



# Compulsory schooling system and equity in education: An analysis on intergenerational transmission of education

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## ABSTRACT

This paper uses the China Family Panel Studies' micro-level data and the ordered logit model to study intergenerational transmission of education and examines whether the nine-year compulsory schooling system affects equity in education. The results show that when parents have higher educational attainments, their children will have higher educational attainments. Full-sample results show that when the mother has higher education, the probability that her children have higher education increases by 7.97%, whereas for the sub-sample after the compulsory schooling policy carried out, the probability increases by 22.42%. We find that the compulsory schooling system strengthens intergenerational transmission of education in the level of higher education. An implication is that the compulsory schooling system may promote equity in compulsory education but does not promote equity in higher education.

## 1. Introduction

Education is one of the most important ways for people to improve their abilities and climb the social ladder (Machin & Vignoles, 2004) [1]. The literatures find that there exists intergenerational transmission of socioeconomic statuses such as education and income (Blanden et al., 2007; Fessler et al., 2012; Chen et al., 2019) [2–4]. If the children of better-educated parents have higher educational attainment, it will further strengthen the intergenerational transmission of other socioeconomic statuses, exacerbating social inequities such as social entrenchment. Meanwhile, many countries including China have been carrying out policies such as the compulsory schooling system to promote the equity in education. The purpose of this paper is to explore educational equity from the perspective of intergenerational transmission of education and to examine whether the compulsory schooling system promotes educational equity.

China has been converting from a country with a large and less-educated population to a country with many competent personnel. There were 218.36 million persons with university education in 2020. The number of people with university education per 100,000 persons went up from 416 persons in 1964, 615 persons in 1982, 3611 persons in 2000 to 15467 persons in 2020. The average years of schooling for people aged 15–59 increased from 5.72 years in 1982, 8.46 years in 2000 to 10.66 years in 2020.<sup>1</sup> The total enrollment rate in university education went up from 1.95% in 1965, 3.4% in 1990, 12.5% in 2000, 26.5% in 2010 to 57.8% in 2020. China

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<sup>1</sup> The number of people with university education (referring to junior college or above) per 100,000 people went up from 416 in 1964, 615 in 1982, 1422 in 1990, 3611 in 2000, 8930 in 2010 to 15467 in 2020. The number of people with senior secondary school education rose from 8039 in 1990, 11146 in 2000, 14032 in 2010 to 15088 in 2020. The number of people with junior secondary school education fell from 23344 in 1990, 33961 in 2000, 38788 in 2010 to 34507 in 2020. (Data from the 5th Census 2000, 6th Census 2010, 7th Census 2020 Key Data Bulletin.)

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implemented the nine-year compulsory education law in 1986. The universal 9-year compulsory education achieved largely in 2000 and came true completely in 2011. But the problem of inequity and imbalance in educational development is still prominent. Whether the compulsory schooling system can promote equity in education. If the answer is yes, can it promote equity in which level of education? To what extent can it promote equity? There is a lack of empirical evidence on whether the compulsory schooling system promotes equity in education.<sup>2</sup>

Parental education may have an impact on children's education through the channels of educational attitudes, educational investment, and educational efficiency. First, parents' perceptions and attitudes towards their children's education depend on their educational attainment, with well-educated parents paying more attention on their children's education than less-educated parents (Kirchsteiger & Sebald, 2010; Piopiunik, 2011; Parker & Dam, 2015; Wang et al., 2014) [8–11]. Second, parents' educational attainment determines their ability to invest in their children's education, with less-educated parents often facing income or credit constraints that lead to underinvestment in their children's education (Piopiunik, 2011; Lundborg et al., 2014) [9,12]. Thirdly, parental education determines the efficiency of investment in children's education. As well-educated parents are more aware of ways to invest energy and money in raising better children, parental education may affect productivity in children development activities (Guryan et al., 2008; Gimenez-Nadal & Molina, 2013; Amin et al., 2015) [13–15]. The compulsory schooling system, on the other hand, affects the intergenerational transmission of education by differently influencing the educational attitudes of parents with different levels of education. The compulsory schooling system may reinforce the intergenerational transmission of education if they reinforce the belief of less-educated parents that their children only need to complete the compulsory education and do not need to pursue any higher level of education.

Based on micro-level data from the China Family Panel Studies (CFPS 2018), firstly, this paper matches accurately educational attainments of parents and children. Due to the natural order property of children's educational attainments, secondly, this paper uses the ordered-logit model to estimate the marginal effects of parents' educational attainments on children's educational attainments. And then the paper uses the exogenous event of the compulsory education law to examine the heterogeneity of intergenerational transmission of education. Specifically speaking, the paper uses the regression results of sub-sample and an interaction term to examine the impact of the compulsory schooling system on intergenerational transmission of education and educational equity.

The results show that the higher the educational attainments of parents, the higher the educational attainments of children. The full-sample regression results show that the probability that children have higher education increases by 8.89% and 7.97% respectively when the mother has senior secondary school education and higher education. The corresponding marginal effects of the father's are 5.68% and 7.40% respectively. The sub-sample analyses before and after the introduction of the compulsory schooling system reveal a shift in the "turning point" of intergenerational transmission of education. Before the compulsory education law, the marginal effects of parents' educational attainments on children's educational attainment of primary school and below are negative, and those on the children's educational attainment of junior secondary school and above are positive. After the compulsory education law in 1986, the marginal effects on the children's educational attainment of junior secondary school and below are negative and those on the children's educational attainment of senior secondary school and above are positive. Examining the sub-sample group of children protected by the compulsory education law, this paper finds that the probability of children with higher education increases by 17.52% and 22.42% when the mother has senior secondary school and higher education respectively. The marginal effects are obviously higher than the full-sample results. In addition, the regression results of the model with the interaction term of parental education and the dummy variable of the compulsory schooling system further suggest that the compulsory schooling system reinforces the intergenerational transmission of education. It implies that, from the perspective of intergenerational transmission of education, the compulsory schooling system doesn't necessarily promote educational equity at higher levels of education. It may be necessary to significantly heighten the total enrollment rate in senior secondary school and university education to promote equity in the higher level of education.

The contributions of this paper are threefold. Firstly, this paper examines the marginal effects of parents' educational attainments on children's educational attainments by using the ordered logit model that can better describe the natural ordinal property of educational attainments and reveals successfully the shift up in turn-point of marginal effects of educational attainments after compulsory education law carried out. Secondly, most literatures have discussed the impact of the compulsory schooling system on educational equity from the perspectives of educational opportunities, educational achievement, and educational access (Liu et al., 2016; Zhao, 2016; Jia et al., 2020) [16–18], but few literatures have explored the impact of the compulsory schooling system on educational equity from the perspective of intergenerational transmission of education. This paper fills the gap by finding that the compulsory schooling system reinforces the intergenerational transmission of education, which is detrimental to educational equity. Because the compulsory schooling system is baseline for education, it does not necessarily promote the equity in higher education. The conclusion is important for policy makers. Thirdly, our paper is related to the literature studying the impact of public education policies, such as university expansion, on the intergenerational transmission of education (Wei, 2017; Zhang et al., 2018; Luo et al.,

<sup>2</sup> In 2015, the average years of schooling for people aged 25–64 in high-income countries (such as the United States, Germany, the United Kingdom, France, Japan, South Korea, and Singapore) is 12 years, and China is 8.14 years. Most people tend to believe that one of reasons for most of South American countries remained in the middle-income countries is that the average years of schooling stay long in the junior secondary school, which cannot meet the demand for talents in industrial upgrading (Aoki & Masahiko, 2011; Cai, 2011; Zhang et al., 2014) [5–7]. The average years of schooling for people aged 25–64 in China is exactly in the level of junior secondary school. If China wants to enter a high-income country, it may be the only way to increase the average years of schooling of people above senior secondary school. (Data from Barro-Lee Educational Attainment Dataset).

2018) [19–21]. This paper examines the impact of the compulsory schooling system on intergenerational transmission of education.

The remainder of the paper is organized as follows. Section 2 shows the literature review, the theoretical framework, and hypothesis development; Section 3 constructs the econometric model; Section 4 shows the selection of variables and summary statistics; Section 5 presents the empirical analysis and robustness tests; finally, Section 6 concludes the paper and provides corresponding policy recommendations.

## 2. Literature and theoretical framework

There is general agreement in the literature that parental education has a significant impact on children's education. When parents' years of education increase, children's years of education will also increase (Heineck & Regina, 2009; Zhou et al., 2018; Zou et al., 2019) [22–24]. Scholars have found that for each additional year of parental education, children's years of education increase by 0.2–0.6 years (Zhou et al., 2018; Zou et al., 2019) [23,24]. The literature has also analyzed the heterogeneity of intergenerational transmission of education from several perspectives. First, in terms of gender difference, most studies argue that mothers' educational attainment has a greater impact on their children's educational attainment than fathers' (Carneiro & Heckman, 2002; Heineck & Regina, 2009; Zhou et al., 2018; Zou et al., 2019) [22–25]. But some studies find fathers' education to be more important (Fessler et al., 2012; Chen et al., 2019) [3,4]. In terms of the gender of children, parental education has a greater impact on daughters than on sons (Heineck & Regina, 2009; Du et al., 2019) [22,26]. Second, in terms of urban-rural differences, the existing studies generally suggest that the intergenerational transmission of education is higher in urban areas than in rural areas (Sun et al., 2015; Xu et al., 2016; Chen et al., 2019; Zhu et al., 2018; Yan, 2019; Zou et al., 2019) [4,25,27–30]. Third, in terms of differences in the absolute level of education, some studies suggest that intergenerational transmission of education is stronger for parents and children with lower levels of education (Kwenda et al., 2015; Akarçay-Gürbüz & Polat, 2017) [31,32]. However, some scholars have argued that this effect also varies by region, finding that intergenerational transmission of education is stronger for parents and children with higher levels of education in urban areas and for parents and children with lower levels of education in rural areas (Chen et al., 2019) [4]. Most of the existing literature uses OLS regression model to measure the influence of parents' years of education on children's years of education, which fails to show the heterogeneity of the impact on the intergenerational transmission of education for the children at different educational levels (primary, junior high, senior secondary school, etc.) in China. This paper examines the intergenerational transmission of education by using the ordered logit estimation method that can better describe the natural ordinal variable of educational attainments. Based on this, **Hypothesis 1** is proposed in this paper.

**Hypothesis 1.** There is intergenerational transmission of education in China. As parents' educational attainment increases, the probability of children receiving higher levels of education rises significantly.

There is a close relationship between public education policies and educational equity. Educational policies not only regulate the distribution of educational resources directly, but also determine the educational decisions and welfare of families. For example, scholars have found that China's schooling regime restructuring may affect the educational inequality in China. Some studied the impact of the emerging variegated school and education regimes and the market-oriented reform of education in China in the late 1990s (Zhang, 2022; Zhang, 2022) [33,34]; some studied the impact of education-featured gated communities on urban education equity and found that it inhibits the mobility of education (He, 2022) [35]. Compulsory education policies have strong interference on people with low levels of education. There have been foreign literatures on the impact of basic education policies on intergenerational transmission of education. For example, it has been studied that Sweden's delayed educational streaming and America's compulsory education policy can reduce the influence of parents on children's educational choices, thus weakening the intergenerational transmission of education (Bauer & Riphahn, 2006; Rauscher, 2012) [36,37]. In developing countries, existing research also demonstrates that school fee abolition policies for basic education in African countries can also weaken the intergenerational transmission of education (İscan et al., 2015) [38].

In 1986, China promulgated and implemented the Compulsory Education Law of the People's Republic of China, which emphasized the compulsory and universal benefits of nine-year compulsory education. Since the implementation of the law in 1986, school-age children have had more educational opportunities, higher educational achievements, and significantly higher rates of return on education (Liu et al., 2016; Zhao, 2016; Jia et al., 2020) [16–18]. Some scholars have also recently studied the impact of the compulsory education system on the intergenerational transmission of education, but there is not a consistent conclusion. Some studies believe that the compulsory education system cannot inhibit the intergenerational transmission of education. Because in rural areas, the government may shift the burden of raising education funds to rural families, which increases the economic burden of rural families to invest in their children's education, thus strengthening the intergenerational transmission of education (Guo et al., 2019; Peng & Zhao, 2021) [39,40]. Some studies believe that the compulsory education system can weaken the intergenerational transmission of education because it exempts tuition and miscellaneous fees in the compulsory education stage (Chen et al., 2021; Zhou et al., 2021; Mao & Zhang, 2023) [41–43].

In terms of intergenerational transmission mechanism of education, the existing literatures believe that parental education may have an impact on children's education through the channels of educational attitudes, educational investment, and educational efficiency. First, parents' ideas and attitudes towards their children's education depend on their educational attainments, with more-educated parents placing more importance on their children's education than less-educated parents (Kirchsteiger & Sebald 2010; Piopiunik, 2011; Parker & Dam, 2015; Wang et al., 2014) [8–11]. The compulsory schooling system may reinforce the intergenerational transmission of education in the level of higher education if they reinforce the belief of less-educated parents that their children only need complete compulsory education and do not need to pursue any higher level of education. Second, parents' educational

attainment determines their ability to invest in their children’s education, with less-educated parents often facing income or credit constraints that lead to underinvestment in their children’s education (Piopiunik, 2011; Lundborg et al., 2014) [9,12]. Before the implementation of compulsory education, all the tuition and miscellaneous expenses of children were borne by the children’s families. Tuition and miscellaneous expenses of children constituted a heavy economic burden for the low-income families. Many children from poor families dropped out of school because they could not pay the tuition (Mei et al., 2012) [44]. The Compulsory Education Law provides for the exemption of tuition fees, which can reduce the cost of education for parents, so the compulsory education system can weaken the intergenerational transmission of education in the stage of compulsory education. Based on this, Hypotheses 2 and 3 are proposed in this paper.

**Hypothesis 2.** The compulsory education system weakens the intergenerational transmission of education in the compulsory education stage.

**Hypothesis 3.** The compulsory education system strengthens the intergenerational transmission of higher education level.

**3. Model**

This study focuses on the effect of parental educational attainment on the educational attainment of their children. Thus, the parental education will be introduced as the main independent variable in the model. In addition, some of the children’s characteristics and family background factors are also included. Before the ordered logit regression, the baseline model is constructed as in equation (1) :

$$Edu_i = \beta_0 + \beta_1 Fedu_i + \beta_2 Medu_i + \sum_{j=1}^k \tau_j X_i + u_i \tag{1}$$

where the dependent variable  $Edu_i$  denotes the number of years of education of child  $i$ , the independent variables  $Fedu_i$  and  $Medu_i$  denote the number of years of education of parents respectively, and  $X_i$  is a series of control variables.

Since there is a natural order in educational attainment, we classify educational attainment into five levels and assign values of 1, 2, 3, 4, and 5, with higher values representing higher educational attainment, as in equation (2).

$$y_i = \begin{cases} 1, & \text{Illiterate / Semi-literate} \\ 2, & \text{Primary School} \\ 3, & \text{Junior secondary school} \\ 4, & \text{Senior secondary school} \\ 5, & \text{Higher education} \end{cases} \tag{2}$$

The dependent variable  $y_i$  is the highest level of education attained by the individual.  $y_i^*$  is the latent variable corresponding to  $y_i$ .  $X_i$  is a vector of the control variables.  $\beta$  is the estimated coefficients of the independent variables.  $\varepsilon_i$  is the random error term which is assumed to follow the Logistic distribution. Denote  $\omega_i$  as the critical values, where  $i = 1, 2, 3, 4$ . Since the value of  $y_i$  depends on the comparison with the critical value, it is expressed as in equation (3):

$$y_i = \begin{cases} 1, & y_i^* \leq \omega_1 \\ 2, & \omega_1 < y_i^* \leq \omega_2 \\ 3, & \omega_2 < y_i^* \leq \omega_3 \\ 4, & \omega_3 < y_i^* \leq \omega_4 \\ 5, & \omega_4 < y_i^* \end{cases} \tag{3}$$

Based on the expression for  $y$  above and the properties of the logistic distribution, the corresponding probability of each value of  $y$  is obtained as in equations (4)–(6):

$$p(y=0|X) = P(y^* \leq \omega_1|X) = P(\beta X + \varepsilon \leq \omega_1|X) = P(\varepsilon \leq \omega_1 - \beta X|X) = \Phi(\omega_1 - \beta X) \tag{4}$$

$$\begin{aligned} P(y=i|X) &= P(\omega_{i-1} < y^* < \omega_i|X) \\ &= P(y^* \leq \omega_i|X) - P(y^* \leq \omega_{i-1}|X) \\ &= P(\beta X + \varepsilon \leq \omega_i|X) - \Phi(\omega_{i-1} - \beta X) \\ &= P(\varepsilon \leq \omega_i - \beta X|X) - \Phi(\omega_{i-1} - \beta X) \\ &= \Phi(\omega_i - \beta X) - \Phi(\omega_{i-1} - \beta X) \end{aligned} \tag{5}$$

$$P(y=5|X) = 1 - \Phi(\omega_5 - \beta X) \tag{6}$$

where  $i = 1, 2, 3, 4$ , and  $\Phi(\cdot)$  is the Logistic distribution function.

Therefore, the ordered logit model in this paper is as in equation (7):

$$y_i = \alpha + E_i \beta + X_i \gamma + \varepsilon_i \tag{7}$$

where  $E_i$  is the educational attainment of the father or mother and  $X_i$  are control variables that include some factors of the offspring’s

characteristics and family background factors.

#### 4. Data

##### 4.1. Data sources and description

The data used in the empirical analysis come from the China Family Panel Studies (CFPS) collected by the China Social Science Survey Centre of Peking University in 2018. The data reflect changes in China's society, economy, population, education and health by tracking and collecting data at the individual, household and community levels, providing a database for academic research and public policy analysis. The CFPS2018 is the fourth round of the national survey, covering 25 provinces, municipalities, and autonomous regions across China. Given that individuals generally enter university at around the age of 20, respondents born between 1949 and 1998 are selected to ensure that all samples have graduated from at least senior secondary school. A total of 20,318 samples are selected by matching the educational attainment of the respondents with the education of their parents. We then match variables such as sibling information, urban and rural household registration at the age of twelve, gender, type of parental work, and political affiliation of parents. The variable descriptions are shown in [Table 1](#).

The key independent variable is the education of the parents, and the dependent variable is the education of the children. Children's and parents' education is expressed in two ways, years of schooling and educational attainment, respectively. For educational attainment, four dummy variables are used: primary school, junior secondary school, senior secondary school (secondary/technical school), and higher education, with 'illiterate/semi-literate' as the control group.

The control variables in this paper include two main dimensions: the personal characteristics of the children and their family background. In terms of the individual characteristics of the children, firstly, the existing literature has shown that there are gender differences in the intergenerational transmission of education, so this paper includes gender as a control variable; secondly, there is a significant urban-rural gap in China, and the household registration of the children is one of the factors affecting educational opportunities, so this paper uses the household registration of the children at the age of 12 as a control variable. The household

**Table 1**

Variable descriptions.

Type of variables	Name of variables	Explanation of variables
Dependent variable	Number of years of schooling for children	Illiterate/Semi-literate = 1; Primary school = 6; Junior secondary school = 9; Senior secondary school = 12; Junior college = 15; Undergraduate = 16; Masters = 19; Doctor = 22
	Children's educational attainment	Illiterate/Semi-literate = 1; Primary school = 2; Junior secondary school = 3; Senior secondary school = 12; Higher education = 5
Independent variable	Number of years of education of parents	Illiterate/Semi-literate = 1; Primary school = 6; Junior secondary school = 9; Senior secondary school = 12; Junior college = 15; Undergraduate = 16; Masters = 19; Doctor = 22
	Parents' educational attainment	Primary school = 1; else = 0 Junior secondary school = 1; else = 0 Senior secondary school = 1; else = 0 Higher education = 1; else = 0
Control variables	Region	Eastern region = 1; else = 0 Central region = 1; else = 0
	Household registration	Children's Household registration at age 12 urban = 1; else = 0
	Gender	Gender of children Man = 1; Female = 0
	Birth year	Birth year of children
	Ethnicity	Ethnicity of children Han = 1; else = 0
	Siblings	Siblings of children Number of siblings
	Party	Political affiliation of parents Chinese Communist Party member = 1; else = 0
Job of parents	Industrial/service manual worker = 1; else = 0 General non-manual worker = 1; else = 0 Advanced non-manual worker = 1; else = 0	

registration at the age of 12 is chosen instead of the latest one because the children may change their household registration when they grow up when there is a change in their place of residence. On the other hand, there are large differences in the level of education and economic development between the eastern, central, and western regions of China, and this paper sets up dummy variables for the eastern and central region, with the western region as the control group. In addition, the development of education has a time trend, so this paper uses the year of birth as a control variable. Finally, this paper includes an ethnicity control variable.

Then we also control the family background. Firstly, based on the “quantity/quality trade-off” theory, the number of siblings in the family may affect the education level of the children, so this paper adds the number of siblings as a control variable. Secondly, the CPFS data includes the political affiliation of the parents, with the indicator taking a value of 1 if the parent is a member of the Communist Party and 0 otherwise. Lastly, the CFPS surveyed respondents’ parents’ specific occupations and entered their parents’ occupation codes according to ISCO-88. This paper refers to Zou et al. (2019) [24] to classify parents’ occupations into four classes: agricultural manual workers, industrial/service manual workers, general non-manual workers, and advanced non-manual workers. Among them, agricultural manual workers include farmers, fishermen, etc.; industrial/service manual workers include skilled or unskilled workers, unskilled or unskilled workers, soldiers and police officers, drivers, service industry workers, etc.; general non-manual workers include general professional and technical workers, general office workers, etc.; advanced non-manual workers include senior professional and technical staff, managers, administrative officials, etc.

#### 4.2. Summary statistics

In this section, we show the sample summary statistics, the distribution of parents’ and children’s educational attainment, and the educational transition matrix. In addition, this paper also provides detailed statistical description of all variables used in the model, as shown in [Table A1](#). The sample size is 20,318. There are no missing values for all variables.

In terms of the composition of the children sample, it can be seen from [Table 2](#) that: (1) the gender ratio of males and females is balanced, with 49.07% of males and 50.93% of females. The average number of years of schooling for males (8.62 years) is higher than that for females (7.31 years); (2) the distribution of the sample by birth is also balanced, with the four sample populations from the 1950s to 1980s all accounting for more than 20% and those born in the 1990s accounting for 11%; (3) the distribution of the sample among the eastern, central, and western regions is reasonable. The average years of schooling in the western region are significantly lower than that in the eastern and central regions; (4) In terms of household registration, non-agricultural households account for 11.74% and agricultural households account for 87.82% of the sample, with agricultural households accounting for a larger proportion of the sample. The average number of years of education for non-agricultural households (11.74 years) is significantly higher than that for agricultural households (7.43 years).

In terms of the distribution of educational attainment between parents and children, it can be seen from [Table 2](#) and [Fig. 1](#) that: (1) the distribution of educational attainment of the children is approximately normal. The average number of years of schooling for the children is 7.95 years, with a median of 9 years. The average educational attainment of fathers and mothers is below the nine-year compulsory education, and the educational attainment of mothers is lower than that of fathers; (2) the proportion of children who have graduated from junior secondary school (29.97%), senior secondary school (15.73%) and higher education (12.89%) is significantly higher than the proportion of parents. This further confirms that the children’s educational attainment is overall higher than their parents’; (3) The proportion of mothers with illiterate/semi-literate education is as high as 62%. The proportion of mothers who have graduated from primary school, junior secondary school, senior secondary school and higher education are all significantly lower than the proportion of fathers. To a certain extent, this reflects the gender discrimination in paternal education or the educational inequity of favoring sons over daughters.

To portray the intergenerational transmission of education, this paper constructs a transition matrix of children’s and parents’ educational attainment ([Table 3](#)). If there is no intergenerational transmission of education, the data in each cell of [Table 3](#) should not follow a pattern. Conversely, if there is intergenerational transmission of education, which means that the educational attainment of parents positively affects the educational attainment of children, the data on the main diagonal and its two sides will show significant differences. For example, when fathers have a higher education, the proportions of children achieving senior secondary school, and higher education are 25.35% and 47.49% respectively. This value is even higher for mothers at 21.74% and 62.73%; as the father’s education level rises from illiterate, primary, junior secondary school and senior secondary school to higher education, the proportion of children obtaining a higher education shows a clear upward trend. The same characteristics are shown between mothers’ and children’s education (rightmost column of [Table 3](#)). This transition matrix confirms that there is intergenerational transmission of education and that the intergenerational transmission of education is more influential for mothers. The exact marginal impact also needs to be combined with the results of the analysis of the marginal effects in the ordered logit model.

**Table 2**  
Composition of the sample.

	Gender		Birth year						Region			Household Registration	
	Man	Female	1940s	1950s	1960s	1970s	1980s	1990s	Eastern Region	Western Region	Central Region	Urban	Rural
Number of samples	9971	10347	351	4082	5023	4449	4179	2234	8715	5830	5773	2474	17844
Percentage	49.07%	50.93%	1.73%	20.09%	24.71%	21.90%	20.57%	11.00%	42.89%	28.69%	28.42%	12.18%	87.82%
Average years of education	8.62	7.31	4.23	6.90	7.78	7.78	10.23	11.56	8.73	8.27	6.45	11.74	7.43
Median years of education	9	9	1	6	6	9	9	12	9	9	6	12	9



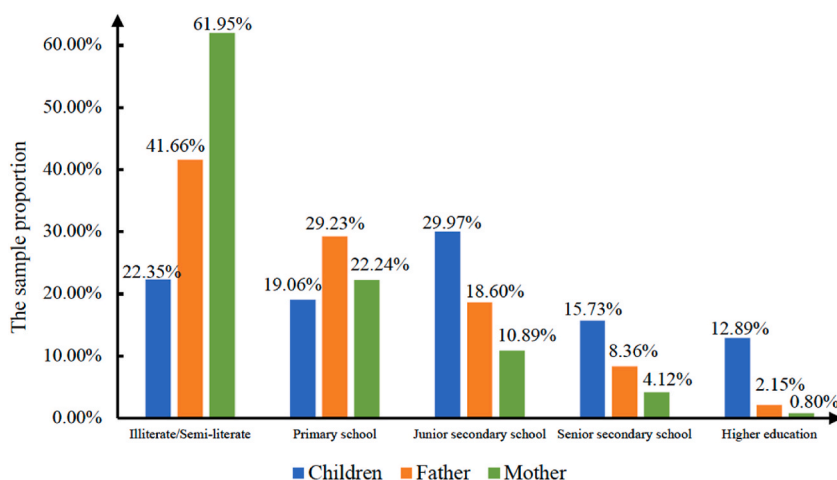


Fig. 1. Distribution of parents' and children's educational attainment.

Table 3  
Conversion matrix of children's and parents' educational attainment.

		Children				
		Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Father	Illiterate/Semi-literate	38.54%	22.96%	24.80%	9.92%	3.78%
	Primary school	14.13%	20.47%	37.40%	17.16%	10.84%
	Junior secondary school	8.31%	13.47%	32.02%	22.49%	23.71%
	Senior secondary school	6.18%	10.37%	28.86%	22.14%	32.45%
	Higher education	4.79%	6.39%	15.98%	25.35%	47.49%
Mother	Illiterate/Semi-literate	32.54%	22.68%	28.07%	11.66%	5.05%
	Primary school	7.68%	17.44%	37.21%	20.91%	16.76%
	Junior secondary school	3.42%	8.50%	31.18%	25.40%	31.50%
	Senior secondary school	2.39%	4.30%	20.05%	22.20%	51.06%
	Higher education	1.24%	3.11%	11.18%	21.74%	62.73%

## 5. Results

### 5.1. The ordered logit model results

Table 4 reports the results of the ordered logit model for the full sample.<sup>3</sup> The dependent variable is 'children's educational attainment'. Column 1 of Table 4 examines the effect of parents' educational attainment on children's educational attainment without controls. Column 2 adds control variables for personal characteristics of parents such as occupation and political affiliation. Columns 3 and 4 consider the effect of the father's and mother's educational attainment on their children's educational attainment respectively. Column 5, in addition, compared with column 2, controls variables for children's personal characteristics such as region, year of birth, gender, household registration at age 12, ethnicity, and the number of siblings. To examine the effect of parental education on children's educational attainment, the paper reports the marginal effect values of each variable on children's educational attainment (see Table 5 for details).

The estimated coefficients in column 5 of Table 4 show that the coefficients for the main explanatory variables, father's and mother's educational attainment, and the other control variables are significantly positive; the magnitudes of the coefficients increase significantly as the father's and mother's educational attainment increases.

The marginal effects based on the ordered logit model in column (5) of Table 4 are presented in detail in Table 5. Taking mothers as an example: (1) the children of mothers with senior secondary school education are 6.11% more likely to receive senior secondary school education as the educational attainment and 8.89% more likely to receive higher education than those of control group, respectively. Accordingly, children of mothers with higher education are 5.47% and 7.97% more likely to have a senior secondary school education and higher education than those of the control group, respectively; (2) as the mother's educational attainment increases, the probability of her children receiving better education increases significantly. For example, when the mother's educational

<sup>3</sup> Appendix Table A2 reports the results of OLS regressions for the full sample, where the independent variable is parents' years of schooling and the dependent variable is children's years of schooling, which finds a significant positive effect of parents' years of schooling on children's years of schooling.



**Table 4**  
The ordered logit model results (The full sample).

Name of variable	Dependent variable: children's educational attainment				
	(1)	(2)	(3)	(4)	(5)
Primary school (Father)	2.0996*** (0.0708)	1.9952*** (0.0679)	1.8040*** (0.0589)		1.5753*** (0.0550)
Junior secondary school (Father)	3.0578*** (0.1288)	2.7635*** (0.1182)	2.1948*** (0.0897)		1.6973*** (0.0752)
Senior secondary school (Father)	3.8768*** (0.2123)	3.1638*** (0.1792)	2.7697*** (0.1512)		1.9757*** (0.1146)
Higher education (Father)	5.8937*** (0.6035)	3.7174*** (0.3966)	4.0476*** (0.4169)		2.4269*** (0.2672)
Primary school (Mother)	2.2464*** (0.0796)	2.1007*** (0.0749)		1.9299*** (0.0653)	1.5008*** (0.0552)
Junior secondary school (Mother)	4.1722*** (0.2011)	3.2738*** (0.1618)		2.4787*** (0.1186)	1.8476*** (0.0949)
Senior secondary school (Mother)	8.0802*** (0.6003)	5.4246*** (0.4194)		4.0697*** (0.3133)	2.9005*** (0.2328)
Higher education (Mother)	10.5476*** (1.7993)	5.7655*** (1.0249)		4.2915*** (0.7641)	2.5977*** (0.4819)
Eastern region			1.9729*** (0.0662)	1.9332*** (0.0651)	1.8534*** (0.0629)
Central region			1.6865*** (0.0610)	1.6602*** (0.0599)	1.6052*** (0.0583)
Birth year			1.0676*** (0.0013)	1.0647*** (0.0013)	1.0624*** (0.0013)
Gender			1.8992*** (0.0499)	1.8937*** (0.0497)	1.9091*** (0.0503)
Household registration			4.3772*** (0.2020)	3.8420*** (0.1945)	3.3626*** (0.1725)
Ethnicity			1.7004*** (0.0884)	1.7498*** (0.0909)	1.6745*** (0.0870)
Siblings			0.9496*** (0.0070)	0.9538*** (0.0070)	0.9580*** (0.0071)
Party (Father)		1.1401*** (0.0447)	1.3315*** (0.0528)		1.2970*** (0.0521)
Party (Mother)		1.1858* (0.1067)		1.5737*** (0.1446)	1.4163*** (0.1316)
Industrial/service manual worker (Father)		1.5696***	1.5133***		1.3330***
General non-manual worker (Father)		1.5377*** (0.1099)	1.6912*** (0.1193)		1.4590*** (0.1069)
Advanced non-manual worker (Father)		1.3664*** (0.0663)	1.6758*** (0.0795)		1.5335*** (0.0760)
Industrial/service manual worker (Mother)		1.9640*** (0.0796)		1.5586*** (0.0665)	1.3321*** (0.0602)
General non-manual worker (Mother)		2.3065*** (0.2285)		1.8467*** (0.1875)	1.4204*** (0.1481)
Advanced non-manual worker (Mother)		2.2113*** (0.1726)		1.9694*** (0.1540)	1.5196*** (0.1237)

Note: Illiterate/semi-literate parents are used as the control group.

\*\*\* Significant at 1% level.

\*\* Significant at 5% level.

\* Significant at 10% level.

attainment increases from primary, junior high and senior secondary school to higher education the probability of the children receiving senior secondary school education increases by 2.33%, 3.52%, 6.11% and 5.47% respectively compared to the control group; the probability of the children receiving higher education also increases by 3.39%, 5.12%, 8.89% and 7.97% respectively (the two rightmost columns of Table 5). It is easy to see that the probability of children receiving a senior secondary school or higher education is significantly higher when the mother has received a senior secondary school or higher education (marginal effect value > 5%); (3) the effect of a mother's education on her children's educational attainment is significantly greater than that of the father. This may be mainly because mothers spend more time with their children, have more responsibility for their children's education, and their children are therefore more influenced by their mothers.<sup>4</sup> The results provide evidence supporting Hypothesis 1 that there exists intergenerational transmission of education in China.

<sup>4</sup> From a gender perspective, males are more likely than females to have received junior secondary school, senior secondary school and higher education (2.1%, 3.7% and 5.4% higher respectively), while illiteracy and primary education are significantly less likely than females (see row "Gender" in Table 5). In terms of household registration at the age of 12, children in urban households are significantly more educated than those in rural households. In terms of the Eastern, Central and Western regions, children in the Eastern and Central regions are more likely to have received junior secondary school, senior secondary school, higher education than those in the West (the West is the control group).

**Table 5**  
Marginal effects of factors on children's educational attainments (The full sample).

Name of variable	Dependent variable: children's educational attainment				
	Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Primary school (Father)	-0.0626*** (0.0048)	-0.0160*** (0.0013)	0.0146*** (0.0011)	0.0261*** (0.0020)	0.0379*** (0.0030)
Junior secondary school (Father)	-0.0729*** (0.0061)	-0.0186*** (0.0016)	0.0170*** (0.0014)	0.0303*** (0.0026)	0.0441*** (0.0037)
Senior secondary school (Father)	-0.0938*** (0.0080)	-0.0240*** (0.0021)	0.0219*** (0.0019)	0.0391*** (0.0034)	0.0568*** (0.0049)
Higher education (Father)	-0.1221*** (0.0152)	-0.0312*** (0.0039)	0.0285*** (0.0036)	0.0508*** (0.0064)	0.0740*** (0.0092)
Primary school (Mother)	-0.0559*** (0.0051)	-0.0143*** (0.0013)	0.0130*** (0.0012)	0.0233*** (0.0021)	0.0339*** (0.0031)
Junior secondary school (Mother)	-0.0845*** (0.0071)	-0.0216*** (0.0018)	0.0197*** (0.0018)	0.0352*** (0.0029)	0.0512*** (0.0043)
Senior secondary school (Mother)	-0.1466*** (0.0111)	-0.0375*** (0.0029)	0.0342*** (0.0029)	0.0611*** (0.0047)	0.0889*** (0.0066)
Higher education (Mother)	-0.1315*** (0.0256)	-0.0336*** (0.0066)	0.0307*** (0.0061)	0.0547*** (0.0107)	0.0797*** (0.0154)
Eastern region	-0.0850*** (0.0046)	-0.0217*** (0.0013)	0.0198*** (0.0012)	0.0354*** (0.0020)	0.0515*** (0.0029)
Central region	-0.0652*** (0.0050)	-0.0167*** (0.0013)	0.0152*** (0.0012)	0.0271*** (0.0021)	0.0395*** (0.0031)
Birth year	-0.0083*** (0.0002)	-0.0021** (0.0001)	0.0019*** (0.0001)	0.0035*** (0.0001)	0.0050** (0.0001)
Gender	-0.0890*** (0.0036)	-0.0228*** (0.0011)	0.0208*** (0.0010)	0.0371*** (0.0016)	0.0540*** (0.0023)
Household registration	-0.1670*** (0.0071)	-0.0427*** (0.0020)	0.0390*** (0.0020)	0.0696*** (0.0031)	0.1012*** (0.0043)
Ethnicity	-0.0710*** (0.0071)	-0.0182*** (0.0019)	0.0166*** (0.0017)	0.0296*** (0.0030)	0.0430*** (0.0044)
Siblings	0.0059*** (0.0010)	0.0015*** (0.0003)	-0.0014*** (0.0002)	-0.0025*** (0.0004)	-0.0036*** (0.0006)
Party (Father)	-0.0358*** (0.0055)	-0.0092*** (0.0014)	0.0084*** (0.0013)	0.0149*** (0.0023)	0.0217*** (0.0034)
Party (Mother)	-0.0479*** (0.0128)	-0.0123*** (0.0033)	0.0112*** (0.0030)	0.0200*** (0.0053)	0.0290*** (0.0078)
Industrial/service manual worker (Father)	-0.0396*** (0.0054)	-0.0101*** (0.0014)	0.0092*** (0.0013)	0.0165*** (0.0022)	0.0240*** (0.0033)
General non-manual worker (Father)	-0.0520*** (0.0101)	-0.0133*** (0.0026)	0.0121*** (0.0024)	0.0216*** (0.0042)	0.0315*** (0.0061)
Advanced non-manual worker (Father)	-0.0589*** (0.0068)	-0.0151*** (0.0018)	0.0137*** (0.0016)	0.0245*** (0.0029)	0.0357*** (0.0042)
Industrial/service manual worker (Mother)	-0.0395*** (0.0062)	-0.0101*** (0.0016)	0.0092*** (0.0015)	0.0164*** (0.0026)	0.0239*** (0.0038)
General non-manual worker (Mother)	-0.0483*** (0.0144)	-0.0124*** (0.0037)	0.0113*** (0.0034)	0.0201*** (0.0060)	0.0293*** (0.0087)
Advanced non-manual worker (Mother)	-0.0576*** (0.0112)	-0.0147*** (0.0029)	0.0134*** (0.0027)	0.0240*** (0.0047)	0.0349*** (0.0068)

Note: Illiterate/semi-literate parents are used as the control group.

\*\*\* Significant at 1% level.

\*\* Significant at 5% level.

\* Significant at 10% level.

## 5.2. The impact of the compulsory schooling system on the intergenerational transmission of education

The birth year of the children in the full sample spans from the 1940s to the 1990s, which is a long period of time, so there may be differences in the intergenerational transmission of education for children of different ages. Children born after 1980 may have been affected by the nine-year compulsory schooling system. In order to examine the heterogeneity of intergenerational transmission of education before and after the nine-year compulsory schooling system, this paper selects a sub-sample of children born in 1980 and later (the population born in 1980, who happened to be in primary school by 1986; and 1986 happened to be the first year of the compulsory schooling system), as well as the regression results of adding interaction terms to the full sample, to infer the impact of the compulsory schooling system on intergenerational transmission of education and thus educational equity.

Specifically, this paper runs the ordered logit model based on a sample of 6413 children born between 1980 and 1998 (the sample affected by the compulsory schooling system) and the marginal effects from the ordered logit model are shown in Table 6. Compared with the marginal effects of full-sample regression in Table 5, a significant change is that 'the turning point' of the marginal impact of

**Table 6**

Marginal effects of factors on children's educational attainment (A sample of children affected by the compulsory schooling system).

Name of variable	Dependent variable: children's educational attainment				
	Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Primary school (Father)	-0.0246*** (0.0040)	-0.0361*** (0.0057)	-0.0327** (0.0053)	0.0176*** (0.0028)	0.0758*** (0.0120)
Junior secondary school (Father)	-0.0353*** (0.0043)	-0.0517*** (0.0060)	-0.0468*** (0.0056)	0.0252*** (0.0030)	0.1086*** (0.0125)
Senior secondary school (Father)	-0.0434*** (0.0052)	-0.0638*** (0.0073)	-0.0576*** (0.0068)	0.0310*** (0.0036)	0.1335*** (0.0151)
Higher education (Father)	-0.0667*** (0.0114)	-0.0977*** (0.0164)	-0.0884*** (0.0150)	0.0476*** (0.0083)	0.2051*** (0.0340)
Primary school (Mother)	-0.0224*** (0.0034)	-0.0328*** (0.0048)	-0.0297*** (0.0044)	0.0160*** (0.0024)	0.0688*** (0.0101)
Junior secondary school (Mother)	-0.0338*** (0.0041)	-0.0495*** (0.0057)	-0.0448*** (0.0050)	0.0241*** (0.0028)	0.1039*** (0.0116)
Senior secondary school (Mother)	-0.0569*** (0.0060)	-0.0834*** (0.0083)	-0.0755*** (0.0073)	0.0407*** (0.0043)	0.1752*** (0.0165)
Higher education (Mother)	-0.0729*** (0.0169)	-0.1067*** (0.0245)	-0.0967*** (0.0221)	0.0521*** (0.0123)	0.2242*** (0.0508)
Eastern region	-0.0248*** (0.0033)	-0.0363*** (0.0047)	-0.0329*** (0.0049)	0.0177*** (0.0023)	0.0762*** (0.0098)
Central region	-0.0128*** (0.0034)	-0.0187*** (0.0049)	-0.0169*** (0.0045)	0.0091*** (0.0024)	0.0393*** (0.0103)
Birth year	-0.0040*** (0.0003)	-0.0068*** (0.0004)	-0.0053*** (0.0004)	0.0028*** (0.0002)	0.0122*** (0.0008)
Gender	-0.0060** (0.0024)	-0.0086** (0.0035)	-0.0078** (0.0032)	0.0042** (0.0017)	0.0181** (0.0074)
Household registration	-0.0492*** (0.0051)	-0.0721*** (0.0072)	-0.0653*** (0.0064)	0.0352*** (0.0040)	0.1515*** (0.0140)
Ethnicity	-0.0452*** (0.0048)	-0.0662*** (0.0066)	-0.0600*** (0.0065)	0.0323*** (0.0034)	0.1390*** (0.0140)
Siblings	0.0033*** (0.0007)	0.0048*** (0.0010)	0.0044*** (0.0010)	-0.0024*** (0.0005)	-0.0101*** (0.0022)
Party (Father)	-0.0152*** (0.0043)	-0.0222*** (0.0062)	-0.0201*** (0.0056)	0.0108*** (0.0030)	0.0466*** (0.0130)
Party (Mother)	-0.0077 (0.098)	-0.0113 (0.0144)	-0.0103 (0.0130)	0.0055 (0.0070)	0.0238 (0.0302)
Industrial/service manual worker (Father)	-0.0067** (0.0033)	-0.0098** (0.0049)	-0.0089** (0.0044)	0.0048** (0.0024)	0.0206** (0.0103)
General non-manual worker (Father)	-0.0175** (0.0071)	-0.0257** (0.0104)	-0.0232** (0.0094)	0.0125** (0.0051)	0.0539** (0.0218)
Advanced non-manual worker (Father)	-0.0187*** (0.0050)	-0.0274*** (0.0073)	-0.0248*** (0.0065)	0.0134*** (0.0036)	0.0575*** (0.0151)
Industrial/service manual worker (Mother)	-0.0200*** (0.0040)	-0.0293*** (0.0058)	-0.0265*** (0.0052)	0.0143*** (0.0029)	0.0615*** (0.0120)
General non-manual worker (Mother)	-0.0259*** (0.0085)	-0.0380*** (0.0124)	-0.0344*** (0.0112)	0.0185*** (0.0061)	0.0798*** (0.0259)
Advanced non-manual worker (Mother)	-0.0236*** (0.0064)	-0.0346*** (0.0093)	-0.0314*** (0.0083)	0.0169*** (0.0046)	0.0727*** (0.0192)

Note: Illiterate/semi-literate parents are used as the control group.

\*\*\* Significant at 1% level.

\*\* Significant at 5% level.

\* Significant at 10% level.

intergenerational transmission of education on children's education has shifted. In the full sample, the marginal effects of the parents' educational attainment on the children's educational attainment of primary school and below are negative, and those on the children's educational attainment of junior secondary school and above are positive; but in the sample affected by the compulsory schooling, the marginal effects on the children's educational attainment of junior secondary school and below are negative and those on the children's educational attainment of senior secondary school and above are positive.

Table 6 follows the analysis in Table 5. Taking mothers as an example: (1) the probability of children receiving senior secondary school, higher education is 4.07% and 17.52% higher than the control group when the mother's educational attainment is senior secondary school; correspondingly, the probability of children receiving senior secondary school, higher education is 5.21% and 22.42% higher than the control group when the mother's educational attainment is higher education; (2) as the mother's educational attainment increases, the probability of her children receiving senior secondary school education, especially higher education, increases significantly. Specifically, the probability of children receiving higher education increases by 6.88%, 10.39%, 17.52% and 22.42% respectively when the mother's educational attainment increases from primary and junior secondary school to senior

secondary school, higher education (rightmost column of Table 6). This is consistent with the trend shown in Table 5, but the marginal effects are significantly larger than those in Table 5. This means that the compulsory schooling system reinforces the intergenerational transmission of education at higher levels of education, while also reflecting the “bottom-line” role of compulsory education, which guarantees 9 years of education for all and thus promotes equity in 9 years of compulsory education, but at the same time, competition at higher levels of education, such as a senior secondary school, higher education, may become more intense; (3) When mothers have educational attainment of senior secondary school, higher education, the impact on their children’s access to higher education is significantly greater than that of fathers (rightmost column of Table 6, 17.52% > 13.35%; 22.42% > 20.51%). This is consistent with the analysis in Table 5, but also implies that the intergenerational transmission of education has been reinforced at the level of children’s access to higher education since the implementation of the compulsory schooling system.

To further examine the impact of the compulsory schooling system on the intergenerational transmission of education, the dummy variable of “whether affected by the compulsory schooling system (assigned a value of 1 if born in 1980 and later, otherwise assigned a value of 0)” is added to the full-sample ordered logit model, following Zhang & Wan (2018) [20]. And an interaction term for “whether affected by the compulsory schooling system and parents’ educational attainment” is also added. The effect of the compulsory schooling system on the intergenerational transmission of education is reflected in the marginal effect values of the interaction term “whether affected by the compulsory schooling system and parental education”. If the marginal effect is significantly positive, then the compulsory schooling system enhances the intergenerational transmission of education.

In Table 7, we find: (1) the effect of the compulsory schooling system on children’s educational attainment is statistically insignificant and the marginal effect is less than 1%; (2) the marginal effect of the interaction between mother’s junior secondary school education and the compulsory schooling system is statistically significant, and the marginal effect of the interaction on children’s education at junior secondary school, senior secondary school, higher education is around 1%; (3) The interaction term between the mother’s education at the higher education and the compulsory schooling system is statistically significant, and the marginal effects on the children’s education at junior secondary school, senior secondary school and higher education are increased by 2.86%, 4.69% and

**Table 7**  
Marginal effect of the introduction of compulsory schooling system on children’s educational attainment (The full sample).

Name of variable	Dependent variable: children’s educational attainment				
	Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Primary school (Father)	−0.0668*** (0.0054)	−0.0167*** (0.0014)	0.0167*** (0.001)	0.0274*** (0.0023)	0.0394*** (0.0033)
Junior secondary school (Father)	−0.0563*** (0.0079)	−0.0141*** (0.0020)	0.0141*** (0.0020)	0.0231*** (0.0033)	0.0332*** (0.0047)
Senior secondary school (Father)	−0.0846*** (0.0107)	−0.0212*** (0.0027)	0.0212*** (0.0027)	0.0347*** (0.0044)	0.0499*** (0.0064)
Higher education (Father)	−0.1050*** (0.0180)	−0.0263*** (0.0045)	0.0263*** (0.0045)	0.0431*** (0.0074)	0.0619*** (0.0106)
Primary school (Mother)	−0.0531*** (0.0063)	−0.0133*** (0.0016)	0.0133*** (0.0016)	0.0218*** (0.0026)	0.0313*** (0.0037)
Junior secondary school (Mother)	−0.0677*** (0.0104)	−0.0169*** (0.0026)	0.0169*** (0.0026)	0.0278*** (0.0043)	0.0399*** (0.0062)
Senior secondary school (Mother)	−0.1296*** (0.0178)	−0.0324*** (0.0045)	0.0324*** (0.0046)	0.0531*** (0.0073)	0.0764*** (0.0105)
Higher education (Mother)	−0.0816*** (0.0330)	−0.0204*** (0.0083)	0.0204*** (0.0083)	0.0334*** (0.0135)	0.0481*** (0.0195)
Interaction (primary school and the policy) (Father)	0.0009 (0.0116)	0.0002 (0.0029)	−0.0002 (0.0029)	−0.0004 (0.0048)	−0.0005 (0.0069)
Interaction (junior secondary school and the policy) (Father)	−0.0404*** (0.0133)	−0.0101*** (0.0033)	0.0101*** (0.0034)	0.0166*** (0.0054)	0.0238*** (0.0078)
Interaction (senior secondary school and the policy) (Father)	−0.0294* (0.0166)	−0.0074* (0.0041)	0.0074* (0.0042)	0.0121* (0.0068)	0.0174* (0.0097)
Interaction (higher education and the policy) (Father)	−0.0774** (0.0339)	−0.0194** (0.0085)	0.0194** (0.0086)	0.0317** (0.0139)	0.0457** (0.0200)
Interaction (primary school and the policy) (Mother)	−0.0139 (0.0107)	−0.0035 (0.0027)	0.0035 (0.0027)	0.0057 (0.0044)	0.0082 (0.0063)
Interaction (junior secondary school and the policy) (Mother)	−0.0296** (0.0143)	−0.0074** (0.0036)	0.0074** (0.0036)	0.0121** (0.0058)	0.0174** (0.0084)
Interaction (senior secondary school and the policy) (Mother)	−0.0257 (0.0225)	−0.0064 (0.0056)	0.0064 (0.0056)	0.0105 (0.0092)	0.0152 (0.0132)
Interaction higher education and the policy) (Mother)	−0.1144** (0.0542)	−0.0286** (0.0136)	0.0286** (0.0136)	0.0469** (0.0223)	0.0675** (0.0319)
policy	−0.0125 (0.0100)	−0.0031 (0.0025)	0.0031 (0.0025)	0.0073 (0.0041)	0.0073 (0.0059)

Note: Illiterate/semi-literate parents are used as the control group. See Appendix Table A3 for the marginal effect values for the other variables.

\*\*\* Significant at 1% level.

\*\* Significant at 5% level.

\* Significant at 10% level.

6.75% respectively. Considering the main effects on the children's education at junior secondary school (2.04%), senior secondary school (3.34%) and higher education (4.81%) when the mother's education is at higher education, the overall effects are significantly higher than the marginal impact on children's education at junior secondary school (3.07%), senior secondary school (5.47%) and higher education (7.97%) in Table 5 when the mother has a higher education. This implies, to some extent, that compulsory schooling system reinforces the intergenerational transmission of education at higher levels of education. This is consistent with the findings in Table 6.

The results suggest that the compulsory schooling system may have promoted educational equity at the compulsory level, but that the compulsory schooling system reinforces the intergenerational transmission of education at higher levels of education and does not promote educational equity at higher levels of education. We find evidence supporting Hypotheses 2 and 3. Since the compulsory schooling system is designed to guarantee the most basic right to education, higher educational opportunities do not increase as a result. Conversely, if the compulsory schooling system reinforces the belief of lower-educated parents that their children need only to complete the compulsory education stage and not to pursue higher levels of education, then the compulsory schooling system may make it more difficult for the lower-educated to cross over from junior secondary school to senior secondary school.

### 5.3. Robustness

#### 5.3.1. Alternative samples

The robustness tests in this paper focus on the segmented sample (the composition of the sample). Considering that the retired population may be heterogeneous from the rest of the population. The first robustness test of this paper is to select 16,819 samples of the non-retirement population in 2018, that is, children born in 1959–1998, and perform the ordered logit model. The marginal effects of the ordered logit model are shown in Table 8. (1) The marginal effect value after excluding the retirement sample is slightly larger than the marginal effect value of the full sample in Table 5. This is because the children born before 1958 experienced unfavorable economic and social conditions, and the educational attainment of the children and their parents is not too high overall. After removing this sample, the estimated intergenerational transmission of education will be enhanced. (2) The results of other variables marginal effect in Table 8 are generally consistent with those in Table 5. Parental educational attainment has a positive effect on children's educational attainment; the higher the educational attainment of the parents, the greater the probability that the child will receive a senior secondary school, higher education; and the mother's educational attainment has a greater effect on the child's educational attainment than the father's. This result implies that the ordered logit model results for the full sample are robust.

#### 5.3.2. Controlling self-effort

Considering that the educational attainment of children is not only influenced by their parents and their families, but also by their own efforts. When the two are correlated, this may result in biased estimates of the intergenerational transmission of education. Following Romer (1993, 1998), Roemer et al. (2003), Checchi & Peragine (2010), Zou & Ma (2019) [24,45–48], a measure of 'effort' is introduced in the ordered logit model.

An individual's "effort" is measured in the following way in equation (8):

$$\text{Effort} = (\text{Years of schooling for children} - \text{Average years of schooling for their children's peers})$$

**Table 8**

The marginal effect of parental education on children's educational attainment (Children born 1959–1998).

Name of variable	Dependent variable: children's educational attainment				
	Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Primary school (Father)	−0.0513*** (0.0045)	−0.0256*** (0.0023)	0.0075*** (0.007)	0.0257*** (0.0023)	0.0437*** (0.0040)
Junior secondary school (Father)	−0.0688*** (0.0056)	−0.0343*** (0.0028)	0.0100*** (0.0010)	0.0345*** (0.0028)	0.0586*** (0.0048)
Senior secondary school (Father)	−0.0845*** (0.0071)	−0.0422*** (0.0036)	0.0123*** (0.0013)	0.0424*** (0.0036)	0.0720*** (0.0062)
Higher education (Father)	−0.1283*** (0.0141)	−0.0640*** (0.0071)	0.0187*** (0.0024)	0.0644*** (0.0072)	0.1093*** (0.0119)
Primary school (Mother)	−0.0488*** (0.0046)	−0.0244*** (0.0023)	0.0071*** (0.0008)	0.0245*** (0.0023)	0.0416*** (0.039)
Junior secondary school (Mother)	−0.0736*** (0.0062)	−0.0368*** (0.0031)	0.0107*** (0.0012)	0.0369*** (0.0031)	0.0627*** (0.0052)
Senior secondary school (Mother)	−0.1288*** (0.0097)	−0.0643*** (0.0049)	0.0187*** (0.0020)	0.0646*** (0.0049)	0.1096*** (0.0081)
Higher education (Mother)	−0.1190*** (0.0228)	−0.0594*** (0.0114)	0.0173*** (0.0036)	0.0597*** (0.0115)	0.1014*** (0.0193)

Note: Illiterate/semi-literate parents are used as the control group. The marginal effect values for the other variables (see Appendix Table A4) are not presented for reasons of space.

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level.

$$-(\text{Years of schooling for mothers} - \text{Average number of years of education for mothers'peers}) \quad (8)$$

The first component measures the additional educational attainment of the child, the second component measures the additional educational attainment of the family background, and the subtraction of the two represents the additional educational attainment of the child through his or her own effort. The effort variable can be either positive or negative, with a higher positive value indicating that the child has worked harder.

Excluding the samples with missing mother's year of birth, this paper conducts the ordered logit model with the variable of "effort" on 5,799 samples born from 1980 to 1998. The marginal effect results are shown in Table 9. When the mother's education attainment is senior secondary school, higher education, her children are 3.73% and 4.76% more likely to receive a senior secondary school education as the educational attainment, and 18.72% and 23.87% more likely to receive an higher education (very similar to the marginal effects in Table 6). The 'turning point' for the effect of each variable on children's educational attainment is also between the 'junior secondary school' and 'senior secondary school'. The results suggest that the ordered logit model results for the samples of children affected by compulsory schooling system are robust.

## 6. Conclusion and insights

Based on the micro-data from the China Family Panel Studies 2018, this paper uses the ordered logit model to examine the marginal effects of parents' educational attainments on their children's educational attainments, and explore furtherly whether the nine-year compulsory schooling system promotes educational equity from the perspective of intergenerational transmission of education. The paper finds that: (1) parents' educational attainments positively influence their children's educational attainments. The higher the educational attainments of parents, the higher their children's educational attainments; (2) mothers' educational attainments positively influence their children's educational attainments more than that of fathers'; (3) The compulsory schooling system shifts up the 'turning point of the marginal effect of intergenerational transmission of education on children's education from junior secondary school to senior secondary school. Before the implementation of the compulsory schooling system, the marginal effects of parents' educational attainments on their children's educational attainments convert from a negative-value at primary school and below into a positive-value at junior secondary school and above. After the implementation of the compulsory schooling system, the marginal effects of parents' educational attainments on their children's educational attainments convert from a negative-value at junior secondary school and below to a positive-value at senior secondary school or above. In other words, the compulsory schooling system does promote educational equity in the compulsory education level, but it does not guarantee educational equity at higher education levels. (4) The full-sample ordered-logit regression results show that the probability of children receiving university education increases by 8.89% and 7.97% when the mother's education level is senior secondary school and university, respectively. While shifting to examine the sample group of school-age children affected by the implementation of the compulsory schooling system, the probability of children receiving university education increases by 17.52% and 22.42% when the mother's education level is senior secondary school and university, respectively. The regression results for the interaction term between parental education and compulsory education, as well as the regression results for the sample group of children affected by compulsory schooling system after the inclusion of 'effort',

**Table 9**  
Marginal effect of parents on children's education level after adding "effort" (Samples of children affected by compulsory schooling system).

Name of variable	Dependent variable: children's educational attainment				
	Illiterate/Semi-literate	Primary school	Junior secondary school	Senior secondary school	Higher education
Primary school (Father)	-0.0252*** (0.0040)	-0.0387*** (0.0060)	-0.0384*** (0.0061)	0.0170*** (0.0027)	0.0853*** (0.0133)
Junior secondary school (Father)	-0.0347*** (0.0042)	-0.0534*** (0.0062)	-0.0530*** (0.0064)	0.0234*** (0.0028)	0.1176*** (0.0137)
Senior secondary school (Father)	-0.0438*** (0.0053)	-0.0674*** (0.0076)	-0.0669*** (0.0077)	0.0300*** (0.0035)	0.1485*** (0.0165)
Higher education (Father)	-0.0677*** (0.011)	-0.1041*** (0.0166)	-0.1033*** (0.0165)	0.0457*** (0.0077)	0.2293*** (0.0358)
Primary school (Mother)	-0.0196*** (0.0034)	-0.0302*** (0.0050)	-0.0300*** (0.0050)	0.0133*** (0.0022)	0.0666*** (0.0110)
Junior secondary school (Mother)	-0.0317*** (0.0040)	-0.0487*** (0.0059)	-0.0484*** (0.0056)	0.0214*** (0.0026)	0.1073*** (0.0125)
Senior secondary school (Mother)	-0.0553*** (0.0060)	-0.0850*** (0.0086)	-0.0844*** (0.0082)	0.0373*** (0.0041)	0.1872*** (0.0178)
Higher education (Mother)	-0.0704*** (0.0162)	-0.1083*** (0.0245)	-0.1075*** (0.0243)	0.0476*** (0.0112)	0.2387*** (0.0530)
Effort	-0.0001 (0.0003)	-0.0002 (0.0004)	-0.0002 (0.0004)	0.0001 (0.0002)	0.0005 (0.0009)

Note: Illiterate/semi-literate parents are used as the control group. The marginal effect values for the other variables (see Appendix Table A5) are not presented for reasons of space.

\*\*\* Significant at 1% level.

\*\* Significant at 5% level.

\* Significant at 10% level.

further confirm that the compulsory schooling system reinforces the intergenerational transmission of education.

The implementation of the nine-year compulsory schooling system in China has demonstrated the achievements in improving human capital quality. This paper finds that the nine-year compulsory schooling system strengthens the intergenerational transmission in the higher level of education, showing that the compulsory schooling system may not promote equity in the higher level of education, supporting further education reform. To promote educational equity and enable the newly added urban labor force to receive more senior secondary school education or even higher education, it is necessary to extend years of compulsory education (12-year compulsory education), or increase substantially the total enrollment rate in senior secondary school and university education, and continue to implement policies supporting education in rural areas.

Limited by data, this paper also has some limitations. Firstly, this paper can't accurately distinguish the differences in influence of compulsory education system on intergenerational transmission of education in urban and rural areas. Although this paper uses the location of household registration at age 12 as a control variable, the type of household registration at age 12 is not fully representative of geographic position children receive education. Because there is population movement between urban and rural areas in China, many parents with agricultural household registration may bring their children to work in the city, that is to say, their children receive good education in city despite their household registration being in rural area. Therefore, the available data cannot accurately distinguish whether children are educated in urban or rural areas. Secondly, the China Family Panel Studies (CFPS2018) used in this paper only measures parents' education by their level of education or years of education, and lacks data on education quality received by parents. The quality of education is also an important dimension of educational attainment. Parents with higher quality education are more likely to know how to cultivate their children with good learning habits and efficient learning methods, and furtherly have an impact on their children's educational attainments, therefore influencing the intergenerational transmission of education.\

#### Author contribution statement

Zhongbin Chen; Yongqi Zhang; Hongjie Yuan: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

#### Data availability statement

Data will be made available on request.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e18933>.

All the authors declare that they have no competing interests that relate to the research described in this paper. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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