Boarding at School and Students' Well-Being: The Case of Rural China

Binbin Shu**
Department of Sociology
The Chinese University of Hong Kong

Yuying Tong*
Department of Sociology
The Chinese University of Hong Kong

* Direct all correspondence to: Yuying Tong, Department of Sociology, Room 439, Sino Building, The Chinese University of Hong Kong, Shatin, Hong Kong; tel: (852) 3943–1209; fax: (405) 2603–5213; email: yytong@cuhk.edu.hk.

**The authors contributed equally to this article, and their names are listed in alphabetical order.

Abstract

Using China Family Panel Studies (CFPS) 2010 data, we examine the consequences of living at school for children between 10 and 15 in rural China from multiple dimensions. We found that boarding at school is beneficial for students' academics in both word recognition and numerical skills. However, boarding students are also more likely to be sick and have higher depression scores, although they are also less likely to be overweight or underweight. Our results are consistent across fixed effects regression models and propensity score matching analyses, showing that there is little selection bias between boarders and nonboarders in rural China. We speculate that the positive outcome of boarding on students' academic skill is caused by their increased exposure to the learning environment as rural parents have little knowledge or time to supervise their children's learning at home. In contrast, detachment from the home environment and dormitory conditions might be the causes of more frequent sickness and higher levels of depression.

Introduction

The rural-urban education gap has been an important social issue in China for many decades. In the middle of the 1980s, the government set a goal of universalizing primary education by the end of the 1980s and making nine years of education compulsory in the 1990s (Tsui 1997). Since then, the universalization of compulsory education has been gradually implemented in rural China, due to the increase of government expenditure on education (Wei et al. 1999). These goals were largely attained by 1998 (Wu 2010). However, rural development efforts lagged considerably behind (Xie and Hannum 1996; Hannum 2002; Hauser and Xie 2005), and consequently there is still a big performance gap between urban and rural students—especially for students from poor, rural areas (Luo et al. 2012). For instance, in 2005 over 80 percent of urban students graduated from academic or vocational high schools, while less than 40 percent of rural students from poor counties graduated from high school (Wang et al. 2011).

As part of its effort to improve the overall level of basic education and narrow the gap between rural and urban areas in China, China's State Council lunched the Rural School Merger Program in the late 1990s (Mo et al. 2011). This program seeks to shutter remote and isolated schools and merge students into geographically centralized schools, so students can benefit from a quality education through access to larger, more centrally located educational facilities and quality teachers via economies of scale (Mo et al. 2011). The merging program accelerated in the 2000s. Statistics have shown that more than two hundred thousand rural primary schools closed between 1997 and 2006 (Xiong 2009; Liu et al. 2010), and junior high schools were reduced in number by 10 percent between 2000 and 2006. As a result, many students must live at school or walk long distances to attend day schools as the centralized schools are often located far from

students' homes in rural villages (Liu et al. 2010). As a result, many students leave home at a young age to live in dormitories miles away from their families. This separation and the concomitant single living environment might have consequences on children's psychological well-being, physical health, and learning outcomes.

The situation is further complicated by the out-migration from rural China. In 2010, there were 261 million people migrating, constituting about 19 percent of the national population (China's National Bureau of Statistics 2011). Although some migrant workers bring their children with them, many leave their children behind in their hometown. For example, in 2010 it was estimated that 61.02 million children were left behind in their rural village with one parent, grandparents, or other relatives (All-China Women's Federation 2013). As a result, sending children to boarding schools may relieve the burden on left-behind family members as they often lack a caregiver at home. Yet children are further separated from their family environment in addition to the separation from their parents. Few studies have examined the consequences of boarding children in rural China, especially in an era of school merging and rural out-migration. This study, using nationally representative data in China, examines whether boarding children at school has beneficial or detrimental consequences on children's well-being. Moreover, we also examine whether the consequences of boarding depend on parental migration status. We use fixed effects model and propensity score matching (PSM) analyses to analyze the selection bias of boarding.

Background

Theoretical Background

The boarding school system began as a Christian phenomenon in Europe (Kashti 1988). In the fifteenth and sixteenth centuries, they have since become widespread in Europe (Kashti 1988) and then appeared in North America in the late seventeenth century (Colmant et al. 2004). Since the 1800s, boarding schools have become increasingly extreme in the boarding quality. On the one hand, some are run by private institutions and provide an elite education to students largely from privileged families. On the other hand, public institutions have begun to establish shelter centers as boarding schools to meet basic education needs of disadvantaged families (Lee and Barth 2009).

Debate in both academic fields and education practice over the consequences of sending children to boarding schools has been heated. Many previous studies have described and analyzed boarding institutions by incorporating narratives of boarding school life (Colmant et al. 2004), mainly focused on disadvantaged children. Defenders argue that boarding schools provide educational opportunity, foster care, and a "therapeutic model" for problem students and those from poor immigrant families (Colmant et al. 2004). Boarding may be beneficial to students' academic performance and psychological well-being. For instance, Kadushin (1967) argues that collective education can control children's immediate adverse environment and change their behaviors, especially those of problem children. It can teach students a new way of life and help them conform to society (Bronfenbrenner 1970) and enhance their potential in college and their future careers (Association of Boarding Schools 2004). In other research, Simmons and Alexander (1978) argue that in poorer countries students gain the most when they are taken from their home environment and placed into a school environment, suggesting longer exposure to schools is beneficial to students' learning.

In contrast, opponents of boarding schools argue that public residence should be the last resort for young people who cannot receive support and do not have a safe family environment (Whittaker 2004; Cookson 2009). Some boarding school students have reported multiple forms of abuse and neglect, including no contact with the opposite sex, separation from siblings, and physical and emotional neglect (Colmant et al. 2004). Others have indicated that boarding makes children mature primarily in a single socialization setting in a collective context (Bronfenbrenner 1970). As a result, boarding students who are raised by schools solely but not by families, another quite important agent of socialization, cannot learn to adapt to various environments. Some researchers have found that boarding children are more likely to develop psychological problems and become malnourished under the strict hierarchy and poor service of the schools (Chase 2008; Luo et al. 2009). They also tend to have poorer academic outcomes (Adams 2006; Moswela 2006).

In further explanation of why sending children to boarding schools has these consequences, previous research has pointed out various mechanisms that in general fall into beneficial, detrimental, and conditional categories. Among the beneficial mechanisms, boarding students are exposed to a learning setting different from their home and this exposure benefits their schooling, as boarding school provides structure in terms of wake up, meals, exercising, and homework (Martin et al. 2014). In particular, Fisher et al.'s (1984) concept of "reversible relocation" argues that temporarily moving away from home causes the home environment to exist in a different geographical location that can be visited or contacted only irregularly. This temporary discontinuity may produce a release of tension and provide a basis for further

cognitive activities as individuals seek to restore their equilibrium or find substitute activities (Mandler 1982). In this way, the reversible relocation can be beneficial to students, especially over the long term. Others argue that boarding school provides a more stable environment that makes children turn away from their "toxic" home setting and neighborhood (Scott & Langhorne 2012). It also makes children develop a collective identity with others in their boarding house, which can provide a lifetime of camaraderie (Martin et al. 2014).

In contrast, the detrimental mechanism of "separation from attachment figures" contends that secure attachment is vital for children's scholastic, emotional, social, and behavioral adjustment at school (Granot and Mayseless 2001). Particular figures, such as parents or other caregivers, can offer more sensitive and supportive caring than anyone else (Kerns 2008). If children are boarding at schools, they are isolated from these attachment figures. The teacher-child relationship at schools cannot compensate for the loss of attachment between them and family caregivers because teachers are less likely to respond to students' emotional needs and more likely to require them (Parsons 2007). This perspective predicts that children at boarding schools are in a disadvantaged environment that is harmful to their well-being. Another view, the "single socialization setting" perspective, argues that the collective context at boarding schools makes students more likely to conform to social pressures (Bronfenbrenner 1970).

Scholars also have argued that the boarding outcome may depend on the school setting, including peer students, the school facility, and management. The "expanding peer effect" claims that although peers may not become attachment figures, they are vital for child growth and development, especially in middle childhood and adolescence (Laible, Carlo, and Raffaelli 2000;

Kerns 2008). Evidence on the impacts of the peer effect, however, is mixed. For instance, public boarding schools in Western countries largely receive students from poor and disadvantaged families, so the transmission of peer cultures may be dominated by deviant behaviors or those who carry infectious diseases or inappropriate habits (Dishion, McCord, and Poulin 1999; Said et al. 2003). In contrast, if boarding students are from more positive populations, they may transmit a more beneficial peer culture. Thus, boarding schools' influence will depend on the extent to which students come from poor or troubled families (Datnow and Cooper 1997).

Another conditional mechanism is the "school management effect." Boarding schools are responsible not only for students' classroom learning but also for students' sleeping, eating, and playing. As a result, a good school management system with adequate facilities is very important and beneficial to students' well-being and can compensate for the negative consequences caused by the detachment from their family (Little, Kohm, and Thompson 2005). It can also enhance the positive impact of reversible relocation and a positive peer effect. In contrast, poorer school operation and facilities could worsen the separation from families and the single socialization environment.

Based on this discussion, it is clear that the consequences of living at school may vary across different social contexts (Ginsburg et al. 2011). Among social contexts, how students are selected is particularly important. Some negative consequences result from boarding children being victims of neglect in their parental home prior to joining boarding schools (Bar-Nir and Schmid 1998). It is necessary to examine the selection process in each setting when studying the consequences of boarding for children. China offers a unique context to investigate the

consequences of boarding because boarding choices are largely based on geographic location instead of family socioeconomic differentials. In the next section we introduce Chinese boarding schools and how they might influence the well-being of rural Chinese students.

The Development of Boarding Schools in Rural China

In rural China, the existing boarding school system was initially established at the founding of the People's Republic of China in 1949. Before that, the majority of rural children were unable to access formal education except by attending school in an urban area. In the 1950s, boarding facilities were founded to promote education in ethnic minority and rural areas. Since then, rural boarding schools have been expanding at the secondary level. However, the expansion ebbed during the Cultural Revolution in the 1960s and 1970s (Tsang 2000). In the 1980s, to further expand compulsory nine-year education, most rural areas established boarding secondary schools in geographically centralized areas to ensure the continuation of schooling after students completed primary school, mainly at their home village. As a result, boarding schools became prevalent in China's rural areas. At that time, however, very few areas had primary boarding schools, since nearly every village had a primary school or teaching points (a small-scale school).

With regard to school quality, the rural-urban gap in education quality was huge and dropout rates in rural secondary schools were very high at the time. In recent decades, with decreasing numbers of children due to a declining birth rate and rural-to-urban migration, many primary schools and teaching points educate fewer children. This further deteriorates curriculum development and investment in rural school facilities. In an effort to improve education quality,

the government launched the school merging program (China's State Council 2001; Mo et al. 2011), meant to close remote schools and merge students from scattered villages into the geographically centralized schools, so students could benefit from increased education quality through access to larger, more centrally located facilities (Mo et al. 2011). As a result, many students have to leave home and start their boarding at school at a very young age. By the end of 2010, boarding primary and secondary students in rural China numbered 30 million, about one-quarter of all rural students. Among them, there are about 9.8 million students who are primary schoolchildren, 12.07 percent of all rural primary students. In secondary schools, the proportion of boarding is 47.89 percent (Dong 2014).

Despite the many boarding students in rural China, few studies have examined the consequences on these children. Among the few exceptions, Luo et al. (2009) examined boarding status and students' nutrition status by comparing boarding and nonboarding students in rural Shaanxi province, one of the least developed western provinces in China. They found that boarding students are suffering from poor services and poor health. Other studies have also documented that boarding students have poorer health outcomes and behavior problems (Pang and Han 2005; Ye and Pan 2008). Mo et al. (2011) showed that these boarding students in rural China had reduced academic performance relative to their nonboarding peers, although Liu et al. (2010) found that merging students into centralized schools is beneficial for students' academic outcome. However, the latter researchers did not study boarding status. Thus, although the benefits of merging students on academic results have not been completely denied in previous research, the consequences of boarding students at school seem have been largely negative. However, previous empirical studies have mostly been based on regional surveys without

nationally representative data. It is also worth noting that China's boarding schools are less selective, in regard to boarders' socioeconomic status, than their Western counterparts, and boarding schools draw students mainly based on geographic distance and local government practice of merging schools. Thus, the boarding schools in China may more accurately reflect the true consequences of boarding than their Western counterparts.

Moreover, previous studies about boarding schools in rural China have often focused on just one dimension of boarding outcomes for children. Previous studies also have not considered parental migration. In rural China, parent migration could further complicate the consequences of attending boarding schools. When one or two parents migrate, children are often left behind in the home village with grandparents or other relatives. On the one hand, boarding children relieves the burden on caregivers at home. On the other hand, however, boarding may further segregate children from the family setting as their parents live in a distant place, which makes it even more difficult to contact them with kids via phone or other electric device. It is necessary to consider parental migration and see whether it moderates or enhances the consequences of boarding children at schools.

Hypotheses

Informed by theoretical debates on beneficial and detrimental outcomes for boarding and considering selection into the boarding system, we examine whether sending children to boarding schools will have positive or negative consequences for rural children in China for a range of outcomes including academic skills, physical health, and mental health.

First, we predict that boarding will positively affect children's academic performance. On the one hand, boarders are not selected based on their academic results. When they are exposed to a more pervasive learning environment at boarding school, they will benefit from increased education time and greater teacher supervision. On the other hand, detachment from parental role models will have minimal effect on their learning outcomes as parents often lack the knowledge, time, and awareness to supervise their children's schooling at home in rural China. Children are often left with grandparents during the daytime, especially when parents migrate. Many children also must perform household chores or even work in the fields after school hours. As a result, residing at boarding schools provides sufficient time and exposure to teachers for learning. Moreover, the school culture in rural China is less harmful than pubic boarding schools in many other settings, as these schools have mixed student bodies of boarding and nonboarding students. Thus, their peers, teachers' qualifications, and school facilities are not significantly different from those of day school students. We also expect that the positive influence of boarding will be stronger among children who have migrating parents as they may enjoy schools more when their parents are absent from the home.

However, different from the expectations regarding academic outcomes, we expect boarding status to have negative consequences on students' physical health. As we discussed above, whether boarding is essential for children in rural China is determined mainly by their geographic location and local government practice, not the dysfunction of their families. Boarders are not selected based on their health. When they start boarding, they share a dormitory with many other students, often in unhygienic boarding facilities. As a result, students often get sick and infect each other. Students' nutrition might also be poor due to dining conditions at

schools (Luo et al. 2009). Moreover, due to safety concerns, boarding students are often kept in classrooms or dormitories. As a result, their outdoor time is largely limited and exercise is essentially constrained, as many schools in rural China lack playground and sporting facilities. Taking these points into consideration, we expect that boarding children are more likely to get sick than their counterparts who are living at home.

We also expect that boarding at school has negative consequences on children's psychological well-being. As detachment theory argues, these children are detached from their family and home environment and are spending their days in a single socialization setting. Teachers in China's education system are more likely to offer them structure and order than care during their nonlearning time. Their daily emotional stress caused by schoolwork and other activities cannot be buffered by an environment other than schools. Thus, we expect the influence to be negative. However, we also expect the influence to depend on parental migration status and student grade level. Parental migration might enhance the consequences of boarding because children may feel greater isolation in a boarding status. For children at higher grade levels, the effects of boarding school might moderate as these children feel closer connections to peers, who play an important role for child psychological well-being.

Data and Sample

We use data from the China Family Panel Studies (CFPS) 2010 survey, a nationally representative study of Chinese communities, families, and individuals, to examine the consequences of boarding at schools for rural children in China. CFPS was designed and implemented by the Institute of Social Science Survey (ISSS) at Peking University in China. In

the 2010 baseline survey, 33,600 adults and 8,990 children from 14,798 households were interviewed. Among these, we focus on rural children between the ages of ten and fifteen. The data provide 2,049 rural children from 1,682 households in 123 counties in China. The CFPS data have several advantages. First, the sample is a nationally representative, which can overcome the limitation of previous studies based on a particular region. As a result, the results can more easily be generalized to the whole nation. Second, this study not only includes students' information on their schools but also includes family variables, which allows us to consider the family context. Third, the CFPS data include a wide range of student outcomes, including scores on standard math and verbal tests conducted in the field, physical health, as well as psychological well-being, so the outcomes on students can be examined from multiple dimensions. This enables a more comprehensive examination about the consequences of boarding children in contemporary rural China. To the best of the authors' knowledge, this is the first study to examine multiple dimensions of well-being from boarding school in China.

Measures

To examine academic skills, we included two dependent variables, *word identification score* and *mathematics score*. The word identification and mathematics scores were collected from a standard literacy and numeracy test conducted during the field work by the CFPS study team; the results are continuous. For the word identification test, students received one point for each correctly read word. The range of scores is 0 to 34. For the mathematics test, students received one point for each correctly answered question. The range of scores is 0 to 24. In regard to health, we examine two dependent variables including both physical and mental health. Physical health includes the incidence of *illness in the last month* and *malnutrition status*. *Depressive*

mood is used to measure mental health status. The two physical health variables are binary. *Illness in the last month* is coded 1 if the respondent reported at least one illness in the past month. Malnutrition status includes both underweight and overweight status and is coded 1 for students who are either overweight or underweight according to BMI. Otherwise, it is coded 0. This variable is used to as a proxy for children at health risk according to their nutritional status. Depression score is a summarized respondent's score on six items of depressive mood. For each item of depressive mood, the frequency ranges from *none* to *almost every day*, with scales ranging from 1 to 5. These scores are summarized to obtain an overall depression score for the analysis. A higher score indicates a higher level of depressive mood. Details about the dependent variables are shown in Appendix Table 1.

The key independent variable is *living at school or not*, a binary variable. We tailored our study to the context of migration and examined whether parental migration status moderates or enhances the influences of boarding at school on child well-being. Parental migration is coded as *father migrating* and *mother migrating*. We control for individual-level factors (gender, grade, etc.), family context factors (parental education, International Socio-Economic Index of Parental Occupational Status [ISEI; Ganzeboom, De Graaf, and Treiman 1992], yearly income, sibship size, etc.). Detailed descriptions of the independent variables are provided in Appendix Table 1.

Analytical approach

As we mentioned above, selection into boarding school might significantly bias the consequences of boarding. To address this issue, we use fixed effects model and the PSM analyses to study the consequences of boarding to children in rural China. We began with

ordinary least squares (OLS) regression as the baseline model, then moved to the fixed effect model and PSM to examine boarding status and student outcomes at different dimensions. The estimating equation is then as follows,

$$Outcome = \alpha + \beta * board + \gamma * X + \varepsilon \text{ , (1)}$$

where *outcome* stands for each outcome variable; *board* indicates the student living at school or not. Therefore, in equation (1), β is the effect of living at school on that outcome.

In China, education policy is often instituted at the provincial level, so it is necessary to control for province-level fixed effects. Since the inclusion of cluster-specific fixed effects may not fully control for cluster correlation (and/or heteroscedasticity) at the provincial level (Cameron and Miller forthcoming), we also used Huber-White robust standard errors in the fixed effects model. Therefore, the model is employed as follows,

$$Outcome_{i,p} = \alpha_{i,p} + \beta * board_{i,p} + \gamma * X_{i,p} + \delta_p + \varepsilon_{i,p} \text{ , (2)}$$

where i denotes individuals, p denotes provinces, and δ_p indicates province fixed effects. Similar to equation (1), in equation (2) our coefficient of interest is β, which denotes the effect of living at school.

In addition, although we argue that China's rural boarding students are not selected like their counterparts from Western countries in terms of their family structure, wealth, and behavior problems, there still might be selection biases caused by geographic location, parental migration status, and family socioeconomic status. To ensure that boarding students are not systematically different from nonboarding students in terms of their personal and family characteristics, we applied the PSM method (Rosenbaum and Rubin 1983; Guo and Fraser 2009) to obtain the true

treatment effect of boarding at schools. To implement the matching, we first estimated all students' propensity score of living at schools by logistic regression (Rosenbaum and Rubin 1983). That is,

$$p(X) = Pr\ (D = 1 | X) = E(D | X), \quad (3)$$

where $D = \{0, 1\}$ is the indicator of exposure to treatment and X is the multidimensional vector of pretreatment characteristics. For our research question, variables in X include family contextual factors (parental education, occupational ISEI, yearly income, parental migration, sibship size) and individual-level factors (gender, grade, starting school age), and we also control for province-level fixed effects.

We then used the stratification matching method (Rosenbaum and Rubin 1984; Becker and Ichino 2002) to balance the two groups of boarding and nonboarding students. Specifically, based on the stratification of estimated propensity scores, we classified the sample into several strata; within each stratum the treatment and control groups are balanced in terms of propensity scores of living at school. Under the "strongly ignorable treatment assignment" (SITA) assumption, the group differences in covariates that lead to some outcomes are fully compressed by the propensity score, so the two groups are also matched to balance observed covariates (Rosenbaum and Rubin 1983; Imbens and Rubin 2014; Becker and Ichino 2002; Rubin 2007; Guo and Fraser 2009). Therefore, after this matching, we could obtain the average treatment effect of living at school on the boarders within each stratum. Finally, given that the numbers of treated units are different across propensity score strata, we add a weight to the treatment effect for each stratum to calculate the average treatment effect on the treated (ATT) for each outcome

variable (Becker and Ichino 2002). Equation (4) shows the treatment effect within stratum q, and equation (5) calculates our final result of interest, ATT:

$$\tau_q^s = E\left\{Y_{1i} - Y_{0i} \mid D_i = 1, i \in I(q)\right\} = \frac{\sum_{i \in I(q)} Y_i^T}{N_q^T} - \frac{\sum_{j \in I(q)} Y_i^C}{N_q^C}, \quad (4)$$

In equation (4), q denotes stratum q, Y_{1i} and Y_{0i} are the potential outcomes in the two counterfactual situations of living at school and living at home, $I(q)$ is the set of units in stratum q, and N_q^T and N_q^C are the numbers of treated and control units in stratum q.

$$\tau^S = \sum_{q=1}^{Q} \tau_q^s \frac{\sum_{i \in I(q)} D_i}{\sum_{\forall i} D_i}, \quad (5)$$

In equation (5), the weight for each stratum is given by the corresponding fraction of treated units and Q is the number of strata.

Results

Our study includes rural children between ten and fifteen years old in China. The sample sizes for the different dependent variables vary and are reported in Table 1. Nearly 30 percent of rural children in this age group attend boarding school during normal weekdays in our sample (shown in Appendix Table 2). Table 1 shows the statistical differences in outcome variables for children between boarders and nonboarders. On average, rural children living at schools have higher word identification and mathematics scores. They also are more likely to be ill in the past month, but fewer boarders have malnutrition problems according to standard body mass index. Boarding students also show a relatively higher score in depressive mood, although the difference is

insignificant. Other comparisons between boarders and nonboarders are shown in Appendix Table 2.

[Table 1 is about here]

Tables 2 and 3 show the regression results for different outcome variables. Under each outcome variable, we present both OLS and fixed effects models. Table 2 shows the results for the academic skills of word recognition and math scores. For each outcome variable, Model 1 is the OLS result and Models 2 and 3 are fixed effects results. Compared to Model 2, Model 3 includes interactions between boarding status and parental migration status as well as boarding status and level of student's grade. In these models, we standardized the scores for all continuous outcome variables. Overall, the regression results show that living at school has positive influences on rural children's word recognition. Maternal migration, but not paternal migration, has negative influences on word recognition scores. This probably indicates that mothers' presence at home has a more important influence on word development than does fathers' presence. The interaction term between boarding and mother migration status shows only a slightly significant effect, which indicates that positive influences of boarding on word score are suppressed when mothers are migrating. Among the control variables, girls have a lower word recognition score than do boys. Grade level has a positive effect on word score, which is expected as children will accumulate more knowledge when they move to upper grades. In addition, the results show that early enrollment has a harmful effect on students' word score. At the household level, paternal education has a positive influence on word score, but not maternal education or the occupation prestige index. In addition, sibship size has negative influences on word score.

For math score, students' boarding status displays a positive effect. Living at school increases math score by 0.131 standardized points in the fixed effects model. However, dissimilar to the results for word recognition, maternal migration status shows a positive effect on math scores. We also classified three types of migration status for left-behind students (only father migrated, only mother migrated, both parents migrated), and found that students with only mother migration or both parents migration do not significantly differ from nonmigration students in math score (results not shown). In addition, the interaction term of parental migration and boarding status did not show a significant effect. Among the control variables, different from word score, there are no significant gender differentials on math score. The grade level shows a positive influence, which is also expected because math skills should improve with increased grade. In addition, the results show that early enrollment has a harmful impact on students' math score. Among the household-level factors, paternal occupation prestige index has positive beneficial influences on math score. The family learning environment is beneficial to students' word recognition and math skills. The models also explain 44 percent of the variance for word recognition and nearly 60 percent for math skills.

[Table 2 is about here]

Table 3 presents the logistic or linear regression results for physical health and depression scores. Similar to academic skill, the first column under each health outcome variable is the naïve model and Models 2 and 3 are fixed effects models. Models 1 to 3 show the logistic regression results for illness in the past month. The baseline model shows that living at school increases the likelihood of being ill in the past month by almost 45 percent. However, when including household-level control and province dummies, the effect turns insignificant. Maternal migration status shows a positive effect on child illness in the past month, but the interaction term between

boarding and maternal migration status is insignificant. Among the control variables, higher paternal education and paternal occupation prestige could decrease the likelihood of child illness, but not maternal education and occupation.

Models 4 to 6 present the logistic regression results for the malnutrition status and demonstrate that students who are boarding tend to have a normal body mass index. This probably is due to the more regular eating habits at schools. The results are robust in the fixed effects model. Among the control variables, girls are healthier than boys, and level of grades has a positive effect on body shape. In addition, the results show that early enrollment has a harmful effect on health.

Models 7 to 9 present linear regression results for the depressive mood index. Model 7 is the OLS naïve model, and Models 8 and 9 show the results for fixed effects models. Boarders' depression score is 0.183 standardized points higher than that of nonboarders. The naïve model shows that father's migration causes children to have a higher level of depressive mood, the significance is at only the .1 level and exists in the OLS model only. None of interactions between boarding status and parental migration status are significant among these three health outcome variables. Among the control variables, we find maternal education increases students' depressive mood. This seems to be surprising. But as less than 3 percent of rural mothers have greater than a middle school education, we are unable to further investigate the finding. In addition, sibship size has a negative impact on mental health.

[Table 3 is about here]

To summarize, according to the regression models, living at school is beneficial to students' academic skills including word recognition and math scores. This shows that boarding might bestow positive consequences on children in rural China. However, the regression results also show that boarding is harmful to students' physical health and mental health, as shown in the results for the incidence of illness and depression score, although nutrition status seems to be normal or even beneficial among boarders. The influences of parental migration are not consistent across the models and displayed relatively few significant influences on children's well-being.

Propensity Score Matching Analyses

Although the boarding system is largely a collective education arrangement in rural China and boarders are not selected based on their intelligence, behaviors, or family background, there remain possibilities that boarders are different from nonboarders. The fixed effects model above controlled for only provincial-level factors. The location of home village, parental migration, and parental education level as well as family situation are some factors that might affect being boarders or not. As a result, we use the PSM method to control for potential systematic differences between boarders and nonboarders. In this framework, students who live at schools are the treated group and those who live at home are the control group. Using logistic regression model (not shown), we predicted the conditional probability of receiving the treatment given the observed covariates (Rosenbaum 2002). Then we summarized the differences between the two groups in propensity scores of being boarders. Figure 1 shows the probability density of the propensity scores for both the treatment and control groups. Specifically, the solid line indicates the treatment group and the dotted line refers to the control group. As expected, the distribution

of the propensity score for those living at school shifted somewhat toward 1 and for those living at home toward 0.

[Figure 1 is about here]

In the second step, we used the samples that were matched to balance propensity scores to estimate the treatment effect on the treated (ATT). We used a stratification matching method. Based on the estimated propensity score, respondents were divided into seven strata, excluding respondents who dropped out because of imbalance. After the stratification matching, the two groups had no systematic differences in propensity scores or observed covariates within each stratum. Thus, we can define the differences observed in outcome variables between the treatment and control groups as the average treatment effect in this stratum. Using equations (4) and (5), we finally get the ATT of all strata.

Table 4 presents the results of five ATTs for the five outcome variables, which are shown in the fourth column of the table and are equal to the distance of the second and the third columns. All differences are significant, showing that the consequences of boarding at schools on students' well-being are probably causal. Moreover, the results are largely similar to the regression results, although mathematical skills and illness are only marginally significant. The similarity indicates a small bias due to the observed confounders, and the propensity score results verify that sending children to boarding schools might have a true effect on children's outcomes. That is, boarding promotes children's academic performance and is beneficial to their body shape but detrimental to their health.

[Table 4 is about here]

As a sensitivity analysis, we reestimated the treatment effects for the treated with a trimming strategy (Guo and Fraser 2009). We performed the trimming because the potential for matches at the two ends of Figure 1 may be sparse even for matched cases, which means the estimation of treatment effects for the treated is not efficient. To deal with this problem and make the results more robust, Crump et al. (2009) developed a trimming strategy for the proportion of participants. After this trimming, findings shown in Table 5 are quite consistent with those for the full sample in Table 4. In other words, the treatment effects for the treated are robust to trimming specifications.

[Table 5 is about here]

However, the causal relationship between boarding and consequences for students could be biased since PSM takes into consideration only the observed differences between boarders and nonboarders. There are potential biases that might occur due to unobserved selection bias. For instance, outcome variables such as academic skills and health status prior to boarding could be a potential source of unobserved selection bias, which could affect the present outcomes. Unfortunately, we do not have information about their prior information in this data set. Indeed, the Rosenbaum sensitivity check (Rosenbaum 2002) shows that the robustness of the estimation could be sensitive to potentially hidden bias. We identify this as a limitation to our study.

Conclusion

In this article, using CFPS 2010 data, we have examined the consequences of living at school for children ages ten to fifteen in rural China from multiple dimensions through three distinguished methods. We summarize our results in Table 6. As shown in the second column, a direct comparison of average scores would overestimate or underestimate the differences between

boarders and nonboarders. The confounding factors must be considered. In the fixed effects model, we examine the education policy differentials at the provincial level, and the results show that boarding children is beneficial to students' academic skills but harmful to students' health. We also used PSM to control for the potential selection bias of being boarders for rural students and found that the biases are rather minimal in our case, which is consistent with our expectations. In rural China, being a boarder is largely determined by grade level and geographic differentials. The latter is mainly caused by the regional differences in education arrangements and school merging programs. As a result, our findings are generally robust but may differ from those in Western settings.

[Table 6 is about here]

More specifically, our study showed that boarding at schools is beneficial to children's word recognition and math skills. This result remained especially robust for word recognition after we removed the observed bias. This is consistent with the "longer exposure to school environment" and "reversible relocation" interpretations (Fisher, Frazer, and Murray 1984), which posit that boarding at schools can improve students' learning. Indeed, boarding students in China often spend a great deal of time in the classroom, and their time spent on homework can be guaranteed. Academic exchanges among boarding students also are easy. Temporary discontinuity with the home environment may release tension and provide a basis for further cognitive activities as the boarders try to get adapted to the new environment (Mandler 1982). In rural China, parents mostly have minimal education and have limited ability and time to invest in their children's academics. Their supervision of students' academic learning is insufficient. Indeed, the majority of parents in rural China have only a primary education. As a result, living

at schools compensates for the weak academic supervision from parents. It is easier for them to receive direct supervision from teachers as well as help from their peers.

However, the benefits are only one side of story. When looking at health status, the results showed that children who are living at school are about 40 percent more likely to be sick in the past month. They may not be able to care for themselves sufficiently, and life teachers often lack experience or are too busy to take care for all the children (Yue et al. 2012). In fact, many schools completely lack life teachers, so room teachers playing both roles. Our field trip to Hunan and Shaanxi provinces confirms this point. Unfortunately, we do not have this variable in our data set, although it has been mentioned in previous studies (e.g., Yue et al. 2012). The hygienic conditions are often poor in rural schools and living conditions are shabby. However, not all of school life is bad for children's health. This study also finds that students who live at school are less likely to be overweight or underweight, which might be due to their more regular eating and sleeping habits.

Finally, we also find that living at school is harmful to students' mental health. Detachment from home and the single daily socialization environment might be the causes of higher depression scores among boarding students. Another possible reason is that many rural kids are left behind by migrant parents. To examine whether parental migration is a cause of children living at school, we included parental migration status in the conditional probability model for predicting the propensity score of living at school and did not find a significant effect on children's boarding status. Thus, we can conclude that parental migration is not a major cause of living at school in rural China, and thus parental migration is not a cause of higher depression scores among boarding children. We also examined whether parental migration enlarges or moderates the effect of boarding at school on child well-being and did not find any such effect.

Discussion

In summary, this study has made contributions to the study of boarding schools in the following ways. First, this study examined boarding outcomes from many different dimensions, which is beyond the single outcomes examined in much previous research. We found that boarding can be both beneficial and harmful, depending on what outcomes are concerned. More specifically, we showed that living at school is beneficial to children's academic development but harmful to their health. As a result, when evaluating whether boarding is good or harmful, one should examine it from different perspectives. This has important theoretical meanings and policy implications for future understanding of sending children to boarding schools. Theoretically, when examining the existing theory or mechanisms of boarding, the interpretation of a particular mechanism might not apply to every dimension of student outcomes. For instance, the detachment perspective may play a very weak role when interpreting the academic outcomes because other mechanisms, such as "longer exposure to learning" and "reversible relocation," can play a stronger role in students' learning outcomes. It can offset the negative consequences caused by the detachment from the family. Detachment's influence might play a more important role in psychological well-being. However, we do not have more specific measures for testing each specific mechanism. This shortcoming provides some direction for future research to examine which mechanisms play more important roles. In practice, it is also important to know that boarding might have different consequences for different aspects of students, so that policy can be applied to enhance the beneficial aspects of boarding but buffer the harmful effects through education policy. For instance, schools can encourage more cooperation with family on promoting students' psychological well-being via encouraging parents or guardians to visit and

participate in children's activities at schools more regularly, so their feeling of separation from their home environment can be reduced.

Second, this study also showed that the consequences of sending children to boarding schools in rural China's case are different from those in the West, mainly because of the selection process for boarding children in rural China. Boarding children are selected not by their family wealth, problem behaviors, or lack of caregivers at home. Instead, they are determined mainly by the distance from their home to the centralized schools as well as the local education policy. As a result, rural China provided for a more objective evaluation of boarding consequences on children. This also reminds scholars that boarding outcomes vary across culture and context and should always be considered within their context and the selection process of boarding should be taken into consideration.

In addition, we showed that boarding may not necessarily be more beneficial to children from migrating families than children from nonmigrant families, as children from migrating families demonstrated no significant difference. Boarders are also not selected by parental migration status. In reality, boarding provided more obstacles for children from migrating parent families, which is partly due to the fast school merging programs in rural China. For instance, in our visits to rural Hunan and Shaanxi provinces, we saw that boarders from migrating family have an even more difficult situation due to hardships in accessing schools. In particular, grandparents or other caregivers found it difficult to send students to schools in distant places due to the struggle to obtain safe transportation for the children. In addition, the centralization of most local schools in the major administrative villages created problems for the children. For instance, in our data

fifty-three students (about 9 percent of all living-at-home students) have to walk more than one hour to school. The other important reason is the extra fee for boarding children at schools. Although rural students in China do not have to pay for tuition or for textbooks, and some poor students receive subsidies for lodging expenses, the fees for boarding still created extra burden for many rural parents. Thus, the consequences of boarding may also be examined from families' perspective, in addition to consideration of the overall quality of the education system. In future research, this could be incorporated if appropriate data were available.

Some limitations to this study warrant mentioning. First, although our study showed that the consequences of boarding at schools vary for different outcome variables, the specific mechanisms are largely speculative. For example, we do not have information on how detached the parents and children are in our sample. We also have no information about schools' dormitory conditions. That is, the school environment is also very important, but we do not have information about that in our data. Second, although we used PSM to remove observed selection bias, our results may still be sensitive to unobserved bias. The results would be more reliable if we had information about students' life, academic performance, health, and parent-child relationship before boarding. However, we believe most selection bias has been controlled, and the unobserved selection bias is negligible under China's school merging program. The results are largely robust and in general reflect the situation in rural China. In addition, we also warn that our conclusions may not be applied to some specific areas, since the consequences are not necessarily uniform across the whole nation. Third, under the context of school merging in rural China, we believe that the consequences could also vary by time. It will be interesting to observe

the long-term consequences of the boarding school program through longitudinal data in the future.

References

Adams, D. W. (2006). Beyond bleakness: The brighter side of Indian boarding schools, 1870–1940. In C. E. Trafzer, J. A. Keller, & L. Sisquoc (Eds.), *Boarding school blues: Revisiting American Indian educational experiences* (pp. 35–64). Lincoln: University of Nebraska Press.

All-China Women's Federation. (2013). China left-behind and migrant children study report [in Chinese]. http://acwf.people.com.cn/n/2013/0510/c99013-21437965.html.

Association of Boarding Schools. (2004). The truth about boarding schools. http://www.tabs.org/thetruth/truth2.html.

Bar-Nir, D., & Schmid, H. (1998). Psychosocial treatment and relations between children in residential boarding schools and their parents. *Child and Family Social Work*, 3, 247–258.

Becker, S. O., & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *Stata Journal*, 2, 358–377.

Bronfenbrenner, U. (1970). Reaction to social pressure from adults versus peers among Soviet day school and boarding school pupils in the perspective of an American sample. *Journal of Personality and Social Psychology*, 15, 179.

Cameron, A. C., & Miller, D. L. (forthcoming). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*.

Chase, S. A. (2008). *Perfectly prep: Gender extremes at a new England prep school*. New York: Oxford University Press.

China's National Bureau of Statistics. (2011). Communiqué of the National Bureau of Statistics of People's Republic of China on major figures of the 2010 population census (No. 1). http://www.stats.gov.cn/english/NewsEvents/201104/t20110428_26449.html.

China's State Council. (2001). Resolution about the transformation and development of basic education [in Chinese]. http://www.edu.cn/20010907/3000665.shtml.

Colmant, S., Schultz, L., Robbins, R., Ciali, P., Dorton, J., & Rivera-Colmant, Y. (2004). Constructing meaning to the Indian boarding school experience. *Journal of American Indian Education*, 43, 22–40.

Cookson, P. W., Jr. (2009). Boarding schools. In R. A. Shweder (Ed.), *The child: An encyclopedic companion* (pp. 112–114). Chicago: University of Chicago Press.

Crump, R. K., Hotz, V. J., Imbens, G. W., & Mitnik, O. A. (2009). Dealing with limited overlap in estimation of average treatment effects. *Biometrika*, 96, 187–199.

Datnow, A., & Cooper, R. (1997). Peer networks of African American students in independent schools: Affirming academic success and racial identity. *Journal of Negro Education*, 66, 56–72.

Dishion, T. J., McCord, J., & Poulin, F. (1999). When interventions harm: Peer groups and problem behavior. *American Psychologist*, 54, 755.

Dong, S. (2014). The history, development and reflection of boarding school in rural China [in Chinese]. *Forum on Contemporary Education*, 259, 11–20.

Fisher, S., Frazer, N., & Murray, K. (1984). The transition from home to boarding school: A diary-style analysis of the problems and worries of boarding school pupils. *Journal of Environmental Psychology*, 4, 211–221.

Ganzeboom, H. B., De Graaf, P. M., & Treiman, D. J. (1992). A standard international socio-economic index of occupational status. *Social Science Research*, 21(1), 1–56.

Ginsburg, C., Richter, L. M., Fleisch, B., & Norris, S. A. (2011). An analysis of associations

between residential and school mobility and educational outcomes in South African urban children: The birth to twenty cohort. *International Journal of Educational Development*, 31, 213–222.
Granot, D., & Mayseless, O. (2001). Attachment security and adjustment to school in middle childhood. *International Journal of Behavioral Development*, 25, 530–541.
Guo, S., & Fraser, M. W. (2009). *Propensity score analysis: Statistical methods and applications.* Thousand Oaks, CA: Sage.
Hannum, E. (2002). Educational stratification by ethnicity in China: Enrollment and attainment in the early reform years. *Demography*, 39, 95–117.
Hauser, S. M., & Xie, Y. (2005). Temporal and regional variation in earnings inequality: Urban China in transition between 1988 and 1995. *Social Science Research*, 34, 44–79.
Imbens, G., & Rubin, D. B. (2014). *Causal inference*. Cambridge: Cambridge University Press.
Kadushin, A. (1967). *Child welfare services*. New York: Macmillan.
Kashti, Y. (1988). Boarding schools and changes in society and culture: Perspectives derived from a comparative case study research. *Comparative Education*, 24, 351–364.
Kerns, K. A. (2008). *Attachment in middle childhood*. New York: Guilford Press.
Laible, D. J., Carlo, G., & Raffaelli, M. (2000). The differential relations of parent and peer attachment to adolescent adjustment. *Journal of Youth and Adolescence*, 29, 45–59.
Lee, B., & Barth, R. P. (2009). Residential education: An emerging resource for improving educational outcomes for youth in foster care? *Children and Youth Services Review*, 31, 155–160.
Little, M., Kohm, A., & Thompson, R. (2005). The impact of residential placement on child development: Research and policy implications. *International Journal of Social Welfare*, 14, 200–209.
Liu, C., Zhang, L., Luo, R., Rozelle, S., & Loyalka, P. (2010). The effect of primary school mergers on academic performance of students in rural China. *International Journal of Educational Development*, 30, 570–585.
Luo, R., Shi, Y., Zhang, L., Liu, C., Rozelle, S., & Sharbono, B. (2009). Malnutrition in China's rural boarding schools: The case of primary schools in Shaanxi province. *Asia Pacific Journal of Education*, 29, 481–501.
Luo, R., Shi, Y., Zhang, L., Liu, C., Rozelle, S., Sharbono, B., Yue, A., Zhao, Q., & Martorell, R. (2012). Nutrition and educational performance in rural China's elementary schools: Results of a randomized control trial in Shaanxi province. *Economic Development and Cultural Change*, 60, 735–772.
Mandler, G. (1982). *Mind and emotion*. New York: RE Krieger.
Martin, A. J., Papworth, B., Ginns, P., & Liem, G. A. D. (forthcoming). Boarding school, academic motivation and engagement, and psychological well-being: A large-scale investigation. *American Educational Research Journal*.
Mo, D., Yi, H., Zhang, L., Shi, Y., Rozelle, S., & Medina, A. (2011). Transfer paths and academic performance: The primary school merger program in China. *LICOS Discussion Paper*.
Moswela, B. (2006). Boarding schools as perpetrators of students' behaviour problems. *Journal of Social Science*, 13, 37–41.
Pang, L.-J., & Han, X.-Y. (2005). The adjustment of the distribution of elementary and secondary schools in rural areas: Problems, reasons and the strategies [in Chinese]. *Subject Education*, 4, 15.

Parsons, T. (2007). The school class as a social system. In J. H. Ballantine, & J. Z. Spade (Eds.), *School and society: A sociological approach to education* (3rd ed.) (pp. 80–85). Thousand Oaks, CA: Sage.
Rogers, W. (1994). Regression standard errors in clustered samples. *Stata Technical Bulletin*, 3, 19-23.
Rosenbaum, P. R. (2002). *Observational studies* (2nd ed.). New York: Springer.
Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70, 41–55.
Rosenbaum, P. R., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, 79, 516–524.
Rubin, D. B. (2007). The design versus the analysis of observational studies for causal effects: Parallels with the design of randomized trials. *Statistics in Medicine*, 26, 20–36.
Said, B., Wright, F., Nichols, G. L., Reacher, M., & Rutter, M. (2003). Outbreaks of infectious disease associated with private drinking water supplies in England and Wales 1970–2000. *Epidemiology and Infection*, 130, 469–479.
Scott, D., & Langhorne, A. (2012). Believing in native girls: Characteristics from a baseline assessment. *American Indian and Alaska Native Mental Health Research: Journal of the National Center*, 19, 15–36.
Simmons, J., & Alexander, L. (1978). The determinants of school achievement in developing countries: A review of the research. *Economic Development and Cultural Change*, 26, 341–357.
Tsang, M. C. (2000). Education and national development in China since 1949: Oscillating policies and enduring dilemmas. *China Review*, 10, 579–618.
Tsui, K.-Y. (1997). Economic reform and attainment in basic education in China. *China Quarterly*, 149, 104–127.
Wang, X., Liu, C., Zhang, L., Luo, R., Glauben, T., Shi, Y., Rozelle, S., & Sharbono, B. (2011). What is keeping the poor out of college? Enrollment rates, educational barriers and college matriculation in China. *China Agricultural Economic Review*, 3, 131–149.
Wei, X., Tsang, M. C., Xu, W., & Chen, L.-K. (1999). Education and earnings in rural China. *Education Economics*, 7, 167–187.
Whittaker, J. K. (2004). The re-invention of residential treatment: An agenda for research and practice. *Child and Adolescent Psychiatric Clinics of North America*, 13, 267–278.
World Health Organization. (2007). WHO global school-based student health survey questionnaire. http://www.who.int/growthref/en/.
Wu, X. (2010). Economic transition, school expansion and educational inequality in China, 1990–2000. *Research in Social Stratification and Mobility*, 28, 91–108.
Xie, Y., & Hannum, E. (1996). Regional variation in earnings inequality in reform-era urban China. *American Journal of Sociology*, 101, 950–992.
Xiong, C. (2009). The new trend of rural education since 1990s in China. *Chinese Sociological Review*, 5, 110–140.
Ye, J., & Pan, L. (2008). The policy analysis of rural boarding schools [in Chinese]. *Journal of China Education*, 2, 1–5.
Yue, A., Shi, Y., Chang, F., Yang, C., Wang, H., Yi, H., …Roselle, S. (2012). Dormitory management and boarding students in China's rural elementary schools. *REAP Working Paper* No. 242.

Table 1. Differences in Skills and Health

	N	Min	Max	Mean	Living at school	Living at home	Diff.
Word identification score	2,046	0	34	20.75	23.80	19.53	4.27***
Mathematic score	2,046	0	24	10.68	13.13	9.69	3.44***
Illness last month (%)	2,044	0	100	20.11	23.93	18.57	5.36**
Malnutrition status (%)	1,855	0	100	34.12	25.61	37.54	–11.93**
Depression score	2,020	0	24	3.12	3.47	2.97	0.50

Note: The last column reports differences between column 6 and column 7.

**$p < .01$. ***$p < .001$.

Table 2. Regression Models for Word Identification and Mathematics Scores

Dependent variables	Word score			Math score		
	(1)	(2)	(3)	(4)	(5)	(6)
Living at school (at home = 0)	0.081†	0.095*	0.590***	0.119***	0.131**	0.099
	(0.043)	(0.040)	(0.120)	(0.034)	(0.038)	(0.122)
Father migrate (no = 0)	0.042	0.030	–0.007	–0.070†	–0.066	–0.075
	(0.049)	(0.039)	(0.043)	(0.039)	(0.047)	(0.054)
Mother migrate (no = 0)	–0.117†	–0.135**	–0.082	0.110*	0.119*	0.114*
	(0.062)	(0.037)	(0.056)	(0.050)	(0.045)	(0.052)
Living at school × father migrate			0.126			0.033
			(0.081)			(0.068)
Living at school × mother migrate			–0.180†			0.022
			(0.100)			(0.087)
Living at school × grade			–0.079***			0.004
			(0.017)			(0.020)
Individual characteristics						
Gender (girl = 0)	–0.175***	–0.189***	–0.194***	0.028	0.023	0.023
	(0.036)	(0.042)	(0.043)	(0.029)	(0.032)	(0.032)
Grade	0.306***	0.287***	0.306***	0.406***	0.397***	0.396***
	(0.011)	(0.012)	(0.011)	(0.009)	(0.011)	(0.010)
Enrollment into education (normal = 0)						
Early enrollment	–0.138†	–0.154*	–0.142*	–0.171**	–0.179**	–0.179**
	(0.077)	(0.063)	(0.064)	(0.062)	(0.056)	(0.055)
Late enrollment	–0.141**	–0.022	–0.026	–0.061†	0.000	0.000
	(0.044)	(0.043)	(0.043)	(0.035)	(0.068)	(0.068)

Table 2 (continued).

Dependent variables	Word score			Math score		
	(1)	(2)	(3)	(4)	(5)	(6)
Household characteristics						
Paternal educational years		0.016*	0.016*		0.003	0.003
		(0.006)	(0.006)		(0.005)	(0.005)
Maternal educational years		0.002	0.002		0.004	0.004
		(0.006)	(0.006)		(0.005)	(0.005)
Paternal occupational ISEI		0.005	0.005		0.004**	0.004**
		(0.003)	(0.003)		(0.001)	(0.001)
Maternal occupational ISEI		0.003	0.003		–0.001	–0.001
		(0.002)	(0.002)		(0.002)	(0.002)
Household yearly income per capita (log)		0.002	–0.000		0.012	0.012
		(0.028)	(0.028)		(0.026)	(0.026)
Sibship size		–0.086***	–0.084***		–0.042	–0.043
		(0.020)	(0.020)		(0.027)	(0.027)
Other outcome-related factors						
Family learning environment assessment		0.121**	0.122**		0.081**	0.081**
		(0.036)	(0.036)		(0.024)	(0.024)
Province dummies	NO	YES	YES	NO	YES	YES
Constant	–1.605***	–2.117***	–2.219***	–	–	–
	(0.068)	(0.318)	(0.319)	(0.055)	(0.241)	(0.247)
Observations	2,016	2,016	2,016	2,016	2,016	2,016
Adjusted *R*-squared	.360	.439	.442	.587	.600	.599

Note: All columns are linear regression models, with standardized word identification score and standardized mathematics score as dependent variables in the first three models and the next three models separately. Standard errors are adjusted for the clustering effect at the province level and are reported in parentheses.

$^{\dagger}p < .1$. $*p < .05$. $**p < .01$. $***p < .001$.

Table 3. Regression Models for Three Health Indexes

Dependent variables	Illness last month			Malnutrition status			Depression score		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Living at school (at home = 0)	1.439**	1.271	1.248	0.740*	0.697***	0.690**	0.125*	0.183*	0.214*
	(0.194)	(0.195)	(0.203)	(0.093)	(0.074)	(0.083)	(0.054)	(0.071)	(0.077)
Father migrate (no = 0)	1.168	1.102	1.014	1.047	1.046	1.084	0.103†	0.082	0.103
	(0.178)	(0.177)	(0.263)	(0.144)	(0.222)	(0.257)	(0.061)	(0.072)	(0.074)
Mother migrate (no = 0)	1.438†	1.500*	1.659*	0.903	0.946	0.869	0.072	0.038	0.078
	(0.270)	(0.306)	(0.363)	(0.161)	(0.215)	(0.196)	(0.079)	(0.072)	(0.070)
Living at school × father migrate			1.322			0.870			–0.077
			(0.583)			(0.254)			(0.163)
Living at school × mother migrate			0.695			1.463			–0.157
			(0.480)			(0.738)			(0.161)
Individual characteristics									
Gender (girl = 0)	0.915	0.922	0.925	1.196†	1.217*	1.212†	–0.017	0.025	0.026
	(0.105)	(0.151)	(0.150)	(0.120)	(0.122)	(0.121)	(0.045)	(0.036)	(0.036)
Grade	0.990	1.032	1.033	0.831***	0.832***	0.831***	–0.001	–0.004	–0.004
	(0.036)	(0.034)	(0.033)	(0.026)	(0.041)	(0.041)	(0.014)	(0.012)	(0.012)
Enrollment into education (normal = 0)									
Early enrollment	0.972	1.159	1.161	1.655*	1.665*	1.667*	0.044	0.059	0.058
	(0.245)	(0.406)	(0.409)	(0.345)	(0.355)	(0.359)	(0.097)	(0.094)	(0.092)
Late enrollment	1.270†	1.148	1.144	1.043	1.034	1.037	0.079	–0.018	–0.019
	(0.175)	(0.129)	(0.133)	(0.128)	(0.157)	(0.158)	(0.056)	(0.049)	(0.047)
Household characteristics									
Paternal educational years		0.953**	0.954**		0.994	0.993		–0.008	–0.008
		(0.015)	(0.015)		(0.015)	(0.015)		(0.007)	(0.007)
Maternal educational years		0.984	0.985		1.000	1.000		0.012*	0.013*
		(0.019)	(0.019)		(0.018)	(0.018)		(0.005)	(0.005)

Table 3 (continued).

Dependent variables	Illness last month				Malnutrition status			Depression score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Paternal occupational ISEI		1.014†	1.014†		0.996	0.996		0.002	0.002
		(0.008)	(0.008)		(0.006)	(0.006)		(0.003)	(0.003)
Maternal occupational ISEI		0.989	0.989		0.991	0.990		0.001	0.001
		(0.013)	(0.013)		(0.008)	(0.008)		(0.003)	(0.003)
Household yearly income per capita (log)		0.867	0.864		0.961	0.963		–0.044	–0.045
		(0.113)	(0.117)		(0.099)	(0.101)		(0.050)	(0.050)
Sibship size		1.065	1.064		1.020	1.022		0.094**	0.094**
		(0.044)	(0.043)		(0.047)	(0.047)		(0.028)	(0.028)
Other outcome-related factors									
Went to hospital for treatment last year		3.684***	3.696***						
		(0.438)	(0.439)						
Birth weight					0.903	0.905			
					(0.061)	(0.060)			
Province dummies	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	0.213***	0.780	0.790	1.363	28.441***	27.904***	–0.074	–0.270	–0.270
	(0.047)	(1.063)	(1.094)	(0.259)	(25.477)	(25.584)	(0.087)	(0.451)	(0.446)
Observations	1,949	1,949	1,949	1,833	1,833	1,833	1,991	1,991	1,991
Adjusted *R*-squared	–959.3	–871.7	–871.2	–1141	–1123	–1123	.003	.035	.035

Note: Columns 1 to 6 are logit models, so they report odds ratios. Columns 7 to 9 are linear regression models, with standardized depression score as the dependent variable. In all models, standard errors are adjusted for the clustering effect at the province level and are reported in parentheses. Individual controls, household controls, and province dummies are the same as described in Table 2.

†$p < .1$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 4. Average Treatment Effect of Living at School on Different Outcomes

Outcome	Living at school (T)	Living at home (C)	Average treatment effect	*N* (T)	*N* (C)	Common support (%)
Word identification score	0.420	0.304	0.116*	574	1,433	99.5
Mathematics score	0.548	0.461	0.087†	574	1,433	99.5
Illness last month (%)	0.243	0.192	0.051†	573	1,431	99.3
Malnutrition status (%)	0.253	0.325	–0.072*	521	1,304	90.4
Depression score	0.082	–0.094	0.177***	571	1,411	98.2

Note: The word identification score, mathematics score, and depression score are all standardized. There are 2,018 samples used in propensity analyses because we discarded some cases to ensure that the variables in the logistic selection model contain no missing values.

$^{\dagger}p < .1$. *$p < .05$. ***$p < .001$.

Table 5. Average Treatment Effect of Living at School on Different Outcomes (Selected Samples)

Outcome	Living at school (T)	Living at home (C)	Average treatment effect	*N* (T)	*N* (C)	Common support (%)
Word identification score	0.436	0.326	0.110*	542	940	73.4
Mathematics score	0.563	0.505	0.059	542	940	73.4
Illness last month (%)	0.255	0.196	0.059*	541	950	73.9
Malnutrition status (%)	0.256	0.315	–0.059*	493	873	67.7
Depression score	0.075	–0.094	0.169**	539	940	73.3

Note: The word identification score, mathematics score, and depression score are all standardized. Implementing the trimming strategy by Crump et al. (2009), we discard all observations with estimated propensity scores outside the rage [0.091, 0.909]. After the trimming, there are 1,494 selected cases remaining in these propensity analyses.

*$p < .05$. **$p < .01$.

Table 6. Comparisons of the Estimated Living-at-School Impacts by Different Methods

Outcome	Crude difference	Regression estimate	Propensity score analyses	
			Full sample	Selected sample
Word identification score	0.578***	0.095*	0.116*	0.110*
Mathematics score	0.767***	0.131**	0.087†	0.059
Illness last month (OR)	1.379**	1.271	1.350†	1.404*
Malnutrition status (OR)	0.573**	0.697***	0.704*	0.748*
Depression score	0.116	0.183*	0.177**	0.169**

Note: 1. The word identification score, mathematics score, and depression score are all standardized, so their crude differences in column 2 are not the same as in Table 1. For the two binary outcome variables, the table reports the odds ratio of the event.

$^{\dagger}p < .1$. *$p < .05$. **$p < .01$. ***$p < .001$.

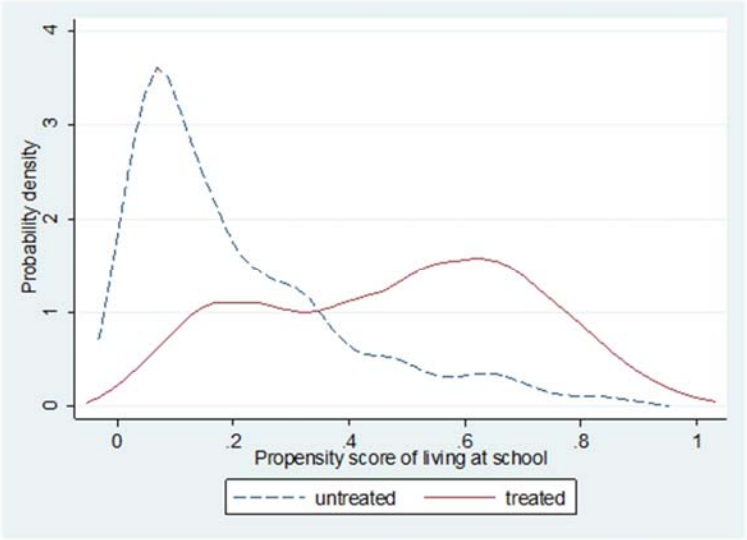

Figure 1. Probability Density Functions of the Propensity Score for the Two Groups

Appendix Table 1. Detailed Description of Dependent and Independent Variables

Variable	Information
Academic skills	
Word identification score	Collected from a literacy test. One point for reading one word right. The result is a continuous score, range = 0–34. Standardized score ranging from –2.81 to 1.80 is used in the models.
Mathematics score	Collected from a numeracy test. One point for each correctly answered question. The result is a continuous score, range = 0–24. Standardized score ranging from –2.38 to 2.97 is used in the models.
Health	
Illness last month	A binary variable, "at least ill once" = 1, "not ill" = 0.
Malnutrition status	A binary variable, "thin or overweight" = 1, "normal" = 0. Thinness and overweight were defined according to BMI for age for children 5–19 years old. Specifically, with <–1 *SD* of BMI for age *Z* scores for thinness, and with >2 *SD* of BMI for age *Z* scores for overweight (World Health Organization 2007).
Depression score	Indicates the frequency of six items regarding depressive mood. For each item, the frequency, from "none" to "almost every day," is rated from 1 to 5 points, separately. We summed the points for the six items to get the overall score, range = 0–24. Standardized scores ranged from –0.75 to 5.30 and were used in the models.
Independent variables	
Living at school or not	A binary variable, "living at school" = 1, "living at home" = 0.
Control variables	
Father migrate	A binary variable, yes = 1, no = 0.
Mother migrate	A binary variable, yes = 1, no = 0.
Individual characteristics	Includes gender, grade, and whether enrollment into education was normal, early, or late.
Household characteristics	Includes parental and maternal education, parental and maternal occupational ISEI (International Socio-Economic Index), household yearly income per capita, and child sibship size.
Province dummies	Includes 23 dummies, since 24 provinces were surveyed in our data.
Outcome-related variables	Includes two continuous variables, interviewer's assessment of the family learning environment (1–5 points) and child birth weight (in Jin); a binary variable reports whether the child went to the hospital for treatment in the last year.

Appendix Table 2. Descriptive Statistics for Differences for Independent and Control Variables

	Observations	Living at school	Living at home	Diff.	Sig.
Living at school or not	2,049				
Living at school	587 (28.65%)				
Living at home	1,462 (71.35%)				
Parental migration status					
Father migrate (%)	2,040				*ns*
No		80.99	78.98	2.01	
Yes		19.01	21.02	–2.01	
Mother migrate (%)	2,028				*ns*
No		89.95	88.56	1.39	
Yes		10.05	11.44	–1.39	
Individual demographic characteristics					
Gender (%)	2,049				*ns*
Girl		49.91	50.41	–0.50	
Boy		50.09	49.59	0.50	
Grade (1–9)	2,049	5.74	5.16	0.58	*
Enrollment into education (%)	2,049				***
Normal enrollment		74.79	68.33	6.46	
Early enrollment		9.2	4.72	4.48	
Late enrollment		16.01	26.95	–10.94	
Household characteristics					
Paternal educational years	2,039	5.95	5.58	0.37	*ns*
Maternal educational years	2,039	3.94	3.75	0.19	*ns*
Paternal occupational ISEI	2,049	23.50	20.99	2.51	***
Maternal occupational ISEI	2,049	21.83	20.74	1.09	***
Household yearly income per capita	2,049	5627	5060	567	***
Sibship size	2,049	1.23	1.35	–0.12	*ns*
Contest variables					
Family learning environment	2,049	3.27	3.25	0.02	*ns*
Went to hospital last year (%)	2,002				*
No		54.58	60.74	–6.16	
Yes		45.42	39.26	6.16	
Birth weight	2,049	6.25	6.19	0.06	*ns*

Note: The penultimate column reports differences between column 3 and column 4. The last column reports significance levels of the difference.
*$p < .05$. ***$p < .001$. *ns* = not significant.