a minimum effect size of 0.25 with 80 per cent power at the 5 per cent significance level, we calculated that we need 130 students. We assumed an intra-cluster correlation of 0.05, a pre- and post-intervention correlation of 0.5. To be conservative, we included 150 students in each RCT group.
3. Including Control Group 2 enhances our study and analysis in three ways. First, we want to illustrate that we, in fact, did succeed in choosing the relatively poorer students among all junior high school students to be involved in our experiment. Second, we are interested in knowing the total dropout rate of the grade 7 students in the county. Third, we include Control Group 2 in the determinants analysis to examine the determinants of dropout of a more general sample, that is, all of the grade 7 students in the county.
4. The students whom we did not manage to follow were the ones who had either dropped out of school or had transferred outside the county. Since they had joined the labour force or had lived too far, we were not able to survey them. However, since only the identified dropouts were used to generate the outcome variable of dropping out of school, our analysis does not introduce selection bias.
5. Since the late 1990s, off-farm employment in China has accelerated and migration has become the most prevalent off-farm activity (de Brauw et al., 2002). In 2009 around 90 per cent of China's rural labour force between the ages of 16

and 30 is estimated to be working off-farm (Huang et al., 2011). Hence, off farm jobs are not scarce and can be found by most able-bodied individuals.

6. A loess cave is a distinct form of dwelling in the sample that is made by burrowing out the soil from a Loess Plateau cliff formation. Adobe houses are dwellings made from sand, clay and water.
7. We chose maths test scores as the outcome variable for two reasons. First, we chose math test scores because in the literature it is one of the most common outcome variables that is used to proxy educational performance (Lai et al., 2009; Glewwe and Kremer, 2006; Rivkin et al, 2005; Schultz, 2004; and so forth). Second, maths accounts for more than 30 per cent of the high school entrance exam, the highest of any subject. Therefore, it is important in the Chinese school system.
8. As tests of interaction effects have often been found to have low statistical power (McClelland and Judd, 1993), we include additional tests by bootstrapping parameter estimates and standard errors among each subgroup of students (Cameron and Trivedi, 2009). Subgroup regressions have often been used to test heterogeneous effects in the CCT literature (Schultz, 2004; Baird et al., 2009; de Janvry and Sadoulet, 2006, among others). For each subgroup regression, 1000 bootstrap replications were performed to obtain the estimate parameter of the treatment variable and the standard errors.
9. There were 78 students who dropped out from Control Group 2. As the group had originally 1207 students, the dropout rate is 6.5 per cent.
10. In order to calculate the average dropout rate for the sample area as if there were no CCT programme, we need to exclude the Treatment Group (which would have had a lower dropout rate if the CCT programme was effective) and replace those observations with the identical values of those in the control group. In other words, we used the 150 observations in Control Group 1 twice and did not use the 150 observations in the Treatment Group.
11. We also run a set of tests to examine if the students not chosen to be in the CCT programme became discouraged and dropped out at higher rates than they would have done otherwise. We include the table of results in an online file (http://reap.stanford.edu/docs/reap_working_papers). Such tests do not provide any evidence of a discouraging effect.
12. In this set of regressions we hold constant pre-test scores, housing, gender, age, other student characteristics, family characteristics and homeroom teacher characteristics (as well as including school dummies). When doing so, the treatment effect of the CCT is 7 per cent for the poorer performing students, 8 per cent for the students with better housing, 7 per cent for girls, 9 per cent for students younger than 13 years old (Table 6, row 1, columns 1 to 4).
13. The additional test is done by following the method suggested by Cameron and Trivedi (2009). We first divide RCT samples into subgroups of students with higher pre-test scores and lower pre-test scores (with the median score as the threshold), subgroups of better housing and poorer housing (whether the family live in cave/adobe house), subgroups of girls and boys, and subgroups of older and younger students (with the threshold of the median age, 13). Then we estimate the effect of CCT on each subgroup using Equation (3) to obtain bootstrapped estimates and standard errors. Finally, we conduct statistical tests to see if treatment effects are the same across subgroups. We include the table of results in an online file (http://reap.stanford.edu/docs/reap_working_papers).
14. So are our results consistent with the idea that high opportunity costs of staying in school are in part a reason for the observed dropout rates? It is true that in Table 3 (the regression that tests the treatment effect using 300 experiment participants), the variable of gender is not significant. However, it is positive (that is, the point estimate suggests that boys are more likely to drop out) and the size is also consistent with Table 2 (the regression that examines the determinants of dropout using the whole sample of 1507 students).

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Appendix 1. Subgroup regression results examining heterogeneous effects of the Conditional Cash Transfer (CCT) treatment on dropping out from grade 7 sample junior high school students in North/North-West China (OLS)

Independent variable: Dropout, 1 = yes, 0 = no

	Pre-test score[a]		Housing[b]		Gender		Student ages	
	Higher than the median [1]	Lower than the median [2]	Cave/adobe house [3]	House of bricks/ concrete [4]	Boy [5]	Girl [6]	> = 13 [7]	< 13 [8]
1. Treatment (Conditional Cash Transfer-CCT = 1)	−0.04	−0.10**	−0.11	−0.09***	−0.06	−0.07*	−0.05	−0.07*
	[−0.04]	[0.05]	[0.17]	[0.03]	[0.05]	[0.04]	[0.05]	[0.04]
2. Control variables[c]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. School dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: [a]Pre-test score is the score on the standardised math test that was given to all students in the sample county (to all grade 7 students in all junior high schools) before treatment.

[b]The variable, Housing, equals 1 if the student lives in a loess cave or adobe house. A loess cave is a distinct form of dwelling in the sample that is made by burrowing out the soil from a Loess Plateau cliff formation. Adobe houses are dwellings made from sand, clay and water. These dwellings are typically homes of the poorest people, unable to afford brick or concrete homes.

[c]Control variables include Pre-test score, Housing, Gender and Age (but omitting the characteristic which is used to divide subgroups) as well as: (a.) other student characteristics include whether or not the student repeated a grade or not; (b.) family characteristics include if the student had siblings; and the father's and the mother's levels of education; and (c.) homeroom teacher characteristics include the teacher's gender; teaching experience and teacher incentives.

[d]The test of the (bootstrapped) empirical distribution of the treatment effect rejects that the effect is identical between the better performing (column 1) and the poorer performing students (column 2) (P-value < 0.01); the null is rejected for poorer students (column 3) and richer students (column4) (P-value < 0.01); the null is rejected for boys (column 5) and girls (column6) (P-value < 0.10); the null is rejected for older students (column 7) and younger students (column8) (P-value < 0.01).

Significance level: * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

Bootstrapped standard errors in brackets.