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exist? Evidence from the educational fee
reduction reform in rural China

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Abstract

In this paper, I test for evidence of an intra-household flypaper effect by evaluating the impact of an educational fee reduction reform in rural China on different categories of household expenditures, including spending on individual children. Using data that pre- and post-dated the reform, I exploit cohort comparisons, the variation in the extent of educational fee reductions across different villages, and variation in the transfers received by children enrolled in different grades within the same family to identify the impacts of the reform. I find that educational fee reductions were matched by increased voluntary educational spending on the same children receiving fee reductions, providing strong evidence of an intra-household flypaper effect.

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1 Introduction

Government transfers in developing countries often address the challenge posed by poverty and low levels of educational attainment among vulnerable populations, especially children. An important question in considering the effectiveness of such transfers is the extent to which transfers targeting to a child “stick” to him or her or, as suggested by many models of household decision-making (e.g., Becker, 1974), targeted individual transfers are equivalent to an increase in total household resources and are neutralized by reallocations of resources away from the target child toward other family members. The existence of an intra-household flypaper effect (IFE) thus provides an essential justification for policies targeting children. Indeed, Becker (1981) attributes the failure of compensatory education programs for minority children to the absence of a strong IFE.

In recent years, conditional cash transfer (CCT) programs like PROGRESA in Mexico have become extremely popular in developing countries.¹ Cash transfers made conditional on child enrolment can be thought of as a subsidy that reduces the price of education for each targeted child. Since the subsidy reduces household’s expenditures on the targeted child, the question arises as to how the saved funds are spent, in particular whether the funds benefit (or stick to) the targeted child or whether they act similarly to a generic household income transfer. However, perhaps partly due to data limitations, no previous studies have examined this issue systematically.² Rather, evaluations of CCT programs have focused on the programs’ impact on educational attainment³, health and nutrition⁴, work⁵, migration⁶, fertility⁷, and spillover effects among households in the same community⁸. If there is an IFE for conditional cash transfers, then the programs could benefit targeted children in ways that go well beyond the impact of the program on school enrolment⁹. Testing for the existence of the IFE also yields insights into the nature of intra-household decision-making in developing countries.

¹For example, such programs exist in Bangladesh, Pakistan, Argentina, Chile, Colombia, Brazil, Mexico, Nicaragua, and Honduras.

²Some research focuses on the implications for intra-household allocation of the fact that the funds are transferred to women, not men. See Attanasio and Lechene (2002), Rubalcava, Teruel and Thomas (2006) and Bobonis (2004).

³Schultz (2004), Behrman and Sengupta (2005), de Janvry et al. (2006), Schady and Araujo (2006), Khandker, Pitt and Fuwa (2003), Filmer and Schady (2006) and Maluccio and Flores (2004).

⁴Behrman and Hoddinott (2005), Rivera et al. (2004), Gertler (2004) and Morris et al. (2004).

⁵Parker and Skoufias (2000, 2001), Gertler, Martinez and Rubio-Codina (2006), Schady and Araujo (2006) and Yap, Sedlacek and Orazem (2002).

⁶Angelucci (2004) and Stecklov et al. (2005).

⁷Schultz (2004), Stecklov et al. (2006) and Todd and Wolpin (2006).

⁸Bobonis and Finan (2005) and Angelucci and De Giorgi (2006).

⁹Park and Shi (2008).

In this paper, I test for the first time whether an intra-household flypaper effect exists for child-targeted transfers by investigating the impact on household expenditures of an educational fee reduction reform that took place in rural China in 2005. As part of the large-scale program called the Two Exemptions One Subsidy (TEOS) program, students enrolled in primary and middle schools were exempted from school fees charged by schools, and students from poor families were exempted from textbook charges and received living subsidies if they lived in school dormitories. Since only enrolled children received any benefits from the program, the program was equivalent to conditional (on enrolment) cash transfer programs widely implemented in many developing countries.

A reform that reduces educational fees for children essentially reduces the price of education. For those households not sending children to schools before the reform because of the high educational fees, the combination of price and income effects from the reform may induce parents to send more of their children to school. However, for those households already sending most or all of their children to school before the reform, the reform has no effect on children's school enrolment. In China, primary and middle school enrolment rates were already high before the fee reduction reform, and a main motivation for the reform was to reduce the financial burden of taxes and fees for rural residents. Indeed, according to Park and Shi (2008), the estimated effect of the reform on primary school enrolment is close to zero and not statistically significant, and the estimated effect of the reform on middle school enrolment is statistically significant but very small¹⁰. Thus, for most households, with reduced educational fees spent on enrolled children, parents had more money for other expenditures, including expenditures on voluntary educational goods and other non-educational goods. If the IFE exists, we would expect parents to spend the extra money still on the education and on the target child who benefits from the fee reduction.

In this paper, I test the IFE by estimating the impact of TEOS reform on individual-specific household expenditures, focusing in particular on how the reform affected voluntary educational expenditures (on supplies, tutoring, etc.) and required educational expenditures (primarily school and textbook fees) on targeted children and their siblings. Detailed information on household expenditures is required for conducting such an analysis. I use Chinese rural household data from the Gansu Survey of Children and Families (GSCF), a longitudinal study following multiple cohorts of children. I helped supervise the last wave of the survey in 2007 for which I designed questions to collect comprehensive information on access to the TEOS program and on household expenditures on food (23 categories), non-food consumption (17 categories), and educational expenditures on each child (both required and voluntary).

¹⁰10% increase in the reduced educational fees leads to only 0.4% increase in the probability to be enrolled in the middle school

Our identification strategy exploits the fact that household surveys were conducted before and after the reform, there was variation across schools in the amount of fee reductions due mainly to differences in the amount of fees charged prior to the reform, and access to subsidies and the amount of subsidies varied with the age (or grade level) of children in the household. The GSCF collected three waves of data in 2000, 2004, and 2007. The first two waves of survey were conducted before the reform and the third wave was conducted after the reform. I compare the spending of households with similar age children before and after the reforms living in the same village, and see how differences in the amount of educational fee reductions across schools and for children in different grades affected household expenditure patterns. In this paper, I use *intended transfer* as the main treatment variable, which is calculated based on program rules. Firstly, I check the impact of the reform on household level expenditures. I find that a one *Yuan* increase in the household intended transfers per capita from the reform leads to 0.613 *Yuan* decrease in household required educational expenditures per capita, and a 0.651 *Yuan* increase in household voluntary educational expenditures per capita; the absolute values of these two coefficients are not significantly different. But there is no significant impact of the reform on household total income per capita, total expenditures per capita, or other specific categories of expenditures. And then, using a household fixed effect specification to examine differences in child-specific expenditures within the same households, I find that a one *Yuan* increase in individual intended transfers from the reform leads to a 0.448 *Yuan* decrease in individual required educational expenditures, and a 0.519 *Yuan* increase in individual voluntary educational expenditures; again the absolute values of these two coefficients are not significantly different. The results provide a strong evidence that an IFE exists. Parents spent the saved money from the fee reductions on voluntary educational expenditures on the same child. I also find that given the same amount of intended transfers households with better educated mothers spend more on education, and parents spend more on girls, older children and children enrolled in middle school.

The only previous literature that has studied the IFE in developing countries is a small empirical literature examining the impact of school feeding programs.¹¹ Jacoby (2002) studied the impact of school feeding programs in the Philippines on children’s caloric intake, comparing children’s caloric intake on schooling days and non-schooling days. He found that daily caloric intake rose roughly one-for-one with feeding program calories. Using a similar methodology, Afridi (2005) found that 49% to 100% of nutrients provided by

¹¹There exists a much larger literature on the flypaper effect in public finance (see Hines and Thaler (1995) for a review). More recent papers include Knight (2002), Choi, Laibson, and Madrian (2007), Walle and Mu (2007), and Lalvani (2002). A number of papers in this literature find positive evidence that earmarked funds do increase spending on targeted areas.

a mandated school meal program in India “stuck” to the children receiving meals. While both studies provide support for the existence of the IFE, their results could be driven by specific features of food consumption and school feeding program, for example it may be difficult to substitute more consumption in one meal with less consumption at other times, or home food availability may be related to other factors affecting home production. In contrast, cash transfers or subsidies are fully monetized, providing more opportunity for passing on program benefits to other household members; in this sense they provide a purer test of the IFE.

One study asking a similar question to ours but in a developed country context is by Kooreman (2000), who showed that the marginal propensity to consume child clothing out of exogenous child benefits provided by a Dutch government program was much larger than the marginal propensity out of other income sources. However, the effects are identified solely from policy variation over time, so the results could be driven by time trends in expenditures that would have occurred even in the absence of the policy.

The rest of the paper is organized as follows. The second section introduces the data and China’s recent educational fee reduction reform in rural areas. The third section provides a simple conceptual framework for analysis. The fourth section describes empirical strategies. The fifth section presents the results. The sixth provides some robustness checks, followed by a concluding section.

2 Background

2.1 Gansu Survey of Children and Families

The data used in this paper was collected as part of Gansu Survey of Children and Families(GSCF). The GSCF is a longitudinal study which was conducted in Gansu province in the western part of China, one of the poorest provinces. In 2007, GDP per capita in Gansu was 9527 *Yuan*¹²(about 1389 dollars using the exchange rate on July 1st, 2008¹³), and the population was about 26 million¹⁴. The sample is representative of rural Gansu, excluding minority counties, and is drawn from 100 villages in 42 townships and 20 counties. Figure 1 shows the distribution of these 20 counties in Gansu province.

The GSCF follows a cohort of rural children aged 9-12 in the year 2000, when the first wave of the survey was conducted. The children and their families were re-interviewed in 2004 (wave 2) when the children were 13-16 years old, and in 2007 (wave 3) when they

¹²This number is from <http://tieba.baidu.com/f?kz=306047423>.

¹³1 Dollar = 6.86 *Yuan*. The exchange rate is from <http://www.x-rates.com/d/CNY/table.html>.

¹⁴The population number is from Gansu Bureau of statistics(<http://210.72.51.4/doc/ShowArticle.asp?ArticleID=3408>)

were 16-19 years old. The third wave also surveyed a new cohort of children aged 9-15 in 2007 and their families. The GSCF has a linked survey design which includes child, household, mother, father, homeroom teacher, school principal, and village leader questionnaires. The survey collected detailed information for target children and all siblings on enrolment status, grade level, and different types of educational expenditures, as well as on household income, expenditures, and wealth. Questions on income included a battery of questions on specific crops produced, livestock raised, self-employment income, wage income, prices, and inputs used in each type of production. The expenditure module consisted of 23 categories of food expenditures and 17 categories of non-food expenditures asked in each wave of the survey. Also, there are questions on over 40 different types of fixed capital and consumer durable goods. In the third wave, I designed a special section in the household questionnaire asking about fee exemptions and living subsidies received by each enrolled child in the household. School and county educational bureau questionnaires also described policy implementation during the recent period of educational fee reforms.¹⁵.

In this paper, I use data on households with children enrolled in school. The main analysis focuses on the survey data for the years 2000 and 2007. For the sake of comparison, in each year only households having a sampled child aged from 9-12 years are used in the analysis. After dropping observations with missing values, the final sample includes 2134 households, 1629 in 2000 and 505 in 2007. In the sample, there are 4410 children (defined as survey target children and their siblings), 3498 in 2000 and 912 in 2007. Table 1 lists some basic characteristics of these households and children. From Panel A in Table 1, we can see that the average household size, number of children, and number of enrolled children are very close in the two years, but a little smaller in 2007. But the ratio of enrolled children to the total number of children is higher in 2007(0.890), than in 2000(0.830). We can also see that in 2007, mothers and fathers have more schooling years, and households have higher income and expenditures. The total enrolment rate of children in the sample increases from 85.8% in 2000 to 94.7% in 2007, and the enrolment rate of children aged 9-16 increased from 93.0% in 2000 to 98.2% in 2007. In this paper, I restrict attention to enrolled children in the analysis. After observations with missing values are dropped, there are 3865 children remaining in the final sample, of which 3001 children are from the year 2000 data, and 864 children are from the year 2007 data. Table 1 also lists the characteristics of enrolled children. From the table, we can see that in both years, the average age and the ratio of girls in the sample are very close to each other. Among all enrolled children, the percentage of primary school students is a little lower in 2007 than in 2000; it is 81.1% in 2007 and 88.3% in 2000. However, the percentage of middle school students is a little higher; it is 16.4% in 2007 and 11.1% in 2000. The percentage of students enrolled in other levels of schools is 2.4% in 2007 and 0.6% in 2000.

¹⁵More detailed information about the GSCF is available at the project website: <http://china.pop.upenn.edu/>

2.2 Educational fee reduction reform in rural China

Under the decentralized fiscal system established after China's economic reforms began in 1979, compulsory education in China has been financed by local governments. Because of imbalanced economic development, poorer localities lacking local financial resource bases frequently have had no choice but to pass financing burdens down to farm households. The free compulsory education system espoused by official policy has never been achieved in practice, and educational fees in fact have often accounted for a large share of household expenditures, especially of the poor. Before recent reforms, individual schools enjoyed significant discretion in setting various fee levels for students. This system led to frequent complaints about excessive fee charging and heavy burdens placed on farmers.

In the past 5 years there have been a number of reforms to the system of rural educational finance in China. One of the main objectives of the recent reforms is to reduce the rural educational fees charged to students in order to reduce farmers' burdens. The focus of this paper is on the most recent of these reforms, known widely as the "Two Exemptions One Subsidy (TEOS)" policy, which targets children engaged in compulsory education, which in China includes primary school (typically grades 1-6) and lower secondary, or middle school (grades 7-9). According to government documents, TEOS was initiated nationally in the beginning of calendar year 2005 in all nationally designated poor counties (Ministry of Finance and Ministry of Education, 2005). The population of national poor counties accounts for about one fourth of China's total rural population. The policy was expanded to all of rural China in 2006, since which time it also has been called the new security system for rural compulsory education (*nongcun yiwu jiaoyu baozhan xin jizhe*)¹⁶. In this paper, I do not distinguish between these two names, and call the program TEOS throughout.

The policy's two exemptions refer to exemptions from paying school fees (*xueza fei*) and charges for textbooks (*keben fei*), which previously had been paid by students. The one subsidy refers to a living subsidy to partially cover the costs of students living in school dormitories. The three components differ somewhat in their coverage and financing. The exemption of school fees targeted all rural children, and funding for this exemption is shared proportionally by the central and local governments. The textbook charge exemption was targeted at the children of poor households only, and the central government took full responsibility for funding. The subsidy for living expenses was also targeted at the poor, but was financed by local governments who were asked to put their programs in place by the end of 2007. If a student was fully exempted from all three types of expenses (school fees, textbook fees, and dormitory living costs), based on field visits in Gansu the only remaining fee he or she would typically be asked to pay by the school would be to purchase notebooks.

¹⁶Guangming Daily (2007).

In Tables 2-3, I report evidence on the timing of the implementation of the TEOS reform based on county and household questionnaires from the Gansu survey. Among the 20 counties surveyed, 15 percent reported implementing the school fees exemption in primary schools in the fall of 2004, another 50 percent reported starting in spring 2005, and the rest reported starting in spring 2006 (Table 2). The textbook fee exemptions began a little bit earlier, with 30 percent of counties starting in fall 2004, and another 45 percent in spring 2005. Just for the school fees exemption, by spring 2006 all counties had implemented the textbook fee exemption. The results are nearly identical for middle schools (Table 2). Implementation of the living subsidies was much slower, especially in primary schools. Only 10 percent of counties reported providing living subsidies in spring 2005, 65 percent of counties reported having started the program by spring 2006 when both exemption policies were fully implemented, and 30 percent of counties still had not begun providing subsidies by the time of the survey in summer 2007. Implementation was much faster in middle schools, which typically have more students living in dormitories. 60 percent of counties started providing living subsidies in spring 2005, and by spring 2006, 95 percent of counties had begun providing living subsidies.

Evidence from the household data is presented in Table 3. Because the coverage is based on recall, I restrict attention to students who have been in their current school since fall 2004 (primary students in grades 3-6 and middle school students in grade 9). Since the textbook fee exemption and living subsidies are targeted to children from poor households, it is possible that the coverage rates for students in the sample could be significantly lower than for schools or counties. In fact this is true for the living subsidy. No students report receiving living subsidies until spring 2005 and by spring 2007 only 0.92 percent of primary students and 8.96 percent of middle school students report receiving living subsidies (Table 3). In contrast, a very high proportion of students report receiving the textbook fee exemption—86 and 78 percent of primary and middle school students in spring 2007 (Table 3). The large difference in coverage of textbook exemptions and living subsidies likely is due to the fact that as a poor province Gansu receives a large amount of central subsidies for textbook exemptions, but lacks local resources to finance living subsidies (which are not centrally financed). Finally, a small percentage of primary school students (4 percent) and middle school students (9 percent) report not receiving the school fees exemption in 2007. This could be due to misreporting or attendance at private schools.

Prior to the reform, schools charged a single comprehensive educational fee which included school fees, textbook charges, and notebook fees. The value of the school fee exemption thus varied by county and school level, depending on the value of the single fee established prior to TEOS. I use the following formula to estimate the annual exempted school fees for

each primary and middle school student:

$$SF_{i,2007} = Pre_CEF_s - notebookfee_{i,2007} - textbookfee_{i,2007} \quad (1)$$

Here, Pre_CEF_s is the comprehensive educational fee charged by school s before the reform¹⁷, which is asked in the school questionnaire; the notebook charge is equal to 10 *Yuan* for primary students and 15 *Yuan* for middle school students; and the textbook fee is equal to 70 *Yuan* for primary school students and 140 *Yuan* for middle school students. The average value of estimated school fees exempted for primary school students is 54.26 with standard deviation equal to 54.66, and the average value of the estimated school fees exempted for middle school students is 71.75 with standard deviation equal to 56.13. Figure 2 shows the kernel density of exempted school fees over 100 villages. We can see that the exempted school fees are different for primary school students and middle school students, and they vary across villages.

According to the Gansu Educational Bureau, the subsidy provided to counties in 2007 for textbook purchases under TEOS was 35 *Yuan* per semester for primary school students and 70 *Yuan* per semester for middle school students. Since counties within the province buy the same textbooks, the value of the textbooks actually provided, and thus the value of the subsidy, is assumed to be uniform throughout the province. The criterion for allocating the free textbooks was the students' household income per capita¹⁸. Overall, 79.58 percent of primary school students and 72.69 percent of middle school students reported receiving textbook fee exemptions in the past year. The provincial education bureau recommended a living subsidy for poor students of one *Yuan* per day for 239 days per year, or 239 *Yuan* per year and 120 *Yuan* per semester (Gansu Educational Bureau, 2006). However, according to the 2007 survey data, only 0.92 and 8.96 percent of primary and middle school students received the subsidy.

Therefore, for each child enrolled in primary or middle school, total cost reductions from the reform, which I call *intended transfer*, are equal to the exempted school fees plus 70 or 140 if she is exempted from the textbook fee too; plus 239 if she gets the living subsidy. Table 4 shows the average value of intended transfers per capita for households in the sample in 2007. It also summarizes descriptive statistics for household expenditures, including

¹⁷In this paper, each village is assigned a nearest primary school, each township is assigned a nearest middle school. Students living in each village are assumed to attend the nearest school.

¹⁸But there was also variation in the number of free textbooks available to students in specific grade levels or schools, due to unexpected variation in class size or poor planning. Also, variation in the number of needy students across grades and schools could lead to differences in the extent to which the poorest students received the exemption. In our field research, we encountered a number of cases in which students received the textbook fee exemption in some semesters but not in others.

total expenditures per capita¹⁹, food expenditures per capita²⁰, non-food expenditures per capita²¹, health expenditures per capita²², required educational expenditures per capita²³, and voluntary educational expenditures per capita²⁴, From Table 4, we see that, for all households, the intended transfers account for about 2.971% of total expenditures. This figure is similar for the richest 30% of households (2.197%), but is greater for the poorest 30% of households (3.774%).

3 Conceptual framework

The impacts of the educational fee reduction reform can be analyzed under the framework of maximizing household utility. We can assume that parents are maximizing a household utility function $U(X, E)$, where X is a vector of household consumptions, including consumptions of voluntary educational goods and other non-educational goods, and E is the number of enrolled children. I assume that $U(X, E)$ satisfies: (1) $U_X > 0, U_E > 0$, (2) $U_{XX} < 0, U_{EE} < 0$, (3) $U_{XE} > 0$. And I also assume that both X and E are normal goods. Since the number of enrolled children can not be arbitrarily large, we assume E can not exceed E^* . E^* can be interpreted as the total number of children of schooling age in the family. I assume that household has income I , the vector of prices for X is denoted as P_X , and the price for E is denoted as P_E . P_E in this paper can be defined as required educational fees for each child. Then the household maximization problem is represented by the following:

$$\begin{aligned} & \max_{X, E} \{U(X, E)\} \\ \text{S.t.} \quad & P_X * X + P_E * E \leq I \\ & E \leq E^* \end{aligned}$$

¹⁹Total expenditures are equal to the sum of expenditures on food, expenditures on non-food consumption and service, expenditures on health care, expenditures on required educational items, and expenditures on voluntary educational items.

²⁰Expenditures on food are the sum of expenditures on rice, flour, maize, beans, bean products, other grains, potatoes and sweet potatoes, grain products, corn, pork, beef and mutton, chicken, other meat, marine products, eggs, vegetables, edible oils, dried and fresh fruits and nuts, spices, cigarette and alcohol, soft drinks, canned food, restaurant food, and money spent on food proceeding.

²¹Expenditures on non-food consumption and service are the sum of expenditures on washing and cleaning supplies, miscellaneous household items and hardware, clothing consumption, bedding, transportation maintenance and parts, electronic appliances maintenance, transportation costs, postage, communication devices maintenance fees, rent, house decoration and renovation, electricity, fuel, cultural products, cultural service fee, personal goods (including jewelry, makeup, etc.), and personal service fees (including salon, bath, photos, etc.).

²²Expenditures on health care are the sum of expenditures on buying medicine, and health insurance.

²³Expenditures on required education items is the sum of tuition and textbook fee.

²⁴Expenditures on voluntary educational items is the sum of expenditures on supplies of pens, exercise books, etc., supplementary tutoring, and snake in school and costs of transportation to school.

Figure 3 shows the optimal choice of households having different preferences. For type *A* households, parents care more about the education of their kids, such that they send all their kids of schooling age to the schools. Therefore, the maximization problem has a corner solution, which is represented by A^0 in Figure 3. But for type *B* households, parents care less about the education of their kids; therefore, their maximization problem has an interior solution, which is represented by B^0 in Figure 3.

The educational fee reduction reform reduces P_E , which is shown in Figure 3 as budget line rotating rightward around point M . Since both X and E are normal goods, for type *A* households, the maximization problem still has a corner solution, which is represented by point A^1 in Figure 3. That is, the number of enrolled kids stays the same as before the reform, while the households can have more money to spend on other goods, which is represented by the higher level of other consumptions in Figure 3. On the contrary, for type *B* households, their optimal choice moves to B^1 , at which more of their kids are enrolled in the schools and they are also able to consume more of other goods.

In this paper, my goal is not to study the impact of the reform on the children's school enrolment, which is studied in a separate paper (Park and Shi (2008)); therefore I take household's enrolment decision as given in the analysis. It is a reasonable assumption since the educational fee reduction reform was not found to have big effects on children's school enrolment. Actually, according to Park and Shi (2008), the primary school enrolment rate was 96.3% before the reform and 98.18% after the reform; and the middle school enrolment rate was 88.92% before the reform but 91.44% after the reform. The increase of enrolment rates is small. Indeed, the estimated impact of the reform on primary school enrolment is close to zero and not statistically significant. Although the estimated impact of the reform on middle school enrolment is statistically significant, the magnitude is not large; 10% increase in money transferred from the reform only led to 0.4% increase in the probability of middle school enrolment. Besides, children of primary school age (6-12 years old) account for 72% of the sample but children of middle school age (13-16 years old) only account for 25% of the sample. It shows that it is reasonable to take household enrolment decision as given in the analysis. Of course, it might cause some potential bias in empirical exercises, the detail of which is discussed in section 4.1.

Based on this assumption, parents' maximization behavior can be divided into two steps. In the first step, they pay required educational fees for their enrolled children, the total amount of which is $P_E * E^*$; in the second step, parents choose the optimal value of X using the remaining money $I - P_E * E^*$ to maximize the utility. For the sake of analysis, I divide X into two parts: voluntary educational goods, E_V , and all other non-educational

goods, \bar{X} . The household maximization problem can be rewritten as the following:

$$\begin{aligned} & \max_{\bar{X}, E_V} \{U(\bar{X}, E_V, E^*)\} \\ \text{S.t. } & P_{\bar{X}} * \bar{X} + P_{E_V} * E_V \leq I - P_E * E^* \end{aligned} \quad (2)$$

Here, $P_{\bar{X}}$ is a vector of prices of non-educational goods and P_{E_V} is a vector of the prices of voluntary educational goods. We assume that the educational fee reduction reform reduces the required educational fees to \bar{P}_E ; then the maximization problem becomes:

$$\begin{aligned} & \max_{\bar{X}, E_V} \{U(\bar{X}, E_V, E^*)\} \\ \text{S.t. } & P_{\bar{X}} * \bar{X} + P_{E_V} * E_V \leq I - P_E * E^* + (P_E - \bar{P}_E) * E^* \end{aligned} \quad (3)$$

Comparing (2) and (3) in the above, we can see that reducing the required educational fee does not change the relative prices between the non-educational goods and voluntary educational goods, but is equivalent to a cash transfer to households equal to $(P_E - \bar{P}_E) * E^*$. The other thing we can see is that the amount of the transfer depends on the price of education households pay before the reform, i.e. P_E . The higher is P_E , the greater is the implicit cash transfer.

Figure 4 shows the maximization problem described above. In Figure 4, voluntary educational goods are put on the X-axis, and all other non-educational consumptions are on the Y-axis. Since the educational fee reduction reform did not change the relative prices between the voluntary educational goods and non-educational goods, the reform shifts the budget line outward. Before the reform, households choose to consume A . After the the budget line is shifted outward, optimal consumption will be at point B if households redistribute the money among all expenditures, but will be at point C if households continue to spend the extra money on education, which is defined as the IFE in this paper. One could similarly interpret the X-axis as measuring the non-educational goods purchased for the targeted children, and the non-educational goods for other enrolled children on the Y-axis.

The above discussion implies that, if the IFE exists, then the impact of the reform on household voluntary educational expenditures should be positively significant, and much greater than the impact on other household expenditures. And individual-specific voluntary educational expenditure should increase for the children receiving benefits from the reform.

One caveat needs mentioning. If household preference over voluntary educational goods and other non-educational goods has some special features, for example, the utility function is quasi-linear. Then even the IFE does not exist, with the increase of the money available

for voluntary educational goods and all other non-educational goods, we can still see that all the extra money is spent on voluntary educational goods. This alternative explanation is shown in Figure 5. However, we can test whether this type of household preference is consistent with the data. I regress expenditures on voluntary educational goods and expenditures on all non-educational goods on money available for purchasing them, controlling for household demographic structure, land area per capita, number of kids enrolled in different levels of schools, mother's education, father's education, and dummies for different villages. I use two measures for money available for purchasing voluntary educational goods and all non-educational goods; one is the sum of expenditures on these goods, and the second one is equal to household total income subtracting required educational expenditures. If the household utility function has the features described in the above, we should expect to see that the impact of the money available to purchase voluntary educational goods and non-educational goods has much larger impact on voluntary educational expenditures than on other non-educational expenditures. Table A in Appendix shows the regressions using household sample from year 2000. From this table, we can see that with the increase in the money available, the non-educational expenditures increase, which is shown in columns (2) and (4). But from columns (1) and (3), with the increase in the money available, the increase in voluntary educational expenditures is much smaller. These results show that it is impossible for the preference to have some special features such that the increase in the money available to be spent on voluntary educational goods and other non-educational goods only leads to the increase in the consumption of voluntary educational goods.

Another important question is how parents know how much they save from the reduced education fees and then spend it on children's voluntary educational items. Actually, there are several ways for parents to get this information. One is from schools' publicized information. In the field research, we did see schools posted the information about what kinds of items were exempted and how much was exempted. The parents can also know this information just from their own experience since most of them have children enrolled in school before 2005 when the TEOS reform started. Figure A in Appendix shows the distribution of the school entering year of the oldest children in the sample households. From Figure A, we can see that more than 95% households had children enrolled before 2005. For the remaining households, they can also know this information from their neighborhoods.

4 Empirical strategy

As discussed in the above, if the IFE exists, the impact of the reform on household voluntary educational expenditure should be significantly positive, and the impact of the reform on household other categories of non-educational expenditures should be much weaker. And the reform is also expected to have significantly positive impact on individual voluntary

educational expenditures. In this section, I discuss empirical strategies used to identify the reform’s impacts on expenditures in household level and in individual level.

4.1 Household level regressions

Before the reform, different schools in different villages charged different educational fees; therefore, when the reform removed the educational fees, households in villages having higher educational fees before the reform benefited more from the reform. We can compare educational expenditures of households, which were surveyed in 2007 when the reform had been implemented, in villages having higher pre-reform educational fees with those households in villages having lower pre-reform educational fees. However, cross-sectional comparisons cannot differentiate the impact of the reform from the village characteristics which might also be related with expenditures. Since GSCF also collected information in 2000; therefore, households surveyed in 2000 are used as a control group in this paper. In other words, I compare households in the same village but surveyed before the reform and after the reform, by which the fixed village characteristics can be canceled out; and then I compare the before-after difference in the expenditures of households in the villages having higher pre-reform educational fees with the before-after difference in expenditures of those living in the villages having lower pre-reform educational fees. The identification idea used here is a “continuous” version of difference-in-difference strategy.

A crucial identification assumption is that the change of educational expenditures from 2000 to 2007 in villages benefiting more from the reform should not be systematically different from those in villages benefiting less from the reform in the absence of the reform. I can test this assumption by using the first two waves (in years 2000 and 2004) of data. The identification will also be violated if there exist some time-varying and region-specific effects correlated with transfers (essentially the pre-reform educational fees) from the reform and potentially affect household educational expenditures. Unfortunately, the mechanism for schools in different villages to charge different fees before the reform is not clear. But, since GSCF collected detailed village level variables, which makes it possible to include a large number of village variables in year 2000 (interacted with year 2007 dummy) to control these time-varying and region specific effects. In the regression, I include illiterate ratio, ratio of primary school graduates in labor force, primary school enrolment rate, middle school enrolment rate, indicator for having pre-school classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of

wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises. Combined with village fixed effects, inclusion of these variables in regression function helps to correct bias due to possible endogeneity of the pre-reform educational fees charged in different villages.

Another concern is that there might be some other concurrent government programs correlated with the level of educational fees charged before the reform and potentially affected educational expenditures. Indeed, Chinese government exempted all agriculture-related taxes in 2006; this policy should not affect the estimation since it is not related with pre-reform educational fees and common for all the households in different villages. To the best of my knowledge, there are no other programs concurrent with the educational fee reduction reform in Gansu.

The following regression function is estimated:

$$EX_{ht}^m = \alpha_0 + \alpha_1 * ITPC_{ht} + \alpha_2 * H_{ht} + V_{v,2000} * Year_{2007} + Village_v + Year_t + \varepsilon_{ht} \quad (4)$$

In equation (4), EX_{ht}^m on the left hand side is a vector of outcome variables, including household income per capita, household total expenditures per capita, and specific categories of expenditures per capita, including food, non-food goods and service, health care, required educational expenditures and voluntary educational expenditures. $ITPC_{ht}$ is intended transfers per capita household h should get in year t from the reform. The value is equal to zero in pre-reform years. In the year 2007, it is equal to the sum of intended transfers to each enrolled child in the household divided by the number of family members²⁵. H_{ht} is a vector of household variables, including household demographic structure²⁶, household endowments²⁷, log of household real income per capita, and the number of children enrolled in different grades²⁸. Interactions of village variables in 2000 and dummy for year 2007, $V_{v,2000} * Year_{2007}$, are included in the regressions to control for time-varying and

²⁵Since the eligibility for students to get textbook fee exemption and living subsidy mainly depends on household income, and the amount of exempted textbook charge and living subsidy are the same for all the kids eligible to get them. Therefore, by including household income in the regressions as a control, the variation from textbook fee exemption and living subsidy is absorbed. In other words, the variation in the variable of intended transfer comes from the variation in the extent of exempted school fees. I will test it in Section 6.1.

²⁶Household demographic structure includes ratio of male from 0-5, 6-12, 13-16, 17-19, 20-29, 30-39, 40-49, 50-54, 55 and above, ratio of female from 0-5, 6-12, 13-16, 17-19, 20-29, 30-39, 40-49, 50-54, 55 and above, and total number of family members.

²⁷Household endowments include land area per capita, father's schooling year, and mother's schooling year.

²⁸This vector of variables includes number of children enrolled in primary school, middle school, high school, and other school levels.

region-specific factors. I also control for village average expenditure levels and cohort average expenditure levels by including village fixed effects, $Village_v$, and year fixed effects, $Year_t$. ε_{ht} is an error term with mean equal to zero. In the estimation, robust standard errors are calculated by clustering at the village level.

In estimating functions (4), one important caveat bears mentioning. According to Park and Shi (2008), the fee reduction reform has no significant effects on primary school enrolment, but it does have significant positive effects on middle school enrolment. In this paper, I take the enrolment decision as given by using households having enrolled children as the sample for analysis and including the numbers of kids enrolled in different grades as control variables. The results shown in this paper should not be extended to interpret the behaviors of households without any children enrolled in schools. However, even when we interpret the results in this way; there are still ways in which the results could be biased. Households sending children (especially 13-16 years old children) to school only after the reform reduced educational fees might be less willing to invest in children’s education due to unobservable characteristics that prevented them from enrolling their children in the absence of the reform. Then the estimates of the impact of the reform on voluntary educational expenditures would be biased downward. However, the bias should not be large because 9-12 years old children account for majority of the sample (67%)²⁹ and the impact of the reform on middle school enrolment is small as described above.

4.2 Individual level regressions

In order to identify the impact of the reform on individual level educational expenditures, I take advantage of two sources of variation. One is the variation in intended transfer received by children enrolled in different levels of grade but living in the same family. The other is differences in the magnitude of fee reductions in different villages. Children surveyed in year 2000 are used as a control group in both cases.

GSCF collected information on required and voluntary educational expenditures for each enrolled child, which makes it possible to exploit within-household variation to identify the impact of the reform on individual educational expenditures. Children living in the same family might get different transfers from the reform if they are enrolled in different grades. Children enrolled in high school receive no transfers, and children enrolled in middle school get more transfers from the reform than children enrolled in primary school. We therefore can compare educational expenditures on children living in the same family, but enrolled in different grades, to identify the impact of the reform on educational expenditures while con-

²⁹There are also 5% children aged from 6-8 years, although Park and Shi (2008) did not investigate the impact of the reform on them, the impact should not be significant since these children were only be likely to be enrolled in primary schools, and the impact of the reform on enrolment in primary school is not significant.

trolling for household level unobservables. However, if just cross-sectional data in one year is used, the impact of the reform cannot be differentiated from the systematic difference in the educational expenditures on children enrolled in different grades in the absence of the reform. Fortunately, children surveyed in 2000 can be used as a control group. Intuitively, I compare educational expenditures differences between children enrolled in different grades but living in the same family before the reform with similar differences after the reform, a version of difference-in-difference strategy.

The above idea can be represented by the following specification:

$$EE_{iht} = \alpha_0 + \alpha_1 * IT_{iht} + \alpha_2 * X_{iht} + \gamma_{ht} + \varepsilon_{iht} \quad (5)$$

In equation (5), EE_{iht} is a vector of child-specific expenditure variables, including educational expenditures (required and voluntary) of children i living in household h in year t ; IT_{iht} is intended transfer received by child i in household h in year t , equal to zero in the year 2000; X_{iht} is a vector of individual characteristics, including sex and age; γ_{ht} is a household fixed effect for household h surveyed in year t . ε_{iht} is an error term with mean equal to zero. In the estimation, robust standard errors are calculated by clustering at the village level. In order to cancel out household fixed effects, I subtract household average values from every variable in equation (5), and then to compare before and after the reform within the same village, I add village fixed effects to the regression. Finally, the following equation is estimated:

$$EE_{iht} - \overline{EE_{ht}} = \alpha_1 * (IT_{iht} - \overline{IT_{ht}}) + \alpha_2 * (X_{iht} - \overline{X_{ht}}) + Village_v + (\varepsilon_{iht} - \overline{\varepsilon_{ht}}) \quad (6)$$

By using the within-household variation to identify the effect of the reform, we can implicitly control any observable and unobservable village and household level variables. But the identification assumption should be that the systematic difference between education expenditures on children enrolled in different levels of schools does not change in the absence of the reform. This assumption might be violated if the time path of educational expenditures on children enrolled in higher level school is different from the time path of educational expenditures on children enrolled in lower level school, or/and if parents' preference toward different children changes. I test this identification assumption by taking advantage of special survey design of the GSCF data. GSCF includes three waves of data, two (year 2000 and 2004) before the reform and one (year 2007) after the reform. Since children surveyed in year 2000 and 2004 were not affected by the reform, so I am able to do control experiment to test this identification assumption.

In order to exploit the variation in the extent of fee reductions in different villages, the

following regression function is estimated:

$$EE_{iht} = \alpha_0 + \alpha_1 * IT_{iht} + \alpha_2 * IT_{-iht} + \alpha_3 * XX_{iht} + \alpha_4 * HH_{ht} + V_{v,2000} * Year_{2007} + Village_v + Year_t + \varepsilon_{iht} \quad (7)$$

In this function, EE_{iht} on the left hand side is defined the same as that in function (6), which is a vector of outcome variables, including required educational expenditures and voluntary educational expenditures. In order to control heterogeneity between treatment group and control group, I include a vector of individual characteristics, XX_{iht} , including dummy for girl, age, and dummies of grades; and a vector of household characteristics, HH_{ht} , which is a vector of household characteristics, including household demographic structure, household endowments, and log of household real income per capita. As discussed above, I include the interactions of village variables in 2000 and indicator for year 2007, $V_{v,2000} * Year_{2007}$, as control. I also control for average village and cohort education expenditure by including village fixed effect, $Village_v$, and year fixed effect, $Year_t$. In the function, ε_{iht} is an error term with mean value equal to zero. The most important variables in this regression function are IT_{iht} and IT_{-iht} . IT_{iht} is intended transfer child i in household h gets from the reform in year t . The coefficient before this variable, α_1 , captures the impact of the reform on child i . IT_{-iht} is the sum of intended transfer of all other children living in the same family. The coefficient before this variable, α_2 , captures spillover effect of intended transfer other children in the same family gets. In the estimation, robust standard error is calculated by clustering in village level. If the IFE exists, we should expect to see precisely estimated α_1 and insignificant α_2 .

In order to estimate function (7), the identification assumptions needed are the same as those for estimating household regressions. The potential selection due to endogenous enrolment decision leads to the same bias in the estimation as it does in the household regressions. In addition, the estimated results might still be driven by some unobservable household or village changes in educational expenditures. But if so, then we should expect to see the same effects of IT_{iht} and IT_{-iht} on individual educational expenditures. Therefore, the estimation of function (7) itself can also provide evidence to see whether the unobservable household or village changes in educational expenditures affect the estimation.

5 Empirical results

5.1 Descriptive results

Table 5 describes the household expenditure patterns in 2000 and 2007. From this table, we can see that required educational expenditures per capita in 2007 is much lower than

that in 2000, the difference of the average values in these two years is -71.349, and is significant by different from zero at the 1% level. This means that the educational fee reduction reform did reduce required payments for children's education. All other variables, including total expenditures, food expenditures, non-food expenditures, health expenditures, and voluntary educational expenditures, increased from 2000 to 2007, with the changes being statistically significant. But this increase might just be due to the existing time trends.

Next, I estimate a rough measurement of the impact of the reform by using the difference-in-difference strategy, and report the results in Table 6. In the table, the "treated" group includes villages having average intended money transferred from the reform above the median, and the "untreated" group includes villages having average intended money transferred below the median. Year 2000 is the pre-reform period and year 2007 is the post-reform period.

The table lists results for total expenditures per capita and other categories of expenditures per capita, including expenditures on food, expenditures on non-food consumption and services, expenditures on health care, required educational expenditures, and voluntary educational expenditures. From the table, we can see that compared with the untreated group, the expenditures of the treated group are always higher. One important reason might be because the treated group includes villages having higher intended transfers, i.e. higher pre-reform educational fees, which could be related to better economic status of these villages. Secondly, we can see that, compared with pre-reform period, expenditures in the post-reform period are greater, whether for the treated or untreated group. The difference-in-difference results are shown in the right-bottom cell in each section in Table 6. We can see that the effects are statistically significant only for required educational expenditures per capita and voluntary educational expenditures per capita; both of them are significant at the 1% level. The difference-in-difference result for required educational expenditures per capita is -40.27, which means the average required educational expenditures per capita in the treated villages decreased by 40.27 *Yuan* more than in the untreated villages. The difference-in-difference result for voluntary educational expenditures per capita is 55.33, which means that the average voluntary educational expenditures per capita in treated village increased by 55.33 *Yuan* more than in the untreated villages. All the other results are not statistically significant. These simple comparisons provide preliminary evidence for the existence of the IFE, i.e. households used money saved from reduced required educational fees to spend on the voluntary educational items. Since it cannot control for other variables, this paper provides more reliable regression results in the following.

5.2 Household level regressions

Table 7 presents the results for the household level regressions. Section A in Table 7 shows the main results using data from waves of years 2000 and 2007, while results in section B are results from a control experiment using data from waves of years 2000 and 2004. For clarity of presentation, we just present the coefficients of the intended transfers per capita, and suppress reporting the coefficients on the many control variables. These full results are available upon request.

Column (1) of section A shows the impact of the fee reduction reform on household income per capita. The reform is expected to increase income if households use the money from the reform to make productive investments. However, the result shows that there is no significant impact of the reform on income, and the coefficient is negative. Column (2) shows the impact on total expenditures per capita. While the coefficient is -2.222, it is not significant either. Since household saving is equal to income minus total expenditures, we can derive from these two estimated results that there is also no impact of the reform on household savings, i.e. households do not save the money from the reduced educational fees.

Columns (3) to (7) show the impact of the reform on different categories of expenditures. Columns (3) to (7) correspond to expenditure on food, non-food goods and services, health care, required educational fees, and voluntary educational spending respectively. Firstly, from columns (3), (4) and (5), we can see that the impact of educational fee reduction reform on expenditures on food, non-food goods and service, and health care per capita are not statistically significant and are all negative. The coefficients are -0.014, -1.770 and -0.476 respectively. Only the impacts on required educational expenditures and voluntary educational expenditures are significant (see columns (6) and (7)). The coefficient of required educational expenditures is -0.613 and significant at the 1% level. This means that one *Yuan* intended transfers per capita leads to a 0.613 *Yuan* reduction in required educational payments per capita. Since intended transfers capture the change in required educational fees due to the most recent reform starting in 2005, but the dependent variable measures the change in required educational expenditures from 2000 to 2007, the estimated coefficient is not expected to be equal to -1. Schools with higher fee reductions since 2005 are likely to be the schools with lower fee reductions before 2005, which would lead to actual reductions, understating the impacts of the reforms, of required education fees from 2000 to 2007 smaller. In addition, it is possible that schools did not fully implement the policies or that parents under-reported required educational fees. However, what is relevant for testing the IFE is the comparison of the coefficient in columns (6) and (7). Column (7) reports the impact of the reform on household voluntary educational expenditures per capita. The coefficient shown in this column is 0.651, significant at the 5% level. Thus, one *Yuan* of intended transfers per capita from the reform leads to a 0.651 *Yuan* increase in

voluntary educational expenditures per capita. We can see that although the magnitudes of coefficients in column (6) and column (7) are not exactly the same, they are very close to each other and have opposite signs. Indeed, the P-value of the Wald test testing the null hypothesis that the absolute values of these two coefficients are the same is 0.899, which means that the difference between the absolute values of these two coefficients is not significant. These results suggest that there are no income effects of the reform and that parents spend the money transferred from the reform on voluntary educational expenditures.

Section B shows the results from a control experiment testing the identification assumption that the time trends of household expenditures in villages benefiting more from the reform are not systematically different from villages benefiting less from the reform. The critical issue is how to generate hypothetical intended transfers for each enrolled child surveyed in year 2004. I calculate the mean value of intended transfers for children enrolled in each grade and living in each village in 2007, and then I assign this average value to children enrolled in the same grade and living in the same village in 2004. The households' hypothetical intended transfers per capita is equal to the sum of all such hypothetical intended transfers divided by the number of household members. All other control variables are defined to be the same as in section A. From section B, we can see that none of the coefficients are significant, showing that the time trends of households' expenditures in different villages are not systematically different in the absence of the reform.

From Table 7, we see that on average one *Yuan* in intended transfers per capita leads to a 0.651 *Yuan* increase in voluntary educational expenditures per capita. I also test the heterogeneous effects of the reform on voluntary educational expenditures. I investigate whether impacts differ by household income per capita, total number of enrolled children, mother's schooling years, and father's schooling years (columns (1) to (4) in Table 8). The coefficient on the interaction of log value of household income per capita and intended transfers per capita is positive (0.148); but not statistically significant (column (1)). The coefficient on the interaction term with number of enrolled children is 0.274, and also not statistically significant (column (2)). Columns (3) and (4) show the heterogeneous impact of the reform in terms of mother's and father's schooling years respectively. Although both coefficients are positive, only the coefficient on the interaction with mother's schooling years (0.083) is significant (at the 5% level). The coefficient of the interaction term with father's schooling years is smaller (0.037) and not statistically significant. This is consistent with other findings that mothers care more about children's education than fathers³⁰.

³⁰Thomas, 1990, and Dufló, 2000.

5.3 Individual level regressions

Table 9 presents estimates of the reform’s impact on educational expenditures on individual children. This table is also divided into two sections in the same manner as Table 8. Columns (1) and (2) show the results from the estimation of equation (6), and columns (3) and (4) show the results from the estimation of equation (7). As before, we only report coefficient on the individual intended transfers and the coefficient on the sum of all other children’s intended transfers in the same family.

We find that one *Yuan* increase in intended transfers leads to a 0.493 *Yuan* decrease in required educational expenditures(column (1) in section A) and a 0.578 *Yuan* increase in voluntary educational expenditures(column (2)). These two coefficients have opposite signs and similar magnitudes. Both are statistically significant at the 1% level. I test the null hypothesis that the absolute values of these two coefficients are equal. The P-value of the Wald test is 0.794, suggesting that there is no significant difference between the magnitudes of these two coefficients. Column (3) also shows the impact of the reform on individual required educational expenditures, estimated from regression function (7). The coefficient on the individual level intended transfers is -0.422 and statistically significant at the 1% level, while the coefficient on the sum of all other children’s intended transfers is -0.085 and statistically not significant at all. Similarly, for voluntary educational expenditure, the coefficient on individual intended transfers is 0.586 and statistically significant at the 5% level, while the coefficient on the sum of other children’s intended transfers is 0.012 and statistically not significant. As before, I also am unable to reject the null hypothesis that the absolute values of the coefficients on individual intended transfer in columns (3) and (4) are equal(the P-value of the Wald test is 0.550). In addition, as I point out in Section 4.2, if the results are driven by unobservable village or household changes in education expenditures, the individual intended transfers, IT_{iht} , and the sum of other children’s intended transfers, IT_{-iht} , should have same effects on education expenditures. But the results in Table 9 shows that they are different.

Section B in Table 9 shows the results from the control experiment that uses data from year 2000 and year 2004. Columns (1) and (2) show the results testing the identification assumption that the differences of educational expenditures between children enrolled in different grades does not change across the time. Both coefficients in these two columns are not significant, which supports the assumption. The last two columns in section B test whether the time trends of household educational expenditures are different in different villages in the absence of the reform. From columns (3) and (4), we can also see that no coefficients are statistically significant. This provides evidence that there are no different time trends of individual educational expenditures in different villages in the absence of the reform.

In this paper, I also investigate the heterogeneous impact of the reform on voluntary educational expenditure in terms of individual characteristics, including gender, birth order, and grade enrolled. All the heterogeneous tests are based on regression function (7). Table 10 presents the results. Columns (1) to (3) correspond to tests for heterogeneous impacts in terms of gender, birth order, and grade enrolled respectively. The coefficient on the interaction term of the girl dummy and individual intended transfers is 0.585, and is statistically significant at the 1% level. Given one *Yuan* increase in intended transfers, girls can get 0.585 *Yuan* more than boys in terms of voluntary education expenditures from their parents. Parents also spend more on older children. The coefficient on the interaction of birth order and individual intended transfer is -0.471 and statistically significant at the 1% level. Consistent with this result, the coefficient on the interaction of individual intended transfer and middle school dummy is 0.864 and statistically significant at the 5% level (column (3)). Thus, with one *Yuan* increase in intended transfer from the reform, parents would spend 0.864 *Yuan* more on voluntary educational expenditures on children enrolled in middle school than on children enrolled in primary school.

6 Robustness checks

6.1 Do schools “evade” mandated fee reductions through greater voluntary educational expenditures?

One could argue that after the educational fees are exempted, schools may evade the regulations by requiring so-called “voluntary” expenditures; in other words, perhaps the voluntary expenditures are not actually voluntary. An obvious example is that schools might require students to take more tutoring classes organized by schools in order to charge additional tutoring fees after the regular school fees were exempted. Or the school could pass on the costs of services previously provided by the school for free and describe the payments as voluntary. In this section, I provide evidence against this possibility.

Table 11 shows the reform’s impact on different components of household voluntary educational expenditures. The first column still shows the impact of the reform on household voluntary educational expenditures per capita. Columns (2) to (4) list the impacts of the reform on the different components of voluntary educational expenditures by increasing order of the magnitudes of the estimated impacts. The impact of the reform on tutoring expenditures is the smallest. The coefficient is equal to -0.007 and not significant at all (column (2)). It shows that the schools did not charge additional fees by requiring children to attend more tutoring classes, which is the most feasible way schools can use if they would like to charge more fees from the students.

The impacts of the reform on other components (including expenditures on school supplies, and children's food and snack in school and transportation) are positive and statistically different from zero. The coefficient on expenditures on school supplies is 0.193 and statistically significant at the 5% level (column (3)). The coefficient on expenditures on children's food and snack in school and transportation is 0.464 and statistically significant at the 5% level (column (4)). This suggests that parents used the money saved from the reduced required educational fees to buy more or better quality school supplies and food or snack for their children. It is not possible for schools to require students to buy these from the school since charging students with extra fees is politically sensitive especially in rural China, the school principals would take a big risk if parents complaint about it. Indeed, in our field research, we have never seen such a case that schools sell school supplies or food to students.

In addition, after the educational fees were exempted, the schools were subsidized by the central and local governments. In 2005, the total money used to subsidize schools in Gansu was 216 million *Yuan*³¹. At the same time, all the information is publicized, and parents can complaint about the overcharged fees. Therefore, schools do not have incentive to charge additional fees from students after the regular educational fees were exempted.

6.2 Do variations from textbook exemption and living subsidy drive the results?

In this paper, I argue that the variation in the intended transfer is from variation of the school fees charged before the reform in different villages, while the variations from exempted textbook charge and living subsidy are absorbed if household income is controlled. In this section, I am going to test whether this argument is valid. I assume that all children enrolled in primary schools and middle schools are eligible to be exempted from textbook fee charge, but no one gets living subsidy. Then I construct a new variable, which I call *intended transfer II*. It is equal to school fees exemption, which is defined in equation (1) in section 2.2, plus 70 (140) if the child is enrolled in primary school (if the child is enrolled in middle school.). The household intended transfer II per capita is equal to the sum of intended transfer II of all the children living in the household divided by the number of total family members. By doing so, the variation of intended transfer II is totally from the variation in pre-reform school fees. Then, I re-estimate functions (4), (6) and (7) by replacing intended transfer with newly constructed intended transfer II. The results are shown in Table 12 and Table 13.

Table 12 shows the results from household level regression. From this table, we can see that only the coefficients shown in columns (6) and (7) are significant. The coefficient in column (6) is equal to -0.608, significant at the 1% level. We should compare this coef-

³¹March 23, 2005, China Education Daily

ficient with that shown in column (6) in Table 7, which is equal to -0.613. We can see that they are almost the same. Indeed, I test the hypothesis that these two coefficients are equal, and P-value of Wald test is 0.880, which means that these two coefficients are not significantly different. Then we can turn to the coefficient shown in column (7) in Table 12. This coefficient is equal to 0.627, significant at the 5% level. The corresponding coefficient in column (7) in Table 7 is equal to 0.651. These two coefficients are very close to each other, and the P-value of Wald test testing their equality is 0.755, which also shows that these two coefficients are not significantly different.

Table 13 shows the results from individual level regressions, but using newly defined intended transfer II as treatment variable. The first two columns show the results from estimating function (6). The coefficient shown in column (1) is equal to -0.464, significant at the 1% level. However, the coefficient shown in column (2) is equal to 0.586, also significant at the 1% level. Columns (3) and (4) show the estimated results of function (7). Coefficient in column (3) is equal to -0.421, significant at the 1% level, but the coefficient in column (4) is equal to 0.537, significant at the 10% level. We can compare these four coefficients in Table 13 with those corresponding coefficients shown in Table 9. We can see that the estimated impacts of the reform on required educational fees are almost the same. The P-values of Wald test are 0.282 and 0.975 for coefficient shown in columns (1) and (3) respectively. The estimated impacts of the reform on voluntary educational expenditures in Table 13 and in Table 9 are also close to each other. The P-values of Wald test are 0.944 and 0.519.

The results discussed in above show that the variations from textbook fee charge and living subsidy do not have any effects on the estimation.

6.3 The impacts of required educational fees on expenditures: IV strategy

In this section, I investigate the impact of required educational expenditures on other expenditures directly. In order to exploit the variation in required educational expenditures due to the educational fee reduction reform, I use intended transfer from the reform as IV for required educational expenditures. Table 14 shows the estimated coefficients. Columns (1) to (6) in the table show the results of household level regressions, and column (7) in the same table shows the result of individual level regression.

Let's firstly look at the results shown in columns (1) to (6) in Table 14. In all these columns, household intended transfer from the reform per capita is used as an IV for household required educational expenditures per capita. The first stage regression has been shown in Table 7. The F-value of the first stage regression is equal to 20.10. It is

larger than 10, which means that household intended transfer from the reform per capita is not a weak IV for household required educational expenditures per capita³². We can see that only the coefficient in column (6), i.e., the regression of household voluntary educational expenditures per capita, is significant. The coefficient is equal to -1.061, significant at the 5% level. It means that one *Yuan* decrease in required educational expenditures per capita leads to 1.061 *Yuan* increases in voluntary education expenditure per capita. Although the coefficient is not exactly equal to -1, the P-value of F test testing the hypothesis that the coefficient is equal to -1 is 0.608, which means that the coefficient is not significantly different from -1. The result estimated here is also consistent with that shown in Table 7. In Table 7, one *Yuan* intended transfer per capita from the reform leads to 0.613 *Yuan* decreases in required educational expenditures per capita and 0.651 *Yuan* increases in voluntary educational expenditures per capita, from which we can derive that one *Yuan* decrease in required educational expenditures per capita leads to 1.062 *Yuan* increases in voluntary educational expenditures per capita. In Table 14, all other coefficients shown in columns (1) to (5) are not significant, which means that the change in the required educational expenditures due to the reform does not affect household expenditures except for household voluntary educational expenditures.

Column (7) in Table 14 shows the result of individual level regression. In this column, the individual intended transfer from the reform and the sum of other children's intended transfer from the reform in the same family are used as IVs for individual required educational expenditures and the sum of other children's required educational expenditures in the same family. I do not present the regression result for the first stage in Table 14, but the F-values are 26.83 and 60.12 in the first stage regression of individual required educational expenditures and the sum of all other children's required educational expenditures in the same family. These two F-values are larger than 10, which mean that the IVs used are not weak³³. In column (7), the coefficient before individual required educational expenditures is -1.312, significant at the 10% level, while the coefficient before the sum of other children's required educational expenditures is not significant. It means that one *Yuan* decrease in individual required educational expenditures leads to 1.312 *Yuan* increases in voluntary educational expenditures on this child. I also test the hypothesis that this coefficient is equal to -1. The P-value of F test is equal to 0.643, which means that the coefficient is not significantly different from -1. The result shown in Table 14 is consistent with that shown in Table 9. As shown in columns (3) and (4) in Table 9, one *Yuan* increase in the intended transfer from the reform leads to 0.422 *Yuan* decreases in required educational expenditures and 0.586 *Yuan* increases in voluntary educational expenditures, which means that one *Yuan* decrease in required educational expenditures leads to 1.389 *Yuan* increases

³²Bound, Jaeger and Baker, 1995.

³³Bound, Jaeger and Baker, 1995.

in voluntary educational expenditures, which is slightly larger but still very similar to the estimates shown in Table 14.

6.4 Measurement error

Measurement error in household income as control variable could lead to attenuation bias in the income coefficient, while could bias other coefficient estimates as well, especially if incomes are correlated with intended transfers. In order to see the effects of measurement error on the coefficient of interest, I use the average value of income of all other households living in the same village in the same year as an IV. A critical assumption for the validity of this IV is that measurement errors in the incomes of different households income are independent. Table 15 shows the results for the household level (columns (1) to (6)) and individual level (columns (7) to (8)).

We find that the results do not change in any noticeable way when we use instruments. The coefficients shown in columns (1) to (4) at Table 15 are not significant, the same as in section A at Table 7. The coefficients shown in columns (5) and (6) are significant. The coefficient shown in column (5) is -0.601, significant at the 1% level; and the coefficient shown in column (6) is 0.692, significant at the 5% level. Comparing with the corresponding coefficients shown in Table 7, we can see that although the estimated impact of the reform on household required educational expenditures is slightly smaller in Table 15, but the estimated impact of the reform on household voluntary educational expenditures is slightly larger in Table 15, both coefficients shown in Table 7 and Table 15 are very close to each other. Then, we can see the results in columns (7) to (8). The one shown in column (7) is -0.498, significant at the 5% level; the one shown in column (8) is 0.527, significant at the 10% level. Compared with the coefficients shown in columns (3) to (4) in Table 9, although the estimated impact of the reform on individual required educational expenditures is larger, but the estimated impact of the reform on individual voluntary educational expenditures is smaller in Table 15, both coefficients shown in Table 9 and Table 15 are very close to each other too.

From the above discussion, we can see that although there might be some measurement errors in the variables, the estimation of the reform's impact is not affected.

7 Conclusion

This paper tests for the existence of an intra-household flypaper effect by investigating the impact of an educational fee reduction reform in rural China on household expenditures.

Using household survey data from the Gansu Survey of Children and Families, I first in-

investigate the impact of the reform on household level expenditures. I find that a one *Yuan* increase in the household intended transfers per capita from the reform leads to a 0.613 *Yuan* decrease in household required educational expenditures per capita, and a 0.651 *Yuan* increase in household voluntary educational expenditures per capita. The absolute values of these two coefficients are not statistically different. But there are no significant impacts of the reform on household total income per capita, total expenditures per capita, or other categories of expenditures, including expenditures on food, non-food consumption and services, and health care. And I also find that a one *Yuan* increase in individual intended transfers leads to a 0.422 *Yuan* decrease in the individual required educational expenditures, but leads to a 0.586 *Yuan* increase in the individual voluntary educational expenditures. The absolute values of these two coefficients are also not significantly different. In addition, I find that with the same amount of increase in the intended transfers from the reform, households having more educated mothers spend more on voluntary educational items, and parents spend more on girls, older kids and kids enrolled in middle schools. Overall, this paper provides a strong evidence for the existence of an intra-household flypaper effect.

The findings in this paper also have policy implications. Besides the commonly recognized positive impacts of governments' educational subsidy programs on targeted children's enrolment, this paper shows that these programs also increase parents' investment on enrolled children's education, which increases their short- and long-run welfare. It also shows that when evaluating governments' educational subsidy programs, we should include the flypaper effects into benefit-cost analysis.

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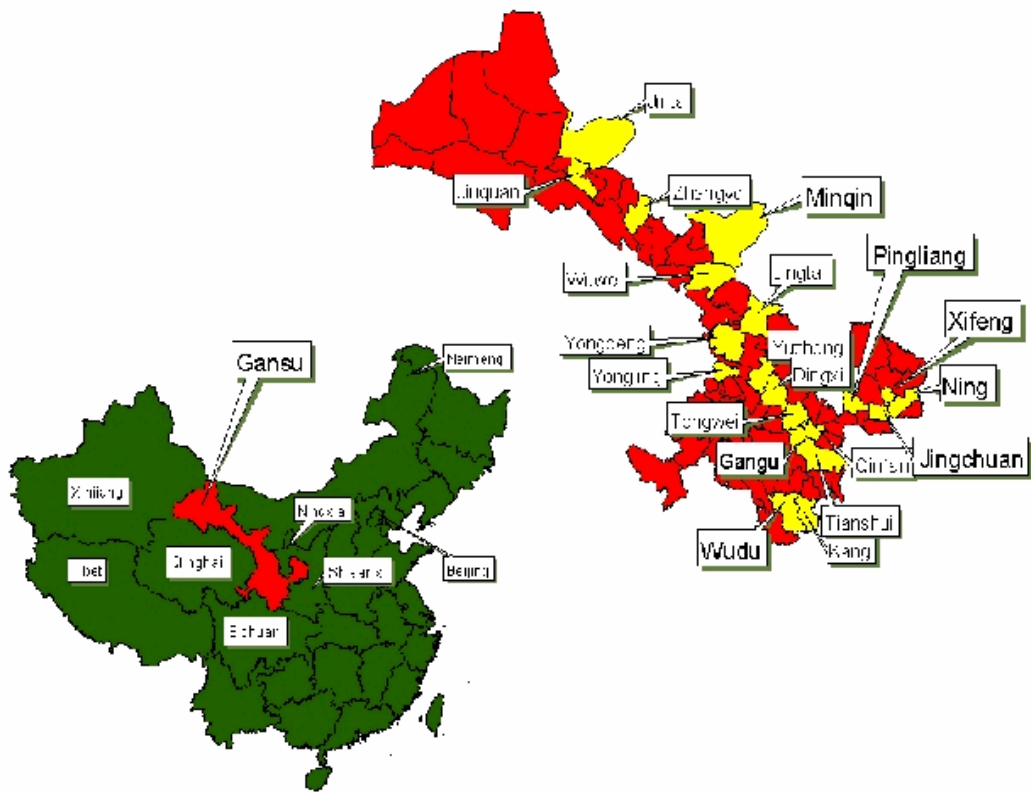
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Figure1. Gansu Province and GSCF Counties.



Map 1. Gansu Province, GSCF Counties Marked

Source: Hannum (2001)

Figure 2. Kernel density of exempted school fees

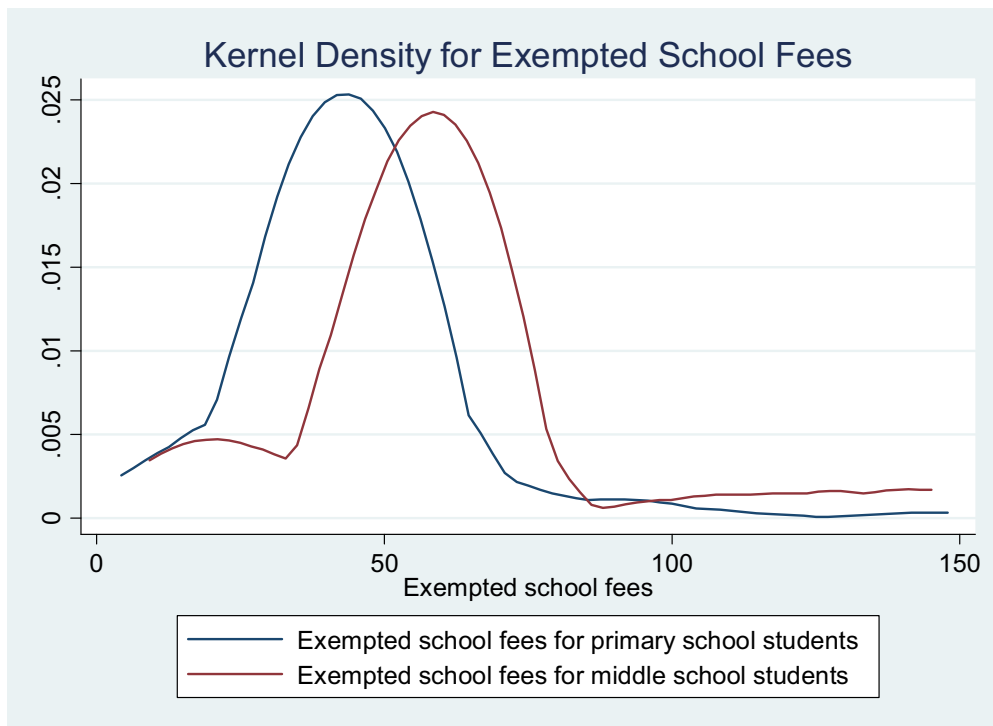


Figure 3

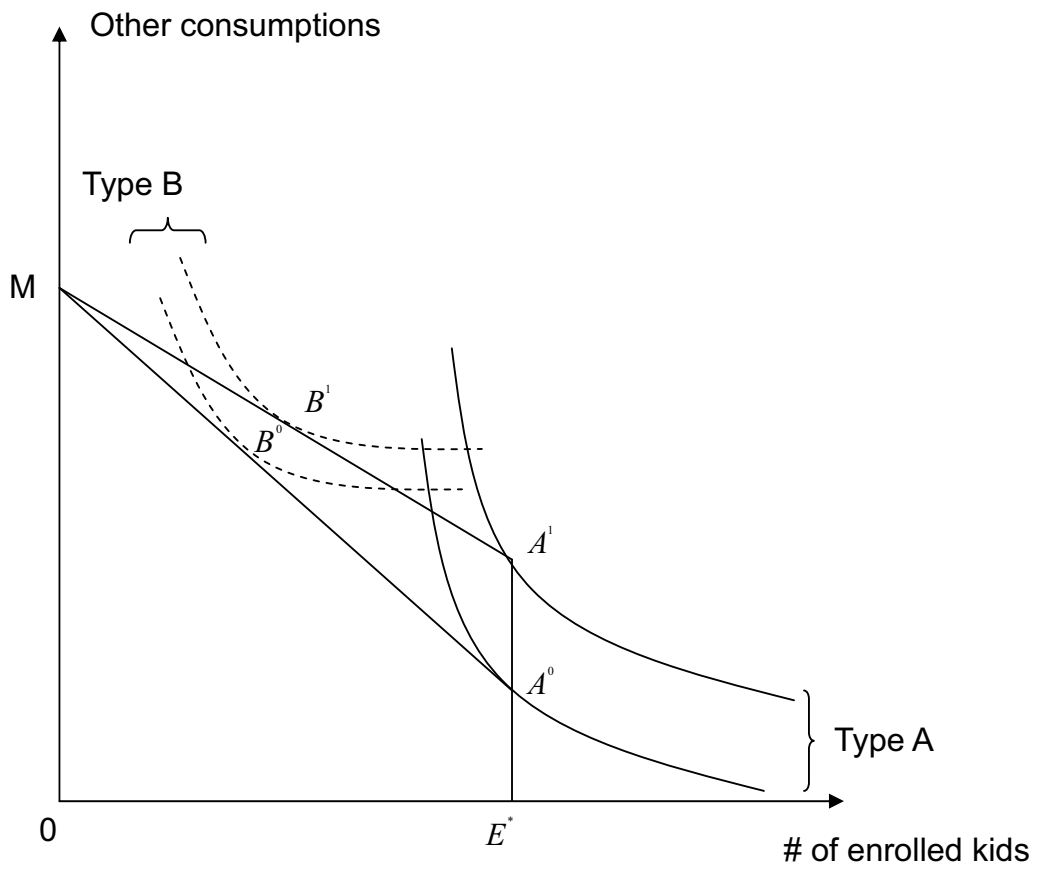


Figure 4

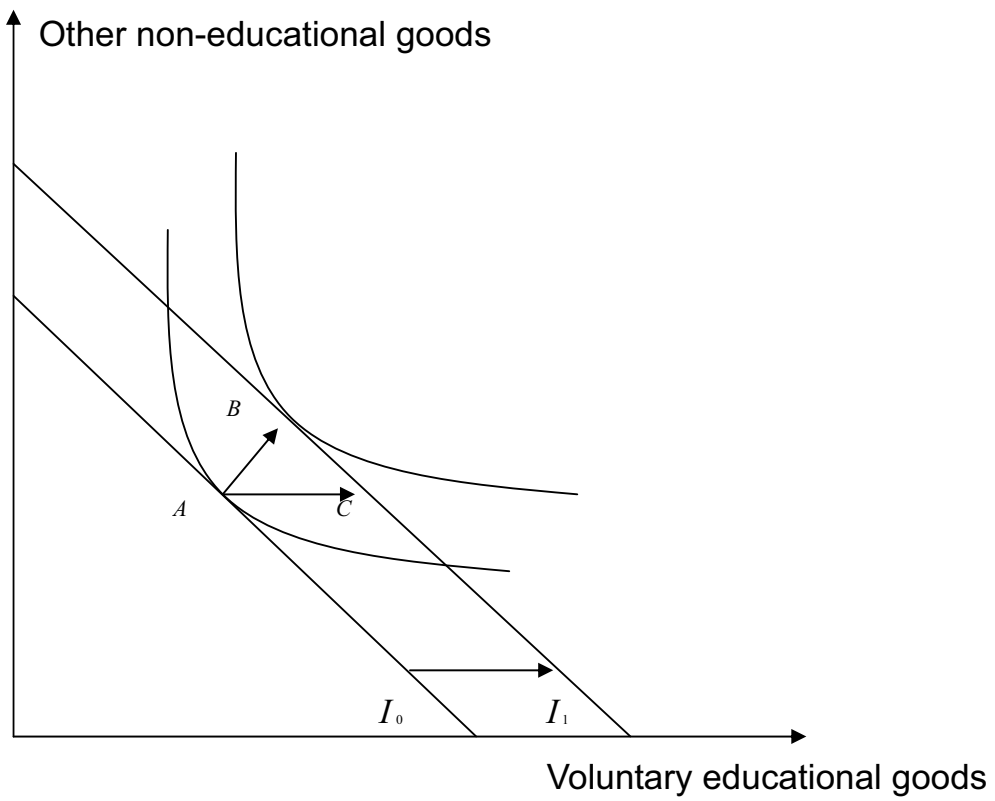


Figure 5



Table 1 Characteristics of households and children in the sample

	2000	2000	2007	2007
	Mean	S.D.	Mean	S.D.
Panel A Households characteristics				
Household size	4.489	1.084	4.265	1.140
Number of children	2.274	0.711	2.002	0.768
Number of enrolled children	1.847	0.716	1.733	0.741
Number of enrolled children/number of children	0.830	0.235	0.890	0.233
Father's schooling year	6.953	3.566	7.251	2.899
Mother's schooling year	4.192	3.513	5.275	3.436
Land area per capita (Mu)	2.075	1.497	2.060	1.457
Total income per capita (Yuan)	1052.819	1359.057	1375.746	1659.385
Total expenditure per capita (Yuan)	1065.753	1101.159	1318.828	1001.087
Observation	1629	1629	505	505
Panel B Children characteristics				
Age	11.419	2.570	11.805	2.512
Female	0.488	0.500	0.486	0.500
Total enrolment rate	0.858	0.349	0.947	0.223
Enrolment rate of children aged 9-16	0.930	0.255	0.982	0.131
Observation	3498	3498	912	912
Of which, enrolled children				
Age	11.347	2.010	11.797	2.268
Female	0.482	0.500	0.484	0.500
Indicator for being enrolled in primary school	0.883	0.322	0.811	0.391
Indicator for being enrolled in middle school	0.111	0.314	0.164	0.371
Indicator for being enrolled in other levels of school	0.006	0.079	0.024	0.154
Observation	3001	3001	864	864

All the money has been deflated to year 2000 value

Table 2. Percentage of counties claiming to implement TEOS in each semester (%)Primary School

	Fall, 2004	Spring, 2005	Fall, 2005	Spring, 2006	Fall, 2006	Spring, 2007
School Fees Exemption	15	65	65	100	100	100
Textbook Exemption	30	75	75	100	100	100
Living Subsidy	0	10	15	65	70	70

Middle School

	Fall, 2004	Spring, 2005	Fall, 2005	Spring, 2006	Fall, 2006	Spring, 2007
School Fees Exemption	15	65	65	100	100	100
Textbook Exemption	30	80	80	100	100	100
Living Subsidy	0	60	65	95	95	95
Num. of Counties	20	20	20	20	20	20

Table 3. Percentage of children claiming to have TEOS in each semester (%)Primary School

	Fall, 2004	Spring, 2005	Fall, 2005	Spring, 2006	Fall, 2006	Spring, 2007	Total student number
School Fees Exemption	7.32	44.24	52.10	61.94	92.07	95.73	1311
Textbook Exemption	7.70	40.12	48.97	60.34	80.70	85.74	1311
Living Subsidy	0.00	0.31	0.31	0.69	0.84	0.92	1311

Middle School

	Fall, 2004	Spring, 2005	Fall, 2005	Spring, 2006	Fall, 2006	Spring, 2007	Total student number
School Fees Exemption	8.53	40.30	49.47	56.29	88.06	91.04	469
Textbook Exemption	8.10	41.36	49.89	56.50	74.63	78.04	469
Living Subsidy	0.21	3.20	3.20	4.90	7.25	8.96	469

(1) The total student sample is constructed according to the following (a) children must be in school, (b) children reporting policy time later than "liu ji" time were dropped; (c) children having drop-out experience were dropped; (d) primary school student sample includes students in grade 3 to grade 6 in 2007; middle school student sample includes student in grade 3.

(2) Those reporting policies earlier than the year when the policies existed or later than the time when the surveyed was conducted were dropped.

Table 4 Intended transfer and household expenditures in 2007

Variables	All		Richest 30%		Poorest 30%	
	Mean	Percentage(%)	Mean	Percentage(%)	Mean	Percentage(%)
Total expenditure per capita	1318.828	100	1871.353	100	1041.442	100
In which :						
Food expenditure per capita	425.418	32.257	644.890	34.461	301.357	28.937
Non-food expenditure per capita	586.485	44.470	825.368	44.105	478.213	45.918
Health expenditure per capita	202.250	15.336	272.060	14.538	165.480	15.889
Required educational expenditure per capita	17.874	1.355	20.206	1.080	19.710	1.893
Voluntary educational expenditure per capita	86.800	6.582	108.830	5.816	76.682	7.363
Intended transfer per capita	39.183	2.971	41.115	2.197	39.305	3.774
OBS	505	505	152	152	152	152

Note: .

(1) Percentages in this table are percentage of total expenditure per capita

(2) All money is deflated to year 2000 value

Table 5 Household expenditures in years 2000 and 2007

	2000	2007	2007-2000
Total expenditure per capita	1065.753	1318.828	253.075***
	(1101.159)	(1001.087)	(52.238)
Food expenditure per capita	264.245	425.418	161.173***
	(251.209)	(327.658)	(15.853)
Non-food expenditure per capita	501.916	586.485	84.569**
	(923.528)	(688.433)	(38.237)
Health expenditure per capita	157.725	202.250	44.525**
	(323.759)	(390.756)	(19.149)
Required educational expenditure per capita	89.223	17.874	-71.349***
	(106.120)	(43.939)	(3.277)
Voluntary educational expenditure per capita	52.643	86.800	34.157***
	(79.675)	(134.694)	(6.311)
Number of households	1629	505	

Standard deviations are in parenthesis

Table 6. Descriptive results

	<u>Total expenditure per capita</u>		<u>Expenditure on food per capita</u>		Treated-Untreated
	Treated	Untreated	Treated	Untreated	
2000	1178.58	922.65	301.36	218.53	82.83
2007	1516.85	1080.65	457.37	351.80	105.57
2007-2000	338.27	158.00	156.01	133.27	22.74
<u>Expenditure on non-food goods and service per capita</u>					
	Treated	Untreated	Treated	Untreated	Treated-Untreated
2000	544.75	434.88	157.89	157.86	0.03
2007	677.13	489.13	235.13	170.64	64.49
2007-2000	132.38	54.25	77.24	12.78	64.46
<u>Required education expenditure per capita</u>					
	Treated	Untreated	Treated	Untreated	Treated-Untreated
2000	114.72	65.03	59.86	46.34	13.51
2007	23.86	14.44	124.66	55.81	68.84
2007-2000	-90.87	-50.59	64.80	9.47	55.33***

* 10% significant level; ** 5% significant level; *** 1% significant level.

In this table, "Treated" group includes the villages where the average saving from the reform is above the median value. "Untreated" group includes the villages where the average saving from the reform is below the median value.

Table 7 Impacts of education fee reduction reform on household expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Household income per capita	Total expenditure per capita	Expenditure on food per capita	Expenditure on non-food consumption and service per capita	Expenditure on health care per capita	Expenditure on required education items per capita	Expenditure on voluntary education items per capita
Section A 2000-2007							
Intended transfer/total family member	-0.677 (2.869)	-2.222 (2.214)	-0.014 (0.464)	-1.770 (1.539)	-0.476 (0.700)	-0.613 (0.137)***	0.651 (0.264)**
Observations	2134	2134	2134	2134	2134	2134	2134
R-squared	0.25	0.22	0.50	0.13	0.11	0.45	0.53
Wald Test: H0: Absolute value of coefficients in columns (6) and (7) are equal; P-value=0.899							
Section B 2000-2004							
Hypothetical intended transfer /total family member	4.498 (5.665)	0.844 (2.013)	-0.227 (0.542)	-0.007 (1.080)	0.699 (1.259)	0.149 (0.109)	0.231 (0.198)
Observations	2991	2991	2991	2991	2991	2991	2991
R-squared	0.21	0.28	0.43	0.17	0.06	0.63	0.58
Village variables in year 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log value of household income per capita	No	Yes	Yes	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household demographic structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, standard errors are calculated clustering over villages; * significant at 10%; ** significant at 5%; *** significant at 1%

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled includes number of kids enrolled in primary school, number of kids enrolled in middle school, number of kids enrolled in high school and number of kids enrolled in other level of schools

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54, ratio of male aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 8 Heterogeneity of the reform's impacts on household expenditure on voluntary education items per capita

	(1) Expenditure on voluntary education items per capita	(2) Expenditure on voluntary education items per capita	(3) Expenditure on voluntary education items per capita	(4) Expenditure on voluntary education items per capita
Intended transfer from the reform per capita(*)log value of household income per capita	0.148 (0.121)			
Intended transfer from the reform per capita(*)total number of enrolled kids		0.274 (0.202)		
Intended transfer from the reform per capita(*)mother's schooling year			0.083 (0.040)**	
Intended transfer from the reform per capita(*)father's schooling year				0.037 (0.051)
Intended transfer from the reform per capita	-0.348 (0.828)	-0.081 (0.443)	0.048 (0.399)	0.353 (0.529)
Village variables in year 2000	Yes	Yes	Yes	Yes
Log value of household income per capita	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes
Household demographic structure	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes
Observations	2134	2134	2134	2134
R-squared	0.53	0.36	0.53	0.53

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled includes number of kids enrolled in primary school, number of kids enrolled in middle school, number of kids enrolled in high school and number of kids enrolled in other level of schools

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of male aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 9 Impacts of education fee reduction reform on individual education expenditures

	(1) Required education expenditure	(2) Voluntary education expenditure	(3) Required education expenditure	(4) Voluntary education expenditure
Section A 2000-2007				
Deviation of individual intended transfer from the reform from household mean value	-0.493 (0.049)***	0.578 (0.160)***	-0.422 (0.142)***	0.586 (0.255)**
Individual intended transfer from the reform				
Sum of other kids' intended transfer from the reform				
Observations	3865	3865	3865	3865
R-squared	0.47	0.44	0.38	0.49
Wald test: H0: (1)=(2), P-value:		0.794		0.550
Section B 2000-2004				
Deviation of individual intended transfer from the reform from household mean value	-0.241 (0.155)	0.332 (0.356)	0.021 (0.122)	0.328 (0.251)
Individual intended transfer from the reform				
Sum of other kids' intended transfer from the reform				
Observations	5342	5342	5342	5342
R-squared	0.653	0.397	0.66	0.52
Wald test: H0: (3)=(4), P-value:				
Robust standard errors in parentheses: * significant at 10%, ** significant at 5%, *** significant at 1%;				
Deviation of individual characteristics from household mean value	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes
Village variables in 2000 interacted with year 2007 dummy				
Individual characteristics				
Dummies for grade enrolled				
Household endowments				
Household demography structure				
Household income per capita				
Year fixed effect				
Village fixed effect				

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) individual characteristics include indicator for female and age
(3) dummies for grade enrolled include indicator for being enrolled in grade1-grade6 in primary schools, grade1-grade3 in middle schools, grade1-grade3 in high schools and other levels of schools
(4) household endowments include land area per capita, mother's schooling year and father's schooling year
(5) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of female aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 10 Heterogeneity of the reform's impacts on individual voluntary expenditure on education items

	(1)	(2)	(3)
	Individual voluntary education expenditure	Individual voluntary education expenditure	Individual voluntary education expenditure
Individual intended transfer from the reform*indicator for female	0.585 (0.219)***		
Individual intended transfer from the reform*birth order		-0.471 (0.166)***	0.864 (0.369)**
Individual intended transfer from the reform*middle school dummy			
Individual intended transfer from the reform	0.343 (0.266)	0.934 (0.295)***	
Household aggregate saving from the reform	Yes	Yes	Yes
Birth order	No	Yes	No
Village variables in 2000	Yes	Yes	Yes
Individual characteristics	Yes	Yes	Yes
Dummies for grade enrolled	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes
Household demographic structure	Yes	Yes	Yes
Household income per capita	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes
Observations	3865	3865	3865
R-squared	0.49	0.49	0.46

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) individual characteristics include indicator for female and age

(3) dummies for grade enrolled include indicator for being enrolled in grade1-grade6 in primary schools, grade1-grade3 in middle schools, grade1-grade3 in high schools and other levels of schools

(4) household endowments include land area per capita, mother's schooling year and father's schooling year

(5) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 11 Decomposition of the reform's impact on voluntary educational expenditures

	(1)	(2)	(3)	(4)
Intended transfer/total family member	Expenditure on voluntary education items per capita 0.651 (0.264)**	Expenditure on tutoring -0.007 (0.027)	Expenditure on school supplies 0.193 (0.095)**	Expenditure on snack in school and transportation 0.464 (0.210)**
Village variables in year 2000	Yes	Yes	Yes	Yes
Log value of household income per capita	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes
Household demographic structure	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes
Observations	2134	2134	2134	2134
R-squared	0.53	0.20	0.48	0.47

Robust standard errors in parentheses, standard errors are calculated clustering over villages; * significant at 10%; ** significant at 5%; *** significant at 1%

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled includes number of kids enrolled in primary school, number of kids enrolled in middle school, number of kids enrolled in high school and number of kids enrolled in other level of schools

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of male aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 12 Robustness check using intended transfer II in household level regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Household income per capita	Total expenditure per capita	Expenditure on food per capita	Expenditure on non-food consumption and service per capita	Expenditure on health care per capita	Expenditure on required education items per capita	Expenditure on voluntary education items per capita
Intended transfer II/total family member	-1.914 (2.123)	-2.505 (2.421)	-0.294 (0.452)	-1.980 (1.878)	-0.250 (0.643)	-0.608 (0.129)***	0.627 (0.265)**
Wald test: H0: (6) in table 12 = (6) in section A in table 7; (7) in table 12 = (7) in section A in table 7; P-value:						0.880	0.755
Village variables in year 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log value of household income per capita	No	Yes	Yes	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household demographic structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2134	2134	2134	2134	2134	2134	2134
R-squared	0.56	0.22	0.50	0.14	0.11	0.45	0.53

Robust standard errors in parentheses, standard errors are calculated clustering over villages. * significant at 10%; ** significant at 5%; *** significant at 1%

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled includes number of kids enrolled in primary school, number of kids enrolled in middle school, number of kids enrolled in high school and number of kids enrolled in other level of schools

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of female aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 13 Robustness check using intended transfer II in individual level regression

	(1)	(2)	(3)	(4)
	Required education expenditure	Voluntary education expenditure	Required education expenditure	Voluntary education expenditure
Deviation of individual intended transfer from the reform from household mean value	-0.464 (0.050)***	0.586 (0.164)***	-0.421 (0.152)***	0.537 (0.283)*
		Individual intended transfer from the reform		
		Sum of other kids' intended transfer from the reform		
Observations	3865	3865	3865	3865
R-squared	0.47	0.44	0.38	0.49
Wald test: H0: coefficients in this table is equal to coefficients in section A in table 9; P-value:	0.282	0.944	0.975	0.519
Deviation of individual characteristics from household mean value	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes
		Village variables in 2000 interacted with year 2007 dummy		
		Individual characteristics		
		Dummies for grade enrolled		
		Household endowments		
		Household demographic structure		
		Household income per capita		
		Year fixed effect		
		Village fixed effect		

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%;

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) individual characteristics include indicator for female and age

(3) dummies for grade enrolled include indicator for being enrolled in grade1-grade6 in primary schools, grade1-grade3 in middle schools, grade1-grade3 in high schools and other levels of schools

(4) household endowments include land area per capita, mother's schooling year and father's schooling year

(5) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of male aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

Table 14. Robustness check of change in the specification of regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Household income per capita	Household total expenditure per capita	Expenditure on food per capita	Expenditure on non-food consumption and service per capita	Expenditure on health care per capita	Expenditure on voluntary education items per capita	Individual voluntary education expenditure
Expenditure on required education items per capita (Household intended transfer from the reform per capita as IV)	1.748 (3.524)	3.626 (3.471)	0.023 (0.757)	2.888 (2.426)	0.776 (1.139)	-1.061 (0.510)**	
Individual required education expenditure (Individual intended transfer from the reform as IV)							-1.312 (0.671)*
Sum of other kids' required education expenditure(Sum of other kids' intended transfer in the same family as IV)							0.074 (0.120)
F-test: H0: (6) =-1 ; (7) =-1; P-value:							0.643
Village variables in year 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log value of household income per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes	Yes	Yes	No
Household demographic structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual characteristics	No	No	No	No	No	No	Yes
Dummies for grade enrolled	No	No	No	No	No	No	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2134	2134	2134	2134	2134	2134	3865
R-squared	0.55	0.20	0.50	0.08	0.08		

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled includes number of kids enrolled in primary school, number of kids enrolled in middle school, number of kids enrolled in high school and number of kids enrolled in other level of schools

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of male above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

(5) individual characteristics include indicator for female and age

(6) dummies for grade enrolled include indicator for being enrolled in grade1-grade6 in primary schools, grade1-grade3 in middle schools, grade1-grade3 in high schools and other levels of schools

(7) The F-value of the first stage regression is 20.10 for IV estimates in the household level regressions; The F-value of the first stage regression is 26.83 for individual saving as IV, and it is equal to 60.12 for sum of other kids' saving as IV in individual regression.

Table 15 Impacts of education fee reduction reform on expenditures after correcting for measurement error

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total expenditure per capita	Expenditure on food per capita	Expenditure on non-food consumption and service per capita	Expenditure on health care per capita	Expenditure on required education items per capita	Expenditure on voluntary education items per capita	Individual required education expenditure	Individual voluntary education expenditure
Intended transfer/total family member	-2.012 (2.359)	0.059 (0.601)	-1.661 (1.572)	-0.501 (0.709)	-0.601 (0.139)***	0.692 (0.310)**	-0.498 (0.232)**	0.527 (0.293)*
Individual intended transfer							-0.157 (0.147)	-0.012 (0.173)
Sum of other kids' intended transfer								
Village variables in year 2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log value of household income per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household endowments	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of kids enrolled	Yes	Yes	Yes	Yes	Yes	Yes	No	NO
Household demographic structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual characteristics	No	No	No	No	No	No	Yes	Yes
Dummies for grade enrolled	No	No	No	No	No	No	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2134	2134	2134	2134	2134	2134	3865	3865
R-squared	0.06	0.22	0.07	0.09	0.30			0.01

Robust standard errors in parentheses, standard errors are calculated clustering over villages; * significant at 10%, ** significant at 5%, *** significant at 1%.

(1) village variables in 2000 include illiterate ratio, ratio of primary school graduates in labor force, primary school enrollment rate, middle school enrollment rate, indicator for having preschool classes, distance of primary school from the village seat, log value of money given to schools by village, indicator for having primary school run by the village, indicator for having middle school run by the village, indicator for having railway through the village, indicator for having bus stop in the village, log value of average agricultural income per capita, log value of average industrial income per capita, ratio of households engaged in non-agricultural work, ratio of households running household enterprise, log value of wage for men doing non-agricultural work, log value of wage for women doing non-agricultural work, log value of wage to hire labor for agricultural production, indicator for having enterprises owned by county, indicator for having enterprises owned by township, indicator for having private enterprises.

(2) household endowments include land area per capita, mother's schooling year and father's schooling year.

(3) number of kids enrolled in primary school, mother's schooling year and father's schooling year.

(4) household demographic structure includes ratio of male aged 0-5, ratio of male aged 6-12, ratio of male aged 13-16, ratio of male aged 17-19, ratio of male aged 20-29, ratio of male aged 30-39, ratio of male aged 40-49, ratio of male aged 50-54, ratio of male aged above 54, ratio of female aged 0-5, ratio of female aged 6-12, ratio of female aged 13-16, ratio of female aged 17-19, ratio of female aged 20-29, ratio of female aged 30-39, ratio of female aged 40-49, ratio of female aged 50-54 and total number of family members.

(5) individual characteristics include indicator for female and age

(6) dummies for grade enrolled include indicator for being enrolled in grade 1-grade6 in primary schools, grade 1-grade3 in middle schools, grade 1-grade3 in high schools and other levels of schools

Appendix

Figure A

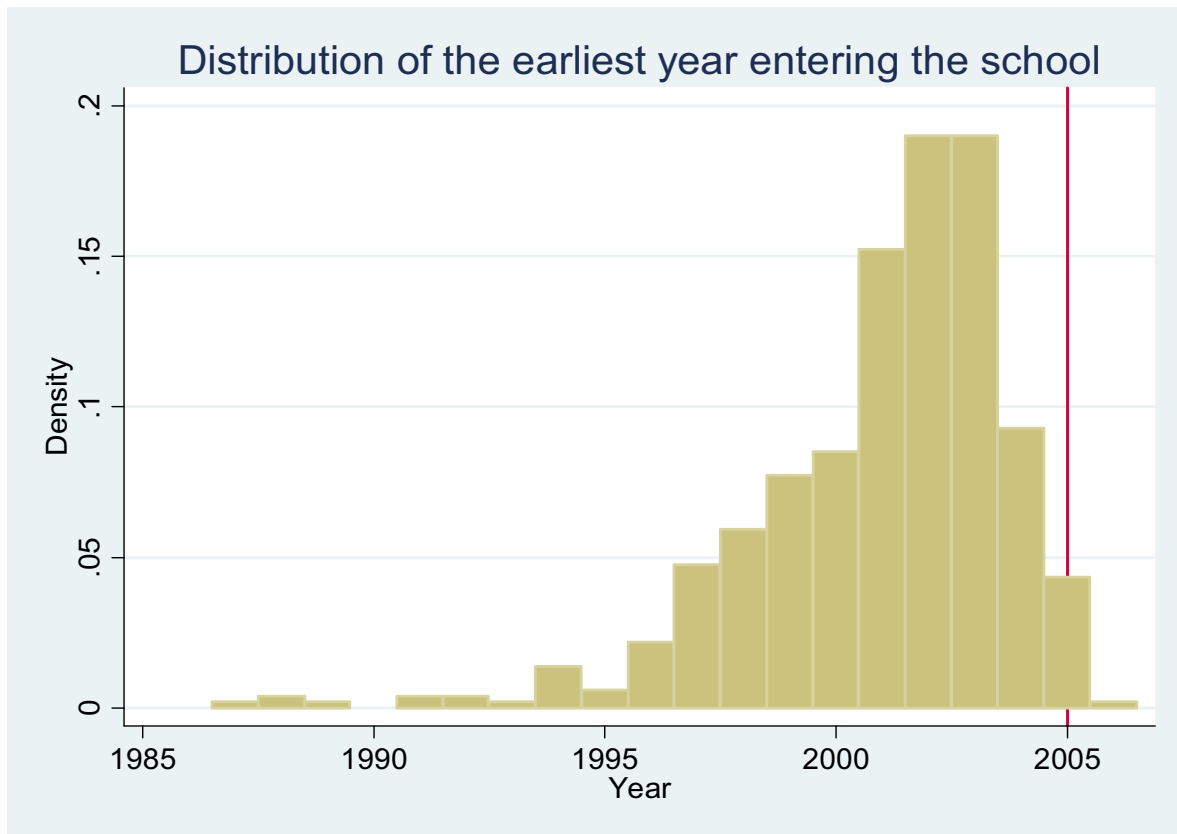


Table A Testing household utility function

	(1)	(2)	(3)	(4)
	HH voluntary educational expenditure	HH non- educational expenditures	HH voluntary educational expenditure	HH non- educational expenditures
Total expenditure - required educational expenditures	0.009 (0.002)***	0.991 (0.002)***		
Total income - required educational expenditures			-0.001 (0.001)	0.170 (0.019)***
Land area per capita	-2.650 (6.392)	2.650 (6.392)	-2.640 (6.450)	9.406 (89.534)
Mother's schooling years	-2.908 (2.320)	2.908 (2.320)	-2.220 (2.341)	55.713 (32.495)*
Father's schooling years	1.168 (2.129)	-1.168 (2.129)	1.431 (2.148)	22.471 (29.822)
Num of kids enrolled in primary schools	52.041 (15.171)***	-52.041 (15.171)***	50.182 (15.307)***	-295.185 (212.484)
Num of kids enrolled in middle schools	226.332 (20.452)***	-226.332 (20.452)***	231.360 (20.619)***	391.294 (286.229)
Num of kids enrolled in high schools	930.718 (62.558)***	-930.718 (62.558)***	934.668 (63.177)***	-45.104 (877.021)
Num of kids enrolled in other levels of schools	2,109.959 (134.436)***	-2,109.959 (134.436)***	2,119.839 (135.876)***	316.783 (1,886.208)
Household demographic structure	YES	YES	YES	YES
Village fixed effects	YES	YES	YES	YES
Observations	1629	1629	1629	1629
R-squared	0.54	1.00	0.53	0.23

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%