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# Who drops out from primary schools in China? Evidence from minority-concentrated rural areas

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**Abstract** One of the Millennium Development Goals is to ensure universal access to primary education by 2015. However, primary school dropout remains a challenge in many developing countries. While official statistics in China report aggregated primary school dropout of only 0.2 %, almost no independent, survey-based studies have sought to verify these dropout rates in rural areas. The primary objective of our study is to document the dropout rate in primary schools in rural China and compare the dropout rate of ethnic minorities and Han students. Using a first-hand dataset of 14,761 primary students in northwest China, we demonstrate that the annual dropout rate in poor rural areas is 2.5 %, suggesting a cumulative dropout of 8.2 %. Importantly, Hui and Salar minority students drop out at rates that are significantly higher than the official rates. Most noteworthy, 23 % of Hui girls and 22 % of Salar girls are dropping out by the end of grade 6. Our findings call for more attention to China's primary school dropout issue—especially in minority areas. Policymakers should begin to examine new ways to increase the chances for minority students to succeed in the educational system.

**Keywords** Dropout · Primary education · Ethnic minorities · China · Rural

## Introduction

One of the Millennium Development Goals (MDG) is to achieve universal primary education by 2015 (United Nations 2009). However, primary school dropout still remains a major concern in many developing countries. In 2015, almost 57 million primary school-aged children were out of school, 95 % of whom live in developing countries. Among the different regions that are plagued by high rates of out-of-school children, Asia is second only to Africa in the number and proportion of unenrolled children (United Nations 2015).

This brings into question whether primary school dropout is a problem for the world's largest developing country. China's government has made an effort to eliminate unenrolled children since early 2000 when the Compulsory Education Law was revised to make universal participation in primary schools a national priority (Lo 1999; Hawkins 1992; Liu 2004; Yi et al. 2012). In 2011, the government claimed that the target of universal 9-year compulsory education (including primary and junior high education) had been achieved in all county-level administrative units, which would have meant that 100 % of China's population was receiving at least primary education (Ministry of Foreign Affairs of China 2015). Following this announcement, the Ministry of Foreign Affairs reported in 2014 that 99.8 % of primary school-

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aged children were officially enrolled in school (Ministry of Foreign Affairs of China 2015). The government has also reported that the annual primary school dropout rate since 2006 has been lower than 1 % (Ministry of Education of China 2012).

However, all of the previously mentioned reports are based on the government's own statistical system. In recent years, a few in-the-field studies by independent research teams have shown that rates of school dropout among junior high students in poor rural areas are often much higher than official, nationwide statistics suggest (Chung and Mason 2012; Yi et al. 2012; Mo et al. 2013). Although these studies reveal an alarming trend of school dropout in rural China, none of them focus on primary education.

To date, the level of dropout in rural primary schools remains an open question. To our knowledge, almost no large-scale survey has been conducted to investigate the dropout issue among primary school students (Witte et al. 2013), though there have been a few anecdotal studies of primary school enrollment (e.g., Chung and Mason 2012). These studies have shown that the actual primary school dropout rate is higher than those that are based on official statistics in China. Even fewer studies have empirically examined what factors might be influencing the decision of primary school students to drop out (Hannum 2002; Hannum et al. 2008; Hannum and Wang 2010). For example, using 1992 national survey data, Hannum (2002) found that ethnicity and gender are associated with school attainment in China. Drawing on the 1990 and 2000 Census, Hannum et al. (2008) suggested that family income and assets may also influence educational attainment in rural China. Additionally, even less attention is paid to quantitatively investigating the levels of and reasons for school dropout among China's vulnerable ethnic minority populations (Lofstedt 1994; Kwong and Xiao 1989; Ma et al. 1996; Wang 1996). For example, relying on a case study, Lofstedt (1994) discussed the educational disadvantages of minority students. Using descriptive statistics from one minority county and 3000 students in rural China, Ma et al. (1996) and Wang (1996) showed that the dropout rates among minority students are high in primary schools, but they did not provide any analytical evidence on the factors that may be associated with dropping out decisions among the minorities.

The overall goal of this paper is to document the dropout rate in primary schools in rural China. To accomplish this goal, we have four specific objectives. First, we document the primary school dropout rate in China's poor rural areas. Second, we compare the dropout rates across different ethnic groups, including Han and non-Han groups. Third, we identify the characteristics correlated with dropout. Fourth, we examine whether there is heterogeneity in the probability of dropping out by a number of characteristics of our sample.

The rest of the paper is organized as follows. The next section reviews the international empirical literature to understand the factors that have actually been observed to be associated with school dropout. The "Potential factors associated with primary school dropout" section describes a conceptual framework for understanding the dropout decisions of the average student (Han and non-Han minority students) as well as any focusing on minority students in particular. The conceptual framework is built around identifying possible cost-benefit relationships that may lead to primary school dropout in rural China. The behavioral focus of the framework ends up deriving a set of testable hypotheses. The "Methods" section of the paper describes the data and the statistical approach. The "Results" section presents the results. The final section summarizes and draws conclusions.

## Empirical literature

Most of the empirical literature seeks to explain the dropout decision by comparing the cost and benefits of staying in school in different contexts. Drawing on this literature, we first explore the factors that are most likely to impact dropout decisions for the average student in China's educational and economic context. We then consider factors that may differentially impact the costs and benefits of dropping out for minority students.

### Cost-benefits of dropping out: factors associated with the schooling system

#### *Out-of-pocket costs for schooling*

The high cost of schooling has been shown to be a major factor in schooling decisions in many parts of the world, with parents in many countries paying substantial tuition, fees, and other costs to keep their children in school (Cameron and Taber 2004; Deininger 2003; Card 2000; Banerjee et al. 2000). Though evidence suggests that the cost of going to school in China in the past may have been prohibitively high (Tsang 1996; Hannum 1998; Park and Wang 2000; Tsang 2003), today out-of-pocket costs are quite low in most parts of the country. In fact, in recent years China has prohibited almost all fees for school-related items (State Council of the People's Republic of China 2008). Hence, in most areas, out-of-pocket costs for schooling are not part of the cost-benefit calculations of families in China.

*Competitiveness of the school system and the returns to education*

The education literature has shown that the competitiveness of a nation's educational system is highly correlated with the school dropout rate. In competitive educational systems, students are more likely to drop out because the expected probability of succeeding in the system is small (Clarke et al. 2000; Reardon 2002; Rumberger and Lim 2008; Liu et al. 2010). In China, high test scores are a necessary prerequisite for entering both academic high school and college (Loyalka et al. 2014; Fields 1988; Alspaugh 1998; Mare 1980). Research has demonstrated that test scores are used to judge students' likelihood of success in the educational system as early as in primary school (Loyalka et al. 2014). If a student is performing poorly and therefore believes that the probability of being promoted to the next level of schooling is low, he or she may consider dropping out (Valenzuela 2000).

## Cost-benefits of dropping out: factors associated with the economic environment

*Opportunity costs*

While out-of-pocket fees are low or nonexistent in China, attending school is not cost-free. The empirical literature has shown that the opportunity cost of attending school—even primary schools—may induce students to drop out of school in China (Song et al. 2006; Yi et al. 2012; Postiglione 2015). In rural China, there are at least two types of opportunity costs to attending primary school. First, children who leave school can work directly in income-generating activities—either on the farm or off farm. Second, children who drop out can perform household chores that free up other household members to work and earn a wage. Given high and rising wage rates in China's unskilled labor market (Fizbein and Shady 2009; Li et al. 2012; Lu 2012), the indirect costs of attending primary school are considerable in either case.

What types of children will be most affected by these high opportunity costs? As children get older (even as young as 10, 11 or 12 years old), they may be more effective workers and therefore more likely to drop out of school to find work on the family farm, in the family business, or even in the off-farm labor market (Bhatty 1998; Barrera-Osorio et al. 2008). It has been argued that the schooling of rural girls is also particularly susceptible to rising opportunity costs (Hannum 2003). Given the persistence of traditional gender roles, girls may be preferentially encouraged to stay home from school to help with housework and/or take care of younger siblings so that other family members can spend more time in income-generating activities and thereby increase total household income (in the short run).

*Poverty*

The empirical literature also demonstrates that poverty is an important factor in the decision to drop out of school (Brown and Park 2002; Filmer 2000; Bray et al. 2004). This link is drawn through two mechanisms. First, high schooling costs may render families with credit constraints simply unable to afford schooling. As stated above, this mechanism should not be a major factor in China today given the low out-of-pocket costs of schooling. However, according to Acemoglu and Autor (2011), there is another mechanism that might connect poverty to drop out in rural China. It is possible that many families consider their children's education to be a consumption good. Ceteris paribus, wealthier families want to "consume" more of this good. Empirical evidence is not always easy to generate due to the fact that in most places the two poverty-dropout mechanisms occur simultaneously. In our study, however, since out-of-pocket costs are negligible, we have a rare opportunity to examine this "schooling as a consumption good" channel.

In summary, in the context in which primary students in poor rural areas attend school, there are three important sets of costs that likely affect dropout. First, the competiveness of China's school system both increases the costs and reduces the benefits of schooling for students perform poorly. Second, rising opportunity costs are thought to be playing a major role in the dropout decisions of students, especially for older students and girls. Finally, poverty may also impose a cost on the children of poor families.

## Cost-benefits of dropping out: language problems and cultural norms of ethnic minorities

Ethnic factors may also contribute to the dropout decision, especially in areas in which minority subpopulations are concentrated. While China's population has 56 officially recognized ethnic groups, 91.5 % of the population is Han (CNBS 2012a). Ethnic minorities have been shown to have disadvantages in education relative to Han students. Hannum and Wang (2010) find that 16- to 21-year-old minority students are only about one-third as likely as Han students to attain 9 years of compulsory schooling. This disparity in educational attainment may be the result of differences in cost-benefit factors that influence the dropout decision for ethnic minority families.

First, it is important to note that the same factors that impact the cost-benefit considerations of the average primary school student in China (presented above) also

influence minority families. The exact magnitudes of the costs/benefits may differ for Han and non-Han students, but there is no reason to believe that these schooling system- and economic environment-related costs should not be faced by almost all families in rural China.

Beyond these factors, we believe there are two additional barriers for minority students. First, and perhaps most importantly, language difficulties may greatly reduce the benefits of schooling. While the language of instruction in most schools is Mandarin, children in some ethnic minorities speak different languages at home. When primary school students are taught in a language other than their mother tongue, their school performance suffers (Gustafsson and Sai 2014; Lai et al. 2015). A survey of 21,000 primary school students showed that minority students whose primary language is not standard Mandarin scored, on average, more than 0.6 standard deviations lower than Han students on standardized examinations in math and Chinese (Yang et al. 2015). As a result, minority students may be more likely to get discouraged and decide the benefits from staying in school are not worth the costs.

In addition to language issues, there may be other costs associated with being a minority student that differentially affect the decision to stay in school. In the most general terms, cultural norms have been cited as a steep barrier for minorities to stay in school (Au 1980; Byers and Byers 1972; Dumont 1972; Erickson and Mohatt 1982; Jacob and Jordan 1987; LaBelle 1976). The specific reasons vary by minority group. For example, some ethnic minorities place less value on education (Postiglione 2013, 2015). Cultural differences may be particularly salient for the educational decisions of girls. In certain ethnic minority groups, there is a greater emphasis on the skills that are thought to make girls more attractive in the marriage market, such as cooking or sewing (Wang 1996; Ren 1995). In these communities, parents may be more likely to take their girls out of school and keep them at home to provide them with more training in these valued skills.

## Potential factors associated with primary school dropout

In this section of the paper, we seek to examine what issues arise from primary school dropout in rural China. To do so, we first build a simple conceptual framework to identify different factors that might help explain why primary students, in general, and minority students, in particular, in China might be inclined to drop out of school. Then, we summarize five hypotheses to guide our empirical analysis of the factors that are associated with the dropout decision —for both Han and non-Han ethnic minority children.

### Conceptual framework

Research teams in the field of education have built rational choice-based frameworks for understanding the school dropout decisions (Schargel and Smink 2014; Liu et al. 2009; Rumberger and Lim 2008; Card and Lemieux 2001; Tinto 1975; Becker 1967). According to the framework, we firstly consider the fact that school decisions are generally not made by the primary beneficiaries (students) but their caregivers (parents) (Alderman and King 1998). Particularly in primary schools, students might be too young to make rational school decisions. Indeed, parents are making school decisions based not only on their perceptions about what is appropriate for the child, but also on what they think is best for the family (Papanek 1985; Mahmud and Amin 2006). It means that parents must trade off the costs and benefits of children schooling for the whole family (Alderman and Gertler 1997; Acemoglu and Autor 2011). If the costs are higher than the benefits, parents then conclude that their children will be better off in the long run if they drop out. On the one hand, since direct cost of primary education (e.g., tuition) is low in many countries (like China), a major component of the cost of schooling is typically the opportunity cost—the income foregone from students or other family members by not working. Cost stream may differ when the opportunity cost of schooling varies by age, gender and cultural notion (Acemoglu and Autor 2011; Alderman and King 1998). Such cost differences will lead to relatively straightforward differences in school decisions. On the other hand, because the actual benefits of education typically accrue over a long period, the schooling decision is likely to be affected by the expected probability of students succeeding in the education system (Riddell 2006; Breen and Yaish 2006). Such benefit differences may also have different effects on school decisions. This approach has been used in many studies (Schargel and Smink 2014; Liu et al. 2009; Rumberger and Lim 2008). Although other authors work on different specific topics or study dropout in different settings, they all share the conceptual approach that assumes a trade-off between costs and benefits of schooling that affects the dropout decisions. For example, a study (Lillard and DeCicca 2001) that analyzed whether a new set of course graduation requirements (CGRs) affected high school dropout decisions in the United States argued that the way the requirements affected dropout rates depended on the weight an individuals placed on the costs and benefits of acquiring a high school education under the new CGRs. Card and Lemieux (2001) also used the approach to understand the underlying correlates of school enrollment in the US. Their analysis demonstrated that the decision of individuals to stay in school until a certain level of attainment depended on how they perceived the costs of obtaining that level of schooling compared to the expected returns of education.

### Hypotheses

Based on the empirical literature and the conceptual framework presented above, we identify five hypotheses that we will test in the empirical section of the paper. Before we do this, however, it is important to state two assumptions that make these hypotheses most relevant to our study of dropouts in China's primary schools. First, we are assuming that there is a high return to education in China. In fact, there is a rich literature base supporting this hypothesis and almost all studies show consistently that incomes of individuals rise steeply with every additional year of schooling (Heckman and Li 2004). Second, we assume that out-of-pocket cost is not a factor that influences educational attainment/dropout at the primary school level. In most schools in China today, there is no tuition and fees are very low if they are collected at all. Because of these assumptions, we do not examine questions such as whether higher costs of schooling are associated with higher dropout rates.

Given these assumptions, there are three general hypotheses that we want to test regarding which factors are associated with higher rates of dropout for all children, including both Han and non-Han minorities:

*General Hypothesis 1*: In a competitive education system, such as that of China, students that are poorer performing are more likely to drop out.

*General Hypothesis 2*: Due to the high and rising opportunity costs in rural China today, parents will choose to allow their children to drop out, especially in the case of older students and girls.

*General Hypothesis 3*: Poorer families are more likely to allow their children to drop out of school.

In addition, we also have two specific hypotheses about the factors that induce ethnic minority children to drop out (Minority-Specific Hypotheses 1 and 2):

*Minority-Specific Hypothesis 1*: Due to language difficulties, non-Mandarin-speaking minorities have higher likelihoods of dropping out.

*Minority-Specific Hypothesis 2*: Under some rubric of cultural norms, minority parents are more likely to ask their children, especially girls, to drop out.

## Methods

### Sampling

This paper draws on two different panel survey datasets. Dataset 1 was collected among 12,938 grade 4 and 5 students in 130 rural primary schools in Qinghai Province during the 2013–2014 academic year. Dataset 2 includes information on 1823 grade 4 students from 51 primary schools in Ningxia Province during the 2011–2012 academic year. Both datasets include two rounds of surveys (at the beginning and end of the school year) with which we were able to accurately measure dropout across the academic year.

Our sampling strategy in Qinghai Province (Dataset 1) had four steps. We targeted Qinghai Province, both because it is one of the poorest provinces in China and also because the province houses a large ethnic minority population (CNBS 2012a). First, we restricted our sampling frame to Haidong Prefecture,[1] a poor minority area located in northeast Qinghai. Haidong Prefecture was determined to be an appropriate location for our research as four out of six counties in the prefecture are designated ethnic minority autonomous counties and five of them are nationally designated poor counties (State Council Leading Group Office of Poverty Alleviation and Development 2012). Second, we included all six counties from this prefecture in our sampling frame. Third, we obtained a list of all primary schools with 1–6 grades in the sample counties and randomly selected 130 schools as our sample schools.[2] All grade 4 and 5 students in the sample schools participated in our survey.

[1] Haidong Prefecture was included among our sampling frame because this area meets all three criteria of our sampling strategy. We established three criteria for choosing our sampling locations in order to be able to (a) investigate the dropout rates among minority students in rural China, (b) compare the dropout rates between Han and minority students, (c) compare the dropout rates between Mandarin-speaking and non-Mandarin-speaking minority groups. These criteria are: (1) multi-ethnic areas inhabited by both Han and relatively large populations of ethnic minorities; (2) areas with both Mandarin-speaking and non-Mandarin-speaking minority groups; (3) areas where the minority groups have similar socioeconomic characteristics with minorities elsewhere in China. Although there are other minority-concentrated areas in rural China, we had additional reasons to choose Haidong as our sampling frame. First, not every area with a high concentration of minorities in China meets all of our criteria. According to the 2010 census, minorities in China are concentrated in relatively poor regions of western China. About 72 % of the minority population lives in the western provinces: Qinghai and Ningxia in the northwest, Guizhou and Yunnan in the southwest, and Guangxi in the south. Additionally, we chose Haidong in Qinghai because we already had established relationships with the local county governments in Haidong Prefecture, due to the fact that we had previously conducted projects in the area. Because of this, we were able to randomly choose from all schools in the prefecture and there were no schools that were unwilling to cooperate. Due to these advantages, we choose to sample schools in Haidong to study the dropout problem among minority groups in China.

[2] Why did we choose 130 schools in Qinghai? In total, our power calculation determined that having a sample of 180 schools would provide enough statistical power to identify dropout rates if they were 2 % or above. After obtaining the sampling frame in Haidong Prefecture, we collected a comprehensive list of all 395 primary

The sampling strategy in Ningxia Province was similar to that used in Qinghai Province. Ningxia Province is also a poor area with a concentrated ethnic minority population. Approximately 35 % of Ningxia's population is of the Hui minority, and it is one of China's largest Muslim settlement areas (CNBS 2012b). First, we targeted three southern counties in the province where most of the poor Hui minority population resides. Second, we obtained a list of all primary schools in the three counties and randomly chose 51 sample schools.[3] In each sample school, we surveyed all grade 4 students.[4]

## Data collection

In order to collect our data, we visited each sample primary school in the county and completed a two-part survey process. The first part is a baseline survey was conducted in early September, at the beginning of the academic year. The second part of the survey process was a follow-up survey conducted in June, at the end of the same academic year.

The student baseline survey consisted of two blocks. In the first block, all Qinghai sample students were given a standardized English test and all Ningxia sample students were given a standardized math test.[5] The students were required to finish the tests in 30 min. During the examination, the students were closely proctored to prevent cheating and time limits were strictly enforced. For the analysis, we standardized the test scores using the score distributions of each dataset and, based on the standardization, we generated the variable *baseline test score*, presented in terms of standard deviations.[6]

In the second block, students were asked to answer a series of questions about their individual and family characteristics. We included questions on each student *family asset*[7] (1 = higher than the median, 0 = lower or equal to the median), *student age* (years), *student gender* (1 = boy, 0 = girl), *belongs to ethnic minority* (1 = yes, 0 = no) and their specific ethnic group (*Han*, *Hui*, *Salar*, *Tibetan or Tu*). We also collected data to generate variables describing family characteristics, including *father has a migrant job* (1 = yes, 0 = no), *mother has a migrant job* (1 = yes, 0 = no), *father completed primary school* (1 = yes, 0 = no) and *mother completed primary school* (1 = yes, 0 = no).

The follow-up survey at the end of the academic year was almost identical to the baseline survey. The first block was another standardized test comprised of different question items than that baseline examination, in order to

Footnote 2 continued
schools in all six counties in the prefecture. Additionally, our sampling frame in Ningxia contained a total of 160 schools. We decided to sample about one-third of the schools from each province to obtain a total of 180 schools (130 schools from Qinghai and 50 schools from Ningxia). Therefore, we randomly chose 130 primary schools from Haidong to be included among our sample schools.

[3] Why did we choose 51 schools in Ningxia? The reason we chose Ningxia (in addition to Qinghai) is that by carrying out our study in two provinces our findings could be more generalizable. The reasons why we chose to include schools from Ningxia within our sample follow the same logic as our selection of Haidong Prefecture. We originally chose 50 schools in Ningxia to ensure our overall sample size was sufficiently large. We determined that having a sample of 180 schools would provide enough statistical power to identify dropout rates if they were 2 % or above. After randomly choosing one-third of the candidate schools from the overall sampling frame in Haidong, we still needed 50 additional schools. The 50 schools were chosen from a sampling frame of 160 schools in the three sample counties. [Note that the actual number was 51, not 50. This is due to the fact that one additional school was added to the sample when we initially thought one of the original schools would not be willing to participate. However, ultimately, all 50 schools plus the one (randomly chosen) back-up school became part of the sample for a total of 50.]

[4] Why did we only choose grade 4 students in Ningxia? First, we decided not to survey grade 1–3 students, because it is our belief that they are too young to take tests and fill out survey forms. Second, we could not include grade 6 students, because by the time we were to follow up with them they would have graduated, making tracking students prohibitively difficult. Thus, we decided to sample grade 4 and 5 students for this study. However, when we sampled schools in Ningxia we found that schools that only have five grades (grade 1–5) are prevalent. Grade 5 students could not be included because they would have graduated when we follow them up in the endline survey. Therefore, we only sampled grade 4 students in Ningxia.

[5] In rolling out this study to investigate dropout problem in rural areas of China, we had the chance to combine this project with two other studies (one in Qinghai and the other in Ningxia). However, the two studies that were conducted in conjunction with our dropout paper with had different goals. In the other part of the study in Qinghai, we had a chance to study ways to improve English. In the other part of the study in Ningxia, we were trying to figure out how to improve student performance in math. Because of these different "secondary objectives," we decided to give students different academic tests in the two study provinces. While this made the RHS set of variables in two parts of the dataset for our drop out paper different, all other variables were measure exactly the same. Moreover, we do not believe the nature/content of the examination matters, both were core academic subjects and we were only looking to measure the baseline performance of the students. Since we normalized both sets of text scores (in both Qinghai and Ningxia), we do not believe that this matters.

[6] When we standardized the test scores of students in each province (Qinghai and Ningxia), we used the score distributions of the students from that province as the reference. Specifically, we used the test scores of all students from Haidong as the reference when standardizing the test scores of all Haidong students. In the same way, we used the test scores of students from Ningxia as the reference when standardizing the test scores of all Ningxia students. Please note, the method that we used was the same as that used in many other studies in the literature (Chu et al. 2015; Yang et al. 2015; Marsh et al. 2005).

[7] The variable of family assets is based on the summed value of a set of family durable assets (including electric appliances, livestock, vehicles, etc.). A value was attached to each asset (based on the National Household Income and Expenditure Survey, which is organized and published by the China National Bureau of Statistics —CNBS 2008) to produce a single metric of family asset holdings. Then, we summed all values to generate the variable of family assets. It equals to 1 if the summed family asset value is higher than the median value and equals to 0 if otherwise.

reflect the levels of student learning one academic year after the baseline. The second block asked the same socioeconomic questions as in the baseline.

One additional activity was carried out in order to identify which students had dropped out during the academic year.[8] We identified which students were present at the baseline but absent during the follow-up survey and documented the reasons for their absences. We consulted with teachers and classmates to sort students into one of four groups: students that were absent due to illness or some other short-term reason; students who were in another class in the same school (either held back a year or switched classes within the same grade); students that had transferred to a different school; and the students that had dropped out of school. In addition to asking several classmates and teachers to verify the status of each student, we also made phone calls to families to confirm that all students who had been reported as dropouts had truly left school. With this careful protocol, we believe that we successfully minimized any potential measurement error for the dropout rate in our dataset.

### Statistical approach

Our statistical analysis has three parts. First, we describe overall dropout rates and dropout rates by ethnicity and gender. Second, we examine the correlates of dropping out to determine which types of students are more likely to drop out of primary school in rural China. Third, we examine whether there is heterogeneity in dropout rates by different characteristics within different ethnic groups.

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

$$y_{is} = \beta_0 + \beta_1 X_{is} + \varphi_s + \varepsilon_{is} \qquad ((1))$$

where $y_{is}$ is the dropout status of student $i$ in school $s$ ($y_{is}$ equals 1 if the student dropped out and 0 if otherwise); $x_{is}$ is a vector of variables that includes student baseline characteristics, including baseline test score, student age, student gender, family asset, ethnicity, parental education and parental migrant job. We also include school-level dummy variables (or fixed effects) to control for all fixed (or non-time varying) school effects (represented by $\varphi_s$ in the equation). We use a linear probability model instead of a probit or logit model because it is more tractable and flexible in handling unobserved heterogeneity, and it allows for straightforward interpretation of coefficients (De Janvry et al. 2006). We compute heteroskedasticity-robust standard errors in all regressions to improve efficiency.

To identify heterogeneity in dropout rates within different ethnic groups, we included interaction terms between the ethnicity variable and a set of key variables (*baseline test score*, *student age*, *gender*, and *family asset*). The heterogeneity analysis addresses whether students of different baseline test scores, ages, genders and family assets drop out more in the different ethnic groups.

## Results

### Dropout rates

Among all 14,761 grade 4 and 5 students of our sample,[9] the overall dropout rate across one academic year is 2.5 % (Table 1, row 1). We arrive at this statistic by dividing the total number of dropped out students (365) by the total number of observations (14,761). Looking separately at grade 4 and grade 5, we find grade 5 students drop out at a higher rate (2.8 %) than grade 4 students (2.2 %; Table 1, rows 2 and 3). Under the assumption that dropout increases by a similar margin for grade 6 students, we estimate an approximate cumulative dropout rate for rural primary schools of 8.2 % (2.2 % of students drop out in grade 4, 2.8 % in grade 5 and 3.4 % in grade 6).[10] This rate is more than 20 times higher than the official rate reported in China's statistical yearbooks (reported as 0.2 %—Ministry of Foreign Affairs of China 2015).

Cross tabulations suggest that there are large differences in annual dropout rates across ethnic groups (Table 2).[11]

[8] In our study, we consider a student to be a dropout if a student who is initially enrolled in school stops attending school at a point later on during the school year/a subsequent school year. In our survey, we identify a student to be a dropout if the student who was present at the baseline survey had stopped attending school at the follow-up survey.

[9] When we sampled our students from Qinghai and Ningxia, we made sure that the sample sizes of each of the ethnic groups was large enough to allow us to make comparisons of dropout rates among the different subgroups in our overall sample. The total sample of 14,761 students consists of five different ethnic groups (Hui, Salar, Tibetan, Tu and Han). The largest ethnic group is Han, which has 6617 students and accounts for 45 % of the whole sample. Hui is the largest minority group, which has 5409 students and makes up 37 % of our sample students. Finally, there are 1443 Tibetan students (10 %), 683 Salar students (5 %) and 605 Tu students (4 %).

[10] The reader should note that our analysis rest on an additional assumption that the dropout rates in Qinghai and Ningxia are similar. Due to the fact that we only surveyed fourth grade students in Ningxia and both fourth and fifth grade students, there is a chance that the predictions we make about the dropout rates in grade 6 in both provinces and grade 5 only in Ningxia. However, this is an unavoidable assumption that we must make to conduct our analysis given the nature of schools in Ningxia (that is, many schools in Ningxia only have 5 grades in elementary school. In order to track students for a year, we could only survey fourth graders in this area). It could be that there are regional differences between Ningxia and Qinghai in terms of drop out rates by grade level. However, this is the best prediction that we can present with the data available.

[11] When we look at the specific dropout rates of the different ethnic minority groups, we can conclude that the insignificant differences between the dropout rates of Tibetan and Han students and those between Tu and Han students are not due to sizes of the sample and

**Table 1** Rates of dropout in primary schools in Qinghai and Ningxia, by grade

| | Enrollment at the baseline | Enrollment at the endline | Change in enrollment (column 2 − column 1) | Dropout rate (%) |
|---|---|---|---|---|
| 1. Full sample | 14,761 | 14,396 | −365 | 2.5 |
| 2. Grade 4 | 8222 | 8042 | −180 | 2.2 |
| 3. Grade 5 | 6539 | 6354 | −185 | 2.8 |

*Source*: Authors' survey

Though Han and Tu students have low annual rates of dropout (rows 4 and 5, column 2), the annual dropout rates of Hui and Salar minorities are significantly higher, both at 5.4 % (row 1 and row 2, column 2). The differences between Han and Hui minority and between Han and Salar minority are both significant at the 1 % level (rows 6 and 7, columns 2 to 4).

Within these high dropout ethnic minority groups, our data show sharp gender differences (Table 2). Specifically, according to our study, Hui and Salar girls drop out at an annual rate of about 7 % (rows 1 and 2, column 3). In contrast, the annual rate of dropout for Hui and Salar boys is only about 4 % (rows 1 and 2, column 4). The girl–boy difference is significant at the 1 % level for the Hui minority, but not significant for the Salar minority (rows 1 and 2, column 5).

The descriptive statistics also suggest that Hui and Salar students are more likely to drop out as they age (Table 3). Hui girls drop out at an annual rate of 5.6 % in grade 4 and 8.6 % in grade 5 (rows 1 and 8, column 2). Similarly, the rate of drop out of Hui boys increases from an annual rate of 3.6 % in grade 4 to 5.4 % in grade 5 (rows 1 and 8, column 4). Salar students also display increases in dropout rates between grades 4 and 5, as difference in the annual dropout rates between grades 4 and 5 is 4.6 % for Salar girls and 5.5 % for Salar boys (rows 2 and 9, columns 2 and 4).

Under the assumption that the rise in dropout rates is roughly linear from grade 4 to grade 6,[12] our data suggest that at least 23 % of Hui girls and 22 % of Salar girls drop out of primary school before the end of grade 6. The cumulative rates are also high for boys, as, according to our data, about 13 % of Hui boys and 14 % of Salar boys drop out by the end of grade 6. Note that these estimates of cumulative dropout rates are likely to be underestimated because we assume students only begin to drop out in grade 4.

## Correlates of dropout

The results of multivariate correlation analysis are consistent with the descriptive analysis. The results show that the dropout rate is correlated with academic performance, age, gender, and ethnicity when holding all other factors constant (Table 4). Our multivariate results show that poor academic performance is correlated with dropping out. This is consistent with other findings in the literature base (Filmer 2000; Brown and Park 2002; Connelly and Zheng 2003). Our data show that a score one standard deviation below average on a standardized test is associated with a one percentage point (or 10 %) increase in the probability of dropping out (significant at the 1 % level—row 1, columns 3 and 4). This indicates that students who score lower on standardized tests are more likely to leave school early. This is consistent with our hypothesis (General Hypothesis 1) that in a competitive education system like China, poorer preforming students are more likely to drop out.

Consistent with the descriptive statistics, the multivariate correlation analysis also demonstrates that older students and girls are more likely to drop out when controlling for other characteristics. The difference between students who are in grade 5 and those who are in grade 4 is significant at the 1 % level (row 2, columns 3 and 4). In addition, on average, boys are one percentage point (ten percent) less likely to drop out than girls (significant at the 1 % level—row 3, columns 3 and 4). For the most part, the magnitudes and the levels of significance remain robust even when we control for other student and family characteristics and include school fixed effects (columns 2–4). It suggests that the presence of opportunity costs may play a role in pushing students out of school, which is consistent with the General Hypothesis 2. That is, due to high opportunity costs presented by continuing schooling, parents in rural China allow their children to drop out. This appears to be the case particularly for older students and girls.

Footnote 11 continued
inadequate power. Rather, we believe our results are due to the fact that few Tiebetan and Tu students drop out. Specifically, among the 1443 Tibetan students in our sample, only 18 students dropped out (1.3 %) and none of the 595 Tu students in our sample dropped out (0 %). Our analysis also revealed that Han students dropped out at a low rate: 0.2 %. Therefore, given such low levels of dropout of Tibetan and Tu students, we did not detect significant differences between the dropout rates of students from these minority groups and Han students.

[12] The assumption that dropout increases linearly from grade 4 to grade 6 has been commonly used to calculate cumulative dropout rates in studies in the literature (Frase 1989; Bylsma and Ireland 2005; Yi et al. 2012; Shi et al. 2015).

**Table 2** Rates of dropout in primary schools in Qinghai and Ningxia, by ethnic group

| | Total sample (1) | Dropout rate of total sample (2) | Dropout rate of girls (3) | Dropout rate of boys (4) | (5) *T* test (*P* value) $H_0$: (3) = (4) |
|---|---|---|---|---|---|
| 1. Hui | 5409 | 5.4 | 6.6 | 4.3 | 0.00 |
| 2. Salar | 683 | 5.4 | 6.7 | 4.2 | 0.14 |
| 3. Tibetan | 1443 | 1.3 | 1.2 | 1.3 | 0.94 |
| 4. Tu | 605 | 0.2 | 0.0 | 0.3 | 0.35 |
| 5. Han | 6617 | 0.2 | 0.2 | 0.3 | 0.38 |
| 6. *T* test | | 0.00 | 0.00 | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Hui = Han | | | | | |
| 7. *T* test | | 0.00 | 0.00 | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Salar = Han | | | | | |

*Source*: Authors' survey

**Table 3** Rates of dropout in primary schools in Qinghai and Ningxia, by grade and ethnic group

| | Girls | | Boys | | (5) *T* test (*P* value) $H_0$: (2) = (4) |
|---|---|---|---|---|---|
| | (1) Numbers of students | (2) Dropout rate | (3) Numbers of students | (4) Dropout rate | |
| *Grade 4* | | | | | |
| 1. Hui | 1674 | 5.6 | 1765 | 3.6 | 0.00 |
| 2. Salar | 160 | 4.4 | 164 | 1.2 | 0.14 |
| 3. Tibetan | 354 | 0.3 | 347 | 0.9 | 0.94 |
| 4. Tu | 134 | 0.0 | 170 | 0.6 | 0.35 |
| 5. Han | 1791 | 0.2 | 1661 | 0.3 | 0.38 |
| 6. *T* test | | 0.00 | | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Hui = Han | | | | | |
| 7. *T* test | | 0.00 | | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Salar = Han | | | | | |
| *Grade 5* | | | | | |
| 8. Hui | 899 | 8.6 | 1073 | 5.4 | 0.00 |
| 9. Salar | 166 | 9.0 | 193 | 6.7 | 0.14 |
| 10. Tibetan | 381 | 2.1 | 361 | 1.7 | 0.94 |
| 11. Tu | 150 | 0.0 | 151 | 0.0 | 0.35 |
| 12. Han | 1545 | 0.2 | 1620 | 0.3 | 0.38 |
| 13. *T* test | | 0.00 | | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Hui = Han | | | | | |
| 14. *T* test | | 0.00 | | 0.00 | |
| (*P* value) | | | | | |
| $H_0$: Salar = Han | | | | | |

*Source*: Authors' survey

**Table 4** OLS regression of correlates of dropout in primary schools in Qinghai and Ningxia

| Dependent variable: Dropout (1 = yes, 0 = no) | [1] | [2] | [3] | [4] |
|---|---|---|---|---|
| 1. Baseline test score (SD)[a] | | | −0.01*** | −0.01*** |
| | | | [0.00] | [0.00] |
| 2. Student age (year) | | | 0.02*** | 0.02*** |
| | | | [0.00] | [0.00] |
| 3. Student gender (1 = boy, 0 = girl) | | | −0.01*** | −0.01*** |
| | | | [0.00] | [0.00] |
| 4. Family asset (1 = higher than the median, 0 = lower or equal to the median)[b] | | | −0.00 | −0.00 |
| | | | [0.00] | [0.00] |
| 5. Belong to ethnic minority (1 = yes, 0 = no) | 0.01*** | | | |
| | [0.00] | | | |
| 6. Hui | | 0.03*** | 0.02*** | 0.02*** |
| | | [0.00] | [0.00] | [0.00] |
| 7. Salar | | 0.04*** | 0.03** | 0.03** |
| | | [0.01] | [0.01] | [0.01] |
| 8. Tibetan | | 0.00 | −0.00 | −0.00 |
| | | [0.00] | [0.00] | [0.00] |
| 9. Tu | | 0.00 | 0.00 | 0.00 |
| | | [0.00] | [0.00] | [0.00] |
| 11. Family characteristics | No | No | No | Yes |
| 12. School dummies | Yes | Yes | Yes | Yes |
| 13. Constant | 0.02*** | 0.01*** | −0.15*** | −0.15*** |
| | [0.00] | [0.00] | [0.02] | [0.02] |
| 14. Observations | 14,761 | 14,761 | 14,761 | 14,761 |
| 15. $R^2$ | 0.082 | 0.083 | 0.098 | 0.099 |

*Source*: Authors' survey

[a] Baseline test score is the score of the standardized English test that was given to students in grades 4 and 5 in Qinghai sample schools and the standardized Math test that was given to students in grade 4 in Ningxia sample schools at the beginning of the academic year in June

[b] The variable of family asset is based on the summed value of a set of assets, including electric appliances, livestock, vehicles, etc. The variable equals 1 if the family asset value is higher than the median value and it equals 0 if otherwise

* Significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in brackets

In addition to academic performance, age, and gender, we also found that ethnic minority status increases the likelihood of dropout (in any given year) by one percentage point (or ten percent, significant at the 1 % level, row 5, column 1). Looking at specific minority groups, Hui students are 2–3 percentage points (20 to 30 percent) more likely to drop out from primary school than Han students (significant at the 1 % level, row 6, columns 2–4). In contrast, Tibetan and Tu minorities display no distinguishable observed differences in dropout rates from Han students (rows 8 and 9, columns 2–4).

Although our multivariate analysis cannot provide direct evidence for why Tibetan and Tu students do not drop out, we are able to use our data to derive descriptive statistics that allow us to examine this question as well as draw on the literature base to provide possible reasons as to why Tibetan and Tu students do not drop out at high rates. We find that the academic performance of Tibetan students is not as poor (on average) as that of Hui and Salar students. Although the average standardized test score of Tibetan students (−0.10) is lower than that of Han (0.44), it is still significantly higher than that of Hui (−0.54) and Salar (−0.32) students (significant at the 1 % level). This relatively strong academic performance among Tibetan students may help to reduce their drop out rates. Additionally, Tibetan schools have taken steps to minimize any language problems that arise from students speaking Mandarin as a second language. Unlike most minority schools, many Tibetan schools have adopted bilingual language programs which provide additional tutoring in Mandarin to help Tibetan students transition to classes that are taught in Mandarin (Shi 2010). In this way, these programs may have reduced the language barrier for Tibetan students in a way that both reduced the costs and

increased benefits of schooling, and decreased their dropout rates.

Similar to Tibetan students, Tu students may exhibit low drop out rates due to their relatively strong academic performance. The standardized test scores of Tu students (0.67) is significantly higher (at the 1 % level of significance) than those of both Hui (−0.54) and Salar students (−0.32). Additionally, these scores are even higher than those of Han students (0.44). Age may also be a factor, as our data show that Tu students are as young as Han students (on average around 10.71 years old). In addition, Tu are significantly younger than Hui students (11.07) and Salar students (11.13). Being younger, Tu students are likely to have lower opportunity costs of working in the unskilled labor market or completing unpaid work within the home. In summary, it may be a combination of better academic performance and lower opportunity costs that lead to lower reported dropout rates among Tu students as compared to those of Hui and Salar students.

### Heterogeneous effects

In this section, we examine how dropout rates in the two most vulnerable minority subpopulations (Hui and Salar) vary by the student and family characteristics of the individuals in those populations. The multivariate analysis examining heterogeneous effects by test scores, age, gender and family assets among Hui students yields similar conclusions as the descriptive analysis (Table 5). Hui students are more likely to drop out if they perform poorer academically, as they age, if they are girls, or if they come from poorer families (significant at the 1 or 5 % levels, rows 2–5). However, the case is different for Salar students (Table 6). Although Salar students are also more likely to drop out as they age, student characteristics in terms of baseline test scores, gender, and family assets do not influence the likelihood of drop out, holding all else constant (rows 2–5, columns 1–4).

The evidence of heterogeneous effects confirms that minority students are particularly prone to dropping out if their academic performance is poor. This is especially the case for Hui minorities. While Hui families recognize the returns to college education and are more willing to invest in education for children who perform well at school, they appear to be less willing to make a similar investment for students who are unlikely to gain access to higher levels of education (Wan and Yang 2008). While this disparity appears to emerge in ethnic minorities as early as primary school, research has shown that Han students with poor academic performance drop out at higher rates starting in junior high school (Yi et al. 2012; Mo et al. 2013). The difference in timing across these groups may be a result of the many educational disadvantages of minorities, including more limited educational resources at home and in the community (Kwong and Xiao 1989; Orfield and Wald 2001). It may be the case that if minority students are performing poorly in primary education, it is harder for them to catch up as they progress through the educational system (Loyalka et al. 2014). In other words, if a Hui student is lagging behind in primary school, his/her family may believe that the learning gap between their child and other children will only widen and the chance of attending college will only get smaller, ultimately leading to the decision to drop out.

Our results also show that for Hui and Salar students, age may be an important indicator of relative opportunity cost. As students get older (10–12 years old), they become increasingly able to provide help to family businesses. Salar and Hui minorities are known for running small-scale family businesses (Ma 2011), and having kids help out rather than hiring another employee may serve as a source of significant savings. In many cases such family businesses are the only income source for the whole family and therefore children's continued schooling can constitute a high opportunity cost (Ma et al. 1996; Ma 2011). When the kids are still young, schools can serve as a convenient child-care center (Ma et al. 1996). As children get older, the value of having them work at the family businesses is more likely to offset the perceived low returns to education.

Possibly related to both opportunity cost and cultural norms, ethnic minority girls are more likely to drop out of primary school than their male counterparts. Girls' opportunity cost of schooling is likely higher than boys because they are expected to take primary responsibility for housework in the family (Ma et al. 1996). Almost all rural Hui families have family members migrating for work (Gustafsson and Sai 2014). Mothers are more able to migrate—and thereby increase household earnings—if girls at home can help take care of housework and younger siblings. Cultural norms also reduce the expected return of schooling for girls. In some minority cultures, such as that of the Hui minority group, girls would not be children any more and should start to prepare for marriage when they are 9 years old (Xie 2011). Thus, parents may prefer to keep girls at home to make them more attractive in marriage market than send them to school.

Interestingly, we find that academic performance, gender, and poverty do not seem to affect the dropout decisions of Salar students. This may be due to the fact that language problems and cultural norms likely play very strong role in Salar minority, and therefore, the factors most commonly associated with dropout decision may have a lesser effect on them. The Salar minority group is much less integrated into the Han-dominated culture and economy (Ma et al. 1996; Wang 1996; Tao 2007). Their

**Table 5** OLS regression results showing the heterogeneous effects of dropout on Hui students in primary schools in Qinghai and Ningxia

| Dependent variable: Dropout (1 = yes, 0 = no) | [1] | [2] | [3] | [4] |
|---|---|---|---|---|
| 1.Hui (1 = yes, 0 = no) | 0.02*** | 0.23*** | 0.04*** | 0.02*** |
| | [0.00] | [0.04] | [0.01] | [0.00] |
| 2.Hui * student score | −0.02*** | | | |
| | [0.01] | | | |
| 3. Hui * student age | | 0.02*** | | |
| | | [0.00] | | |
| 4. Hui * student gender | | | −0.02*** | |
| | | | [0.01] | |
| 5. Hui * family asset | | | | −0.01** |
| | | | | [0.00] |
| 6. Baseline test score (SD)[a] | −0.00 | −0.01*** | −0.01*** | −0.01*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 7. Student age (years) | 0.02*** | 0.01*** | 0.02*** | 0.02*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 8. Student gender (1 = boy, 0 = girl) | −0.01*** | −0.01*** | −0.00** | −0.01*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 9. Family asset (1 = higher than the median, 0 = lower or equal to the median)[b] | −0.00 | −0.00 | −0.00 | 0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 10. Salar (1 = yes, 0 = no) | 0.04** | 0.03** | 0.03** | 0.03** |
| | [0.01] | [0.01] | [0.01] | [0.01] |
| 11. Tibetan (1 = yes, 0 = no) | −0.00 | −0.00 | −0.00 | −0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 12. Tu (1 = yes, 0 = no) | 0.00 | 0.00 | 0.00 | 0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 13. Family characteristics | Yes | Yes | Yes | Yes |
| 14. School dummies | Yes | Yes | Yes | Yes |
| 15. Constant | −0.15*** | −0.04*** | −0.15*** | −0.15*** |
| | [0.02] | [0.01] | [0.02] | [0.02] |
| 16. Observations | 14,761 | 14,761 | 14,761 | 14,761 |
| 17. $R^2$ | 0.100 | 0.105 | 0.100 | 0.099 |

*Source*: Authors' survey

[a] Baseline test score is the score of the standardized English test that was given to students in grades 4 and 5 in Qinghai sample schools and the standardized Math test that was given to students in grade 4 in Ningxia sample schools at the beginning of the academic year in June

[b] The variable of family asset is based on the summed value of a set of assets, including electric appliances, livestock, vehicles, etc. The variable equals 1 if the family asset value is higher than the median value and it equals 0 if otherwise

* Significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in brackets

communities are generally concentrated in a few counties and they speak their own language at home—unlike Hui communities, which are generally less isolated and native speakers of Chinese (Ma et al. 1996; Liu 1999; Tao 2007). Cultural norm also plays a more important role in both life and education in Salar communities (Ma et al. 1996; Wang 1996; Tao 2007). Receiving a liberal education—especially one conducted in their non-native Chinese—may therefore be of less value to Salar families (Ma et al. 1996; Wang 1996; Liu 1999; Tao 2007).

Our results show that in general, poverty seems not to be an important factor that affects the decision to drop out in rural areas. On average, poorer families are not more likely to allow their children to drop out from school. It is likely that most of the rural families in China do not consider education as consumption good, though the families of Hui students may be an exception. Richer Hui families may consider children's education to be a consumption good because of the tradition of this minority running businesses in urban areas across China. This may grant them more exposure to

**Table 6** OLS regression of the heterogeneous effects of dropping out of the Salar students in primary schools in Qinghai and Ningxia

| Dependent variable: Dropout (1 = yes, 0 = no) | [1] | [2] | [3] | [4] |
|---|---|---|---|---|
| 1. Salar (1 = yes, 0 = no) | 0.03** | 0.17* | 0.04** | 0.03** |
| | [0.01] | [0.08] | [0.02] | [0.01] |
| 2. Salar * student score | −0.00 | | | |
| | [0.01] | | | |
| 3. Salar * student age | | 0.02*** | | |
| | | [0.01] | | |
| 4. Salar * student gender | | | −0.02 | |
| | | | [0.02] | |
| 5. Salar * family asset | | | | 0.00 |
| | | | | [0.01] |
| 6. Baseline test score (SD)[a] | −0.01*** | −0.01*** | −0.01*** | −0.01*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 7. Student age (years) | 0.02*** | 0.01*** | 0.02*** | 0.02*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 8. Student gender (1 = boy, 0 = girl) | −0.01*** | −0.01*** | −0.01*** | −0.01*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 9. Family asset (1 = higher than the median, 0 = lower or equal to the median)[b] | −0.00 | −0.00 | −0.00 | −0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 10. Hui (1 = yes, 0 = no) | 0.02*** | 0.02*** | 0.02*** | 0.02*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 11. Tibetan (1 = yes, 0 = no) | −0.00 | −0.00 | −0.00 | −0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 12. Tu (1 = yes, 0 = no) | 0.00 | 0.00 | 0.00 | 0.00 |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| 13. Family characteristics | Yes | Yes | Yes | Yes |
| 14. School dummies | Yes | Yes | Yes | Yes |
| 15. Constant | −0.15*** | −0.14*** | −0.15*** | −0.15*** |
| | [0.02] | [0.02] | [0.02] | [0.02] |
| 16. Observations | 14,761 | 14,761 | 14,761 | 14,761 |
| 17. $R^2$ | 0.099 | 0.099 | 0.099 | 0.099 |

*Source*: Authors' survey

[a] Baseline test score is the score of the standardized English test that was given to students in grades 4 and 5 in Qinghai sample schools and the standardized Math test that was given to students in grade 4 in Ningxia sample schools at the beginning of the academic year in June

[b] The variable of family asset is based on the summed value of a set of assets, including electric appliances, livestock, vehicles, etc. The variable equals 1 if the family asset value is higher than the median value and it equals 0 if otherwise

* Significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in brackets

the idea that "education has benefits beyond the returns to education", and more people in urban areas believe that education satisfies the need for personal development, knowledge, and understanding (Zhang 2005; Li 2009).

## Conclusions

Data from a large-scale field survey has shown that the cumulative dropout rate for primary education is as high as 8.2 % in rural areas. On average, students drop out at an annual rate of 2.2 % in grade 4 and 2.8 % in grade 5. Such figures suggest that the official statistic of 0.2 % for primary school dropout at the national level may have masked this real and serious dropout problem in (at least some) rural primary schools.

Dropout rates are even higher when examining only specific ethnic minority and gender groups. Rates of dropout are particularly high among students of Hui and Salar minority communities. Using our data and a fairly conservative set of assumptions, we show that 23 % of Hui girls and 22 % of Salar girls are dropping out by the end of

grade 6. The cumulative dropout rates for Hui boys and Salar boys are 13 and 14 %.

When exploring the correlates of dropping out, we find students are more likely to drop out if they have poorer academic performance, at older ages and if they are girls. Using our data, these factors are shown to be especially important concerning the dropout decisions of Hui students.

Our analysis also shows that there are differences in the patterns of dropping out between Salar and Hui students. Salar students tend to drop out more as they get older, regardless of relative academic performance and family wealth. We speculate that this pattern may be due to the fact that Salar minority communities traditionally have been more isolated—in terms of both their language and culture—relative to Hui minority communities. It is commonly thought that many families in Salar communities place less value on education—especially when the language of instruction is Mandarin. As children grow older, the opportunity cost of primary education quickly outweighs the value placed on primary education.

To our knowledge, our paper is the first large-scale empirical study that reveals the dropout problem among rural primary schools in China, with a special focus on minority groups. Our findings should draw attention to a fundamental human capital problem of the rural population in China. As studies have shown, a well-educated labor force is essential to sustainable economic development and overcoming the middle-income trap (Schultz 1961, 1963; Rong and Shi 2001). Moreover, without receiving the most basic education and language training, ethnic minorities are likely to face many challenges in the job market in the future. These human capital problems will likely only be reinforced by a clash of values and beliefs with Han and other ethnic groups.

Several policy recommendations can be derived from our findings. First, to the extent that the findings are generalizable to the rest of China, our results suggest that dropping out from primary school still does exist in China. This means that China still has not achieved the Millennium Development Goals of achieving universal primary education by 2015. Although China's government has made an effort to eliminate unenrolled children, this effort being undermined by the fact that large shares of minority students drop out of primary school. Thus, if China's government truly wants to eliminate primary school dropout, it needs to establish programs that target dropout at this age focusing on minority students in particular.

Second, our results suggest that minorities are particularly prone to dropping out if their academic performance is poor. Therefore, one way to prevent minority students from dropping out may be to improve their academic performance and increase their chances of succeeding in the education system. For example, actions can be taken to provide remedial tutoring in Mandarin to reduce the language barrier in school. Studies have shown that educational programs, such as conducting computer-assisted remedial learning program in Mandarin, are effective in improving the overall academic performance of students in both language and math (Lai et al. 2015; Mo et al. 2015; Yang et al. 2013). Another potential direction may be to improve the quality or the efforts of teachers. Studies have shown that, by giving high-powered, financial teacher incentives that are linked to student performance, the effort of teachers can be increased and students can gain in academic performance (Loyalka et al. 2015).

Third, while poverty does not seem to be a major barrier for schooling of the minority students, the high and rising opportunity cost of schooling still plays an important role in the drop out decisions of many students. It is important for leaders to understand that school is not free, even in the case where out-of-pocket costs are low or zero. In order to compensate families for the forgone earnings presented by keeping their child in school, financial assistance can be provided to the students conditional on their continuing enrollment in school. Studies have shown that providing conditional cash transfers (that is, payments made to households that are conditional on their children's school attendance) can effectively reduce dropouts in China and other developing countries (Mo et al. 2013; De Brauw and Hoddinott 2008; Chaudhury and Parajuli 2008; De Janvry et al. 2006; Heinrich 2006; Gertler 2004; Schultz 2004).

Fourth, due to the fact that cultural norms restrict the educational attainment of some minority children, government bodies could potentially launch public information campaigns to educate parents and students about the benefits staying in school. Internationally, studies have been conducted on effectiveness of organizing campaigns to convey large benefits of educational attainment to minority communities (Armor et al. 1976; Cotton and Wikelund 1989; Banerjee et al. 2010), though the empirical evidence is still weak. Only one empirical study in India found that community-based campaigns had a positive impact on student learning (Banerjee et al. 2010). Whether an information intervention could change the cultural beliefs and behaviors of parents in China is an important topic to explore in future studies.

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## Appendix 1

See Table 7.

**Table 7** Description of the composition of ethnicity of sample students in the first year

| | Numbers of students | Percent |
|---|---|---|
| 1. Full sample | 14,761 | |
| 2. Ethinc | | |
| Hui | 5409 | 37 |
| Salar | 683 | 5 |
| Tibetan | 1443 | 10 |
| Tu | 605 | 4 |
| Han | 6617 | 45 |

*Source*: Authors' survey

## Appendix 2

See Table 8.

**Table 8** Description of variables used in the study

| | Obs. | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| *Ethnic* | | | | | |
| Belong to ethnic minority (1 = yes, 0 = No) | 14,761 | 0.55 | 0.50 | 0 | 1 |
| Hui (1 = yes, 0 = No) | 14,761 | 0.37 | 0.48 | 0 | 1 |
| Salar (1 = yes, 0 = No) | 14,761 | 0.05 | 0.21 | 0 | 1 |
| Tibetan (1 = yes, 0 = No) | 14,761 | 0.10 | 0.30 | 0 | 2 |
| Tu (1 = yes, 0 = No) | 14,761 | 0.04 | 0.20 | 0 | 1 |
| *Student's individual characteristics* | | | | | |
| Baseline test score (SD)[a] | 14,761 | 0.00 | 1.00 | −2.22 | 2.58 |
| Student age (year) | 14,761 | 10.95 | 1.17 | 5 | 18 |
| Student gender (1 = boy, 0 = girl) | 14,761 | 0.52 | 0.50 | 0 | 1 |
| *Family characteristics* | | | | | |
| Family asset (1 = higher than the median, 0 = lower or equal to the median)[b] | 14,761 | 0.07 | 0.97 | −3.81 | 3.23 |
| Father has a migrant job (1 = yes, 0 = no) | 14,761 | 0.34 | 0.47 | 0 | 1 |
| Mother has a migrant job (1 = yes, 0 = no) | 14,761 | 0.50 | 0.50 | 0 | 1 |
| Father completed primary school (1 = yes, 0 = no) | 14,761 | 0.80 | 0.40 | 0 | 1 |
| Mother completed primary school (1 = yes, 0 = no) | 14,761 | 0.60 | 0.49 | 0 | 1 |

*Source*: Authors' survey

[a] Baseline test score is the score of the standardized English test that was given to students in grades 4 and 5 in Qinghai sample schools and the standardized Math test that was given to students in grade 4 in Ningxia sample schools at the beginning of the academic year in June

[b] The variable of family asset is based on the summed value of a set of assets, including electric appliances, livestock, vehicles, etc. The variable equals 1 if the family asset value is higher than the median value and it equals 0 if otherwise

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