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by Yunli Bai, Yuhe Guo, Shaoping Li, Chengfang Liu, and Linxiu Zhang

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Abstract

The short-term effects of preschool education on children's cognitive and non-cognitive abilities have been widely concerned by scholars. However, there are relatively few studies on the long-term effects of preschool education. This paper examines the impact of pre-school access on post-compulsory school enrollment (senior high school, college, and undergraduate). The data used in this paper are from the fifth follow-up survey of China Rural Development Survey (CRDS), which was carried out in 100 villages of 2,000 households among 5 provinces in 2016 by Center for Chinese Agricultural Policy of Chinese Academy of Sciences. Based on household fixed effects model (FFE) and instrumental variable method (IV), the results show that children who have attending kindergarten or preschool education are 0.402 and 0.607 percentage point more likely than their peers to be enrolled in senior high school and academic senior high school, respectively. Rural children only attending kindergartens are 0.497 and 0.533 percentage points more likely to attending senior high school and academic senior high school, respectively. However, there is no effect of attending preschool on their enrollment in senior high school. Access to preschool education (kindergarten or preschool) significantly increased the likelihood of rural children attending college (0.312 percentage point) and university (1.645 percentage points). The results of heterogeneity analysis show that attending preschool or kindergarten significantly increased the likelihood of rural girls attending senior high school (1.645 percentage points) and academic senior high school (0.8 percentage point). Attendance at kindergartens significantly increases the likelihood of rural girls attending academic high schools (0.668 percentage point). The conclusion of this study further confirms the significance of investing in rural kindergarten education for improving rural human capital and promoting gender equality.

Keywords: preschool education, post-compulsory education, long-term impact
JEL Codes: J24, E24, I28

1. Introduction

A growing body of literature shows that the benefit of attending preschool is huge. Heckman et al. (2010a) and Conti et al. (2012) show that Perry Preschool Program significantly enhanced adult outcomes including education, employment, earnings, marriage, participation in healthy behaviors, and reduced participation in crime and welfare. Similar results have been found in Europe, Asia, and Africa (Kimmel, 1998; Lefebvre and Merrigan, 2008; Givord and Marbot, 2015; Song and Dong, 2018). Informed by these research findings, many countries have introduced subsidies for free or low-cost preschool.

Since 2010, China has made a big progress in preschool education. In the last decade, China has witnessed a substantial increase in the preschool enrollment rate, from 52% in 2010 to 85% in 2020. During the same time, more than 50 billion has been invested in preschool.

However, the evidence on whether preschool education make a difference for rural children is very scare in China. Using data from Guzhou Province, Rao et al. (2012) found that there is a positive effect of preschool on academic performance in grade one. Using PISA data from Shanghai, Chen and Liu (2017) found that there is also a positive effect of preschool education on academic performance for children aged 15. However, less is known about whether there is any effect of preschool education on post-compulsory school enrollment.

We contribute to this literature by studying impact of pre-school access on post-compulsory school enrollment (senior high school, college, and undergraduate). The data used in this paper are from the fifth follow-up survey of China Rural Development Survey (CRDS), which was carried out in 100 villages of 2,000 households among 5 provinces in 2016 by Center for Chinese Agricultural Policy of Chinese Academy of Sciences. Based on household fixed effects model (FFE) and instrumental

variable method (IV), the results show that children who have attending kindergarten or preschool education are 0.402 and 0.607 percentage point more likely than their peers to be enrolled in senior high school and academic senior high school, respectively.

The remainder of this paper is organized as follows. Section 2 review the literature. Sampling and data collection are described in Section 3. Section 4 presents the estimation results. Finally, we conclude in Section 5.

2. Literature review

2.1 Preschool education in China

The development of preschool education in China is dramatically. According to the statistics book of education, the preschool enrollment increased from 1713, 000 in 1965 to 22,441,800 in 2000, and drop to 16,882,300 in 2019 with the lowing birth rate. There are 175,836 preschools in 2000 and increased to 281,200 in 2019. The gross enrollment rate has been 83.4 percent in 2019 (MOE, 2000, 2019).

There are two types of preschool education in China, and they have different roles and goals in different periods. Before reform and opening up, preschool education was set up to provide social welfare and save mothers' time to engage into agricultural and non-agricultural work. During this period, preschool education was sponsored by five investors, including government, enterprise, city street office, township or village, and private. Preschool education was little support by government finances, especially in rural areas.

According to the Regulations of City Kindergartens issued in 1978, kindergartens was the main body to provide preschool education in cities and aimed to provide children aged 3 to 6 or 7 years

old with nutrition, cultivate their behavior habits, develop their basic movement ability, ensure their physical and mental health, promote early development of their intelligence (attention, observation, memory, imagination, thinking, especially the ability of oral language), and provide social emotion education and aesthetics perception. The length of schooling in kindergarten was usually three years.

Until to 1983, the preschool education in rural area was officially advocated to be supported by government and private sector. 1- year preschool education was advocated to develop in this stage. 1-year preschool education aimed to keep children's health, cultivate their good behavior, enlighten their interest in learning, and cultivate preliminary learning habits. In 1990s, the aim of 1- year preschool education was supplemented with preparing for entering primary school. In this stage, it was an important form of developing preschool education in rural areas but a supplementary to kindergartens in urban areas.

2.2 The long-term effect of preschool education on school enrollment

Plenty of studies have paid attention on the effects of attending preschool on long-term child outcomes, including health during childhood and adolescence, well-being, and behavior in adulthood (Baker et al., 2015; Havnes and Mogstad, 2011; Kühnle and Oberfichtner, 2017), test score, cognitive skill, or school grade during childhood and adolescence (Havnes and Mogstad, 2015; Blanden et al., 2016; Felfe and Lalive, 2010; Bietenbeck et al., 2017), being retained, having graduated or dropped out (Bastos et al. 2017; Borraz and Cid, 2013; Dumas and Lefranc, 2012; Felfe et al., 2015; Fitzpatrick, 2008), and years of schooling, highest grade completed and employment and earnings in labor market (Berlinski et al., 2008; Havnes and Mogstad, 2011, 2015; Bingley and Westerard-Nielsen, 2012; Haimovich Paz, 2015).

There are a few studies identifying the causal effects of attending preschool on the school enrollment in low- and high-income countries. Bastos et al. (2017) used the administrative and population census data from 1988 to 1996 with a difference-in-differences framework and found that the children having access preschool education were 3.0 percentage point more likely to be enrolled in primary school. Having access to preschool education benefited more to girls. Berlinski et al.(2008) exploited the data of Uruguayan for the years 2001-2005 to compare the effects of attending preschool 1-3 years and 0-1 years on the probability of school enrollment at age 15. They adopted average school attendance in the child's cohort in his locality of residence as instrument variable (IV) of attending preschool and found a significant positive effect of preschool attendance on completed years of primary and secondary education by decreasing in retention rates and dropout rates. The gains from attending preschool increased as children grow older, so that exposure to preschool education leads to gradually diverging paths in school attainment between treated and untreated children. Dumas and Lefranc (2012) used the data of DEPP panels during 1970s and 1980s in France and Formation, Qualification, Profession survey (FQP) in 1993 to assess the impact of the age of preschool participation on the probability of high school graduation. With the average age of entry in a given school for a given cohort as the instrument variable, they found that preschool have significant and lasting positive effects and helps children succeed in school. Harvnes and Mogstad (2011) employed difference-in-differences method to estimate the effect of subsidized child care on children's college enrollment with the data from Statistics Norway covering the entire resident population of Norway from 1967–2006. Their study found that subsidized child care increased the probability of attending college by almost 7 percentage point, and girls and children with low educated mothers benefit the most from child care.

Our study would make contribution to these studies from following aspects: First, to our knowledge, there is no study on this topic in China although the preschool developed dramatically in last century. Our study will provide the profile of preschool education and its long-term effect in China using the individual data covering half of a century, which further enrich the literature on this topic in middle income countries. Second, the data used in above studies need to be updated. In our study, the data was collected in 2016, which will update the trends of long-term effect of preschool education. Third, we focus on the long-term effect of attending preschool on school enrollment after compulsory education, including senior high school, college, and university. It is more valuable than those paying attention of the school enrollment in compulsory education which is enforced by the government. Fourth, we compare the long-term effects of attending two types of preschool (3 and 1 years preschool), which will enrich the literature and help to provide specific implication on policy making.

3. Methodology

3.1. Data

This study uses the dataset from the China Rural Development Survey (CRDS), which is a panel dataset collected by the Center for Chinese Agricultural Policy of the Chinese Academy of Sciences, covering 2000 households in 100 villages of 25 counties among 5 provinces in China. The survey takes advantage of a multi-stage stratified cluster sampling to obtain a nationally representative sample of 2000 households. The sampling procedures are as follows.

In the first round of the survey in 2005, each sample province was randomly selected from China's major agroecological zones. Finally, Jiangsu, Sichuan, Shaanxi, Jilin, and Hebei provinces were selected. Five sample counties were then selected from each province in a two-step procedure.

First, the enumeration team listed all the counties in each province in descending order of per capita gross value of industrial output, which is a good predictor of the standard of living and development potential and often more reliable than the net per capita income (Rozelle, 1996). Second, five counties in each province were selected from the resulting list using isometric random sampling method.

From each selected county, the team selected sample townships and villages. Two townships were selected from each county, comprising one from each of the two groups per county: a "more well-off" group and a "poorer" group. Following the same procedure, two villages per township were selected. Finally, the survey teams randomly selected 20 households from each village, among which 8 households were interviewed by questionnaire and 12 households were interviewed in the small group[1]. We conducted follow-up surveys in 2008, 2012, 2016, and 2019. All the households in theses follow-up surveys participated in the questionnaire survey. The information on last year of each wave was collected in each survey.

Especially, we investigated all family members, including any children who have gone to school in other cities or provinces and those who have separated from the original household. In other words, we have investigated the original family and their extended family members. More importantly, this survey tracks at least three generations for each household: the parents, their children, and their grandchildren. Please see the definition of three-generation and the national representation of sample in the paper of Dong et al. (2019). Because we analyze the long-term effect of preschool education on the school entrance after compulsory education, we only keep the

[1] Due to the village adjustment, there are 2 villages in the sample separated and 1 village is merged to another village. Finally, we conducted survey in 101 villages.

individuals who have finish their education.

We collected the personal characteristics of all household members, such as gender, years of schooling, and birth year. In the survey, we coded individuals and relationships in the household in a way which enabled us to keep track of the different generations conveniently. Since we were only concerned with information for the schooling years of the immediate family, this means that information for the daughter-in-law, son-in-law, and so on, is absent. Finally, we obtain a sample which contains 7149 individuals, and among which there are 5379 individuals we have the information on sibling and parental education.

3.2 Variables

According to the goal of this study, we set a group of dependent variables and three groups of independent variables.

3.2.1 Dependent variables

A group of dependent variables is used to measure the school entrance after compulsory education, including *Highschool, Academy, VET, College and University*. *Highschool* is defined to measure the individual's status of entering senior high school (1=yes, 0=no), which is the first school stage after compulsory education. *Academy* is used to indicate the individual's status of entering academic senior high school (1=yes, 0=no), which mainly aims to enter college or university. *VET* is defined to measure the individual's status of attending vocational education and training (1=yes, 0=no). *College and University* are used to measure the individual's status of attending college and university, respectively (1=yes, 0=no).

3.2.2 Independent variables

Preschool education

The first group of dependent variables includes three variables, measuring the participation of preschool education. The first variable is named as *Kindergarten or preschool*, which is equal to one if an individual had ever participated kindergarten or preschool and zero otherwise. The variable of *Kindergarten* is used to measure an individual's participation of kindergarten (1=yes, 0=no). The variable of *preschool* is used to measure an individual's participation of preschool (1=yes, 0=no).

Individual characteristics

The second group of dependent variables are used to measure the individual characteristics, including gender and age cohorts. If an individual is male, we define gender as one and zero otherwise. According to the birthyear, we set birth cohorts containing 1950s, 1960s, 1970s, 1980s, and 1990s. These two variables are usually controlled in previous studies to capture the gender difference and temporal trends, respectively (Beutel and Axinn, 2002; Buchmann et al., 2008; Wang et al., 2018).

Family characteristics

The third group of dependent variables includes *siblings, first child, father's education, and mother's education*, which are used to measure the family characteristics highly related to individual's education (Kantarevic and Mechoulan, 2006; Lee, 2008; Carneiro et al., 2013; Holmlund et al., 2011; Black et al., 2018; Dong et al., 2019, 2020). Siblings is defined as the number of siblings of an individual. *First child* is equal to 1 if the individual is the first child in the family and zero otherwise. Father' education and mother's education are controlled to grab the intergenerational transmission effect of education, which is found in previous studies. Due to the definition of three generations in our sample, the observations of these three variables are 5379.

County dummies

The *county dummies* are used to indicate the regional characteristics since the detailed educational policy and measures are made at county level in China. The descriptive statistics of these independent variables are shown in Table 1.

3.3 Model specification and estimation strategy

To estimate the determinants of the participation of preschool education, we specify the following econometric model:

$$Y_i = \alpha_i + \beta P_i + \gamma I_i + \delta F_i + \eta D_i + \varepsilon_i$$

where i present the ith individual. Y_i denotes the dependent variable of school entrance after compulsory education of individual *i*, including *Highschool, Academy, VET, College and University*. P_i is the vector of participation of preschool education, including *Kindergarten or preschool, Kindergarten, and preschool*. I_i is the vector of variables to measure individual characteristics, including gender and birth cohorts. F_i is the vector of variables of family characteristics, such as siblings, father's education, and mother education. D_i is the vector of county dummy variables. β is the coefficient that captures the effect of participation of preschool education on dependent variables. γ, δ, and η are the vectors of the coefficients to measure the effects of individual, family, and county characteristics on the dependent variables, respectively. α_i is the constant term, and ε_i is the residual term in the model. The standard errors are clustered at the village level to account for correlation of error terms within the same village.

Omitting variables and sample selection bias are the important sources of endogeneity in this study. We firstly avoid the endogeneity by adopting family fixed effect model as a benchmark. For a

family, there are several members and we can construct the unbalance panel data using the family id and personal id. Therefore, we adopt the family fixed effect to eliminate the endogeneity which is caused by omitting the variables of family characteristic, such as risk preference, genes, family culture, and so on. The model in equation (1) is modified as follows:

$$Y_{it} = \alpha_i + \beta P_{it} + \gamma I_{it} + \delta F_{it} + \eta D_{it} + \varepsilon_{it} \qquad (2)$$

The I_{it}, H_{it}, V_{it}, D_{it} and ε_{it} are the same as those in equation (1). ϑ_i is the unobservable family characteristics. We let "¯" indicate the mean of each variable. Subsequently, as Hausman and Taylor (1981) demonstrated, by using household fixed effect regression, we eliminate ϑ_i by subtracting the mean over all members of the family from the equation (2):

$$Y_{it} - \overline{Y_i} = \gamma(I_{it} - \overline{I_i}) + \delta(H_{it} - \overline{H_i}) + (\vartheta_i - \vartheta_i) + (\varepsilon_{it} - \overline{\varepsilon_i}) \qquad (3)$$

In this way, we can eliminate the unobservable characteristics as much as possible and partially address the endogeneity. Stata, the software we used to conduct data analysis, can't do family fixed effect estimation of Probit regression. Thus, we use the aextlogit method to estimate since the dependent variable is dummy variable. Aextlogit in Stata computes the average elasticities for fixed effects logit for the situation of small number of time periods and large cross-sectional size (Kitazawa, 2012; Kemp and Santos Silva, 2016). In our data, the average member of laborers in each household is about 2.87. The families are in large numbers, which fulfills the condition of aextlogit method.

Although we adopt family fixed effect model, it doesn't solve endogenous problem completely. We further use instrumental variable method to address it. In this study, we use the status of kindergarten and preschool set up in village to construct the IVs. For the variable of *Kindergarten or*

preschool, we use the *preschool_v* as its instrumental variable, which is equal to one if there is any kindergarten or preschool before eight years old of an individual and zero otherwise since the age of admission to preschool is eight. We adopt *preschool_v1* as the instrumental variable of *Kindergarten,* which is equal to one if there is any kindergarten before six years old of an individual and zero otherwise due to the age restrict of going to kindergarten. We adopt *preschool_v2* as the instrumental variable of *Preschool*, which is equal to one if there is any preschool before eight years old of an individual and zero otherwise.

4. Results

4.1 Main results

Table 2-6 reports the main results of this paper, those of estimating preschool education (including preschool, kindergarten, and preschool or kindergarten) on individual one's three major school enrollment decisions: senior high school (including academic high school, vocational education and training, and academic high school or vocational education and training), college, and university. In these tables, the first four columns report the FFE estimation results; and the last four columns report the IV estimation results. All IV estimations reported in the table control for the full set of county fixed effect, while it is not included in the FFE estimations. For either model, the first column focuses only on the preschool education. The second adds a set of personal characteristics (e.g., gender and a set of birth cohort dummies). The third further controls for one's number of siblings and a dummy for whether he/she is the first-born child. The final specification further includes parental education years as additional controls.

4.1.1 Results of senior high school enrollment

Results from Table 2 show the effects of preschool education on one's senior high school enrollment. Two notable findings emerge from these Tables. First, preschool education has a statistically significant and positive effect on one's senior high school enrollment. Specifically, other things being equal, attending preschool is associated with an increase of 0.278-1.564 percentage in one's probability of senior high school enrollment. The impacts of kindergarten attendance are slightly larger, which raises one's probability of senior high school enrollment by 0.348-1.578 percentage. Generally, preschool education (preschool or kindergarten) is associated with an increase of 0.402-1.610 percentage in one's probability of senior high school enrollment. These impacts are consistent with previous estimates, especially those found positive impacts of preschool education on one's school enrollment (e.g., Berlinski et al., 2008; Bietenbeck et al., 2017). Secondly, and perhaps more importantly, the point estimates of preschool education are quite robust in IV estimations for kindergarten and preschool or kindergarten education. The robustness in the estimates lends some support to the reliability of IV estimations results.

[*Table 2 about here*]

The estimated coefficients of the control variables are also quite informative and are quite consistent with previous findings. For example, males and individuals whose father or mother has achieved more years of schooling has higher probability of senior high school enrollment, which is commonly observed in China (e.g. Connelly and Zheng, 2003).

4.1.2 Results of academic high school enrollment

There are two segments of China's post-junior high school education options, that is, either academic high school (putong gaozhong) or vocational education and training (zhiye gaozhong). And these two kinds of senior high schools are quite different in developing one's skills and abilities; for

example, VET schools are primarily operated to provide specific technical skills without emphasizing the teaching of basic educational skills, such as Chinese language, math, foreign language, and computer science, which are highly emphasized in academic high schools. Hence, in order to explore the heterogeneous effects of preschool education on these two kinds of senior high schools enrollment, we firstly focus on estimating preschool education on individual one's academic high school enrollment in this part.

Results from Table 3 show the impacts of preschool education on one's academic high school enrollment. And it is quite consistent with the above findings of senior high school enrollment, which shows statistically significant and positive effect of preschool education on one's academic high school enrollment. Specifically, other things being equal, attending preschool is associated with an increase of 0.394-1.346 percentage in one's probability of academic high school enrollment. The impacts of kindergarten attendance are slightly larger, specifically, attending kindergarten raises one's probability of academic high school enrollment by 0.323-1.242 percentage. Generally, preschool education (preschool or kindergarten) is associated with an increase of 0.423-1.324 percentage in one's probability of academic high school enrollment. Besides, the point estimates of preschool education are also quite robust in IV estimations for kindergarten and preschool or kindergarten education.

[*Table 3 about here*]

4.1.3 Results of vocational education and training enrollment

In addition to the academic high school, previous studies have documented the benefits of vocational training in contributing to social inclusion, poverty reduction, equipping learners with basic skills, and supporting personal development (e.g., UNESCO Institute for Statistics, 2006; UNESCO International Institute for Educational Planning, 2004). And given the large resources and

effort devoted into the VET education (State Council, 2005), there has been a great expansion in vocational high school education in China in recent years. Hence, we further focus on estimating preschool education on individual one's VET enrollment in this part.

Results from Table 4 show the impacts of preschool education on one's vocational education and training enrollment. Unlike previous findings of senior high school and academic high school enrollment, preschool education shows insignificant effect on one's vocational education and training enrollment when taking the above-mentioned covariates into account (with two exceptions of the kindergarten education in FFE model).

[*Table 4 about here*]

Taken together, the above results provide strong evidence that preschool education significantly raises one's probability of senior high school and especially academic high school enrollment, indicating the importance of preschool education in China.

4.1.4 Results of college enrollment

In addition to the senior high school enrollment, results from Table 5 show the effects of preschool education on one's college enrollment. And the impacts of kindergarten attendance are inconsistent across the FFE and IV estimation. Specifically, results from fixed effect model show that attending kindergarten has an insignificant effect on one's college enrollment, while it is significantly associated with an increase of 0.296 percentage in one's probability of college enrollment in IV estimation.

Despite that, our results from fixed effect and IV model both show that individuals who ever attended preschool or kindergarten are more likely to enroll in college. Specifically, other things

being equal, preschool education (preschool or kindergarten) is associated with an increase of 0.312-0.633 percentage in one's probability of college enrollment.

[*Table 5 about here*]

4.1.5 Results of university enrollment

Results from Table 6 show the effects of preschool education on one's university enrollment. Our results from fixed effect and IV model both show that individuals who ever attended kindergarten are more likely to enroll in university. Specifically, other things being equal, attending kindergarten is associated with an increase of 0.788-1.645 percentage in one's probability of university enrollment.

Despite that, We find the impacts of preschool education (preschool or kindergarten) are inconsistent across the FFE and IV estimation. Results from fixed effect model show that preschool education is associated with an increase of 0.979 percentage in one's probability of university enrollment, while it is insignificant in IV estimation.

[*Table 6 about here*]

4.2. Heterogeneity in preschool education

More insights into how preschool education work may be obtained by investigating how its effects vary across different subsamples. Table 7-9 repeats the analyses reported in Table 7-9, but this time adding the interaction term of the preschool education and the gender variables.

[*Table 7-9 about here*]

A number of informative patterns emerge from Table 7-9. First, there are apparent gender differences in the effect of preschool education on one's senior high school enrollment (including academic high school, vocational education and training, and academic high school or vocational education and training): generally compared with males, females benefit more from preschool education, which is consistent with the findings of Borraz and Cid (2013), Blanden et al. (2016), and Berlinski et al. (2009).

Second, the heterogeneous effects of different kinds of preschool education are inconsistent across different outcomes. For example, males are 0.412 percentage higher than females in the probability of senior high school enrollment. And this effect is quite similar with preschool education, which is associated with an increase of 0.406 percentage for males than females in their probability of senior high school enrollment. However, the heterogeneous effect of kindergarten attendance on senior high school enrollment is insignificant across different males and females.

Taken together, the above results provide strong evidence that females benefit more from preschool education than their male counterparts, which further indicates the importance of preschool education on gender equality in rural China.

5. Conclusion

In this paper, we have explored the extent to which preschool education impact children's post-compulsory school enrollment. Based on household fixed effects model (FFE) and instrumental variable method (IV), we found that children who have attending kindergarten or preschool education are 0.402 and 0.607 percentage point more likely than their peers to be enrolled in senior high school and academic senior high school, respectively. Rural children only attending kindergartens are 0.497 and 0.533 percentage points more likely to attending senior high school and academic senior high

school, respectively. However, there is no effect of attending preschool on their enrollment in senior high school. Access to preschool education (kindergarten or preschool) significantly increased the likelihood of rural children attending college (0.312 percentage point) and university (1.645 percentage points). The results of heterogeneity analysis show that attending preschool or kindergarten significantly increased the likelihood of rural girls attending senior high school (1.645 percentage points) and academic senior high school (0.8 percentage point). Attendance at kindergartens significantly increases the likelihood of rural girls attending academic high schools (0.668 percentage point). The conclusion of this study further confirms the significance of investing in rural kindergarten education for improving rural human capital and promoting gender equality.

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Table 2：Impacts of preschool education on senior high school enrollment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Models	FFE	FFE	FFE	FFE	IV	IV	IV	IV
Panel A: Preschool								
	1.564***	0.352***	0.278*	0.256	0.555***	0.085	0.062	-0.020
	(0.108)	(0.129)	(0.166)	(0.168)	(0.090)	(0.223)	(0.272)	(0.275)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,925	3,925	2,628	2,628	7,149	7,149	5,379	5,379
Panel B: Kindergarten								
Preschool attendance	1.578***	0.460***	0.392**	0.348**	0.803***	0.604***	0.539**	0.497**
	(0.111)	(0.130)	(0.169)	(0.172)	(0.102)	(0.219)	(0.252)	(0.251)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,925	3,925	2,628	2,628	7,149	7,149	5,379	5,379
Panel C: Preschool or Kindergarten								
Preschool attendance	1.610***	0.544***	0.495***	0.455***	0.567***	0.503**	0.434*	0.402*
	(0.093)	(0.117)	(0.154)	(0.156)	(0.058)	(0.212)	(0.229)	(0.228)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,925	3,925	2,628	2,628	7,149	7,149	5,379	5,379

Notes: Standard errors cluster at village level in columns 1-4, *** p<0.01, ** p<0.05, * p<0.1

Table 3：Impacts of preschool education on academic high school enrollment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Models	FFE	FFE	FFE	FFE	IV	IV	IV	IV
Panel A: Preschool								
Preschool attendance	1.346***	0.394***	0.289	0.279	0.451***	0.282	0.311	0.247
	(0.111)	(0.134)	(0.177)	(0.180)	(0.084)	(0.217)	(0.266)	(0.265)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,428	3,428	2,315	2,315	7,149	7,149	5,379	5,379
Panel B: Kindergarten								
Preschool attendance	1.242***	0.323**	0.286	0.257	0.615***	0.617***	0.567**	0.533**
	(0.110)	(0.132)	(0.177)	(0.178)	(0.092)	(0.214)	(0.244)	(0.243)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,428	3,428	2,315	2,315	7,149	7,149	5,379	5,379
Panel C: Preschool or Kindergarten								
Preschool attendance	1.324***	0.485***	0.447***	0.423**	0.457***	0.667***	0.630***	0.607***
	(0.093)	(0.122)	(0.164)	(0.165)	(0.054)	(0.219)	(0.236)	(0.236)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3,428	3,428	2,315	2,315	7,149	7,149	5,379	5,379

Table 4：Impacts of preschool education on vocational education and training enrollment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Models	FFE	FFE	FFE	FFE	IV	IV	IV	IV
Panel A: Preschool								
Preschool attendance	1.831***	0.145	0.004	0.001	0.080*	-0.197	-0.249	-0.268
	(0.250)	(0.311)	(0.014)	(0.015)	(0.045)	(0.131)	(0.170)	(0.175)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	1,164	1,164	5,379	5,379	7,149	7,149	5,379	5,379
Panel B: Kindergarten								
Preschool attendance	1.983***	0.265	0.031**	0.027**	0.188***	-0.013	-0.027	-0.036
	(0.250)	(0.317)	(0.016)	(0.011)	(0.049)	(0.112)	(0.137)	(0.140)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	1,164	1,164	5,379	5,379	7,149	7,149	5,379	5,379
Panel C: Preschool or Kindergarten								
Preschool attendance	1.989***	0.297	0.015	0.010	0.110***	-0.164	-0.196	-0.205
	(0.218)	(0.292)	(0.014)	(0.014)	(0.029)	(0.112)	(0.130)	(0.132)
Individual controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Family controls	No	No	Yes	Yes	No	No	Yes	Yes
Parental controls	No	No	No	Yes	No	No	No	Yes
County dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	1,164	1,164	5,379	5,379	7,149	7,149	5,379	5,379

Table 5：Impacts of preschool education on college enrollment

	(1)	(2)
Models	FFE	IV
Panel A: Kindergarten		
Preschool attendance	0.453	0.296*
	(0.300)	(0.177)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	871	5,379
Panel B: Preschool or Kindergarten		
Preschool attendance	0.633**	0.312*
	(0.263)	(0.163)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	871	5,379

Table 6：Impacts of preschool education on university enrollment

	(1)	(2)
Models	FFE	IV
Panel A: Kindergarten		
Preschool attendance	0.788*	1.645*
	(0.426)	(0.882)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	871	5,379
Panel C: Preschool or Kindergarten		
Preschool attendance	0.979**	1.275
	(0.389)	(0.937)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	871	5,379

Table 7：Heterogeneous effects of preschool education on senior high school enrollment

	(1)	(2)
Models	FFE	IV
Panel A: Preschool		
Preschool attendance	0.501**	-0.038
	(0.202)	(0.378)
Male	0.313***	0.027
	(0.085)	(0.063)
Preschool attendance*Male	-0.412**	0.056
	(0.186)	(0.331)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	2,628	5,379
Panel B: Kindergarten		
Preschool attendance	0.473**	0.747*
	(0.206)	(0.410)
Male	0.270***	0.128**
	(0.082)	(0.057)
Preschool attendance*Male	-0.240	-0.564
	(0.216)	(0.348)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	2,628	5,379
Panel C: Preschool or Kindergarten		
Preschool attendance	0.689***	0.664
	(0.186)	(0.412)
Male	0.337***	0.175*
	(0.089)	(0.093)
Preschool attendance*Male	-0.406**	-0.506
	(0.171)	(0.340)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	2,628	5,379

Table 8：Heterogeneous effects of preschool education on academic high school enrollment

	(1)	(2)
Models	FFE	IV
Panel A: Preschool		
Preschool attendance	0.471**	0.315
	(0.218)	(0.367)
Male	0.241**	0.068
	(0.096)	(0.061)
Preschool attendance*Male	-0.316	-0.217
	(0.202)	(0.322)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	2,315	5,379
Panel B: Kindergarten		
Preschool attendance	0.579***	0.829**
	(0.218)	(0.405)
Male	0.285***	0.133**
	(0.094)	(0.056)
Preschool attendance*Male	-0.594***	-0.668*
	(0.226)	(0.344)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	2,315	5,379
Panel C: Preschool or Kindergarten		
Preschool attendance	0.739***	1.022**
	(0.199)	(0.448)
Male	0.337***	0.244**
	(0.103)	(0.101)
Preschool attendance*Male	-0.538***	-0.800**
	(0.186)	(0.371)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N		5,379

Table 9：Heterogeneous effects of preschool education on VET enrollment

	(1)	(2)
Models	FFE	IV
Panel A: Preschool		
Preschool attendance	0.011	-0.353
	(0.014)	(0.245)
Male	0.021***	-0.041
	(0.007)	(0.041)
Preschool attendance*Male	-0.048***	0.273
	(0.016)	(0.215)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	5,379	5,379
Panel B: Kindergarten		
Preschool attendance	0.009	-0.082
	(0.014)	(0.225)
Male	0.009	-0.005
	(0.006)	(0.031)
Preschool attendance*Male	0.032*	0.104
	(0.017)	(0.192)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	5,379	5,379
Panel C: Preschool or Kindergarten		
Preschool attendance	0.002	-0.358
	(0.012)	(0.242)
Male	0.013*	-0.069
	(0.007)	(0.054)
Preschool attendance*Male	-0.002	0.294
	(0.014)	(0.201)
Individual controls	Yes	Yes
Family controls	Yes	Yes
Parental controls	Yes	Yes
County dummies	No	Yes
N	5,379	5,379