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How does family background affect children's educational achievement? Evidence from Contemporary China

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Abstract

Education is a lasting process. Academic performance in primary education plays a crucial role in obtaining further educational opportunities. Thus, it is necessary to examine how family background affects children's academic achievement at an early stage. Through analysis of data from the Chinese Family Panel Study in 2010 (CFPS2010), this paper proposes two pathways through which family influences children's academic performance. Firstly, parents compete for high-quality educational opportunities for their children and better educational opportunities lead to better academic performance. Secondly, parenting behavior and educational support for their children could cultivate children's learning habits and affect academic performance. We also find urban students' academic performance are more heavily affected by their families' socioeconomic status compared with rural students. These findings bear important implications for how to reduce the class difference in students' academic performance and promote educational equity in contemporary China.

Keywords: Family Background, Education Opportunity, Parental Participation, Academic Achievement

Introduction

Education is the basic mechanism for enhancing the population quality of a nation, and education during childhood is the foundation for the formation of human labor-force quality. Childhood education not only affects the achievement and happiness at the individual level, but also shapes the labor force quality and capacity of innovation (Heckman 2011) to determine the potentiality of the development of a nation. With the spread of enforcement of compulsory education and the expansion of schools across China, the average schooling years of Chinese citizens has been improved significantly. In spite of this, due to the scarcity of educational resources and its unequal distribution, various conditions of education inequality has yet to be addressed and improved (Yang 2006). As a response, the national Council executive meeting of 2010 has passed the *National Mid-and-long Term Education Development and Reform Plan*, targeting "enhance educational equality, develop equal education opportunities that benefits the whole population", which is listed among the most significant strategic development goals of the nation.

On the one hand, educational (in) equality may be rooted in institutional arrangement, i.e., its role of smoothing or even hampering the effect of family with different social economic status on educational opportunities. On the other hand, educational (in) equality is shaped by the different opportunities and capacities that families have in participation in education. Therefore, the relationship between family background and educational achievement has become a critical indicator in evaluating educational (in) equality. Past studies showed that since the Open and Reform of China, family social economic status has become increasingly important in determining personal education achievement, which has not been dampened with the expansion of schools (Deng and Treiman 1997; Zhou et al. 1998; Li 2003, 2010; Li 2006; Liu 2008; Wu 2009; Wu 2013a; Li 2016).

Existing research has mostly focused on the impact of family background on the eventual education attainment, especially the attainment of higher education, but it is worth noticing that education attainment is a continuous process in which the education achievement of the prior stage affects the later-stage achievement both cumulatively and probabilistically. Without access to high-qualified primary school and middle school education, one barely has much chance to proceed to higher education. The continuous and accumulative nature of education means that the competition for educational opportunities of individuals initiates ever since the primary school and middle school stages. Therefore, without a thorough analysis of the educational processes, it is difficult to fully understand the mechanisms of how family background affects children's educational opportunities and academic achievement. Moreover, there will be straight-forward policy implications to explore the relationship between academic achievement and family background from the starting point—the phase of compulsory education.

The goal of compulsory education is to ensure the equality at the starting point of one's education, and its compulsory and equal nature should in theory guarantee that the impacts of family background on the children's school entering to be the lowest. However, because of the scarcity of high school and college opportunities in current education system of China, academic achievement has remained the primary standard of educational selection. So in fact, the education attainment of individuals is highly related to their academic achievement of each stage. Therefore, the equality of compulsory education should not only be reflected on its equal opportunities of school entering, but also its independence of family background.

In fact, not only that the school quality may affect students' academic achievement during compulsory education, but also the ways and abilities of the participation of parents in their children's compulsory education may directly affect students' academic achievement. Distinctive from past research which focuses on the effect of family background on the final education attainment, this paper concerns through what mechanisms and paths that family background affects the children's academic achievement during the compulsory education period.

Literature review

Families affect children's learning behaviors and academic achievement in important ways, as they are the primary and most significant environments that the children are exposed to. Coleman's report (1966) shows that families may play even more important roles in student's academic achievement than schools and communities. Since then, the line of empirical research on family background and children's achievement has found

that the family social economic statuses may affect children's academic achievements more than the impact of schools (Coleman et al. 1966; Peaker 1971; White 1980; Sirin 2005; Cheadle 2008). The Coleman's hypothesis has been supported by some research and fieldworks based on some Chinese provinces and cities too. For instance, Fang and Feng (2008) found that the family's social economic status affects children's academic scores significantly using the survey data of the middle school students of Nanjing. Sun et al. (2009) found a significant positive effect of the parent's income and educational levels on the academic achievement of primary school students based on a Longitudinal Survey of Families and Children in Gansu province.

Studies have explored the mechanisms of families affecting children's academic achievement based on the study of Coleman, from the human capital theory, cultural capital theory and social capital theory and so on. The human capital theory claims that education is an important human capital investment, where the "cost-benefit" framework is the primary principles for families to make educational investment decision, and the difference in children's educational achievement is mainly caused by the difference of family educational investment. Because of the limitation of family resources, parents of poor families usually are not able to invest sufficiently in their children's education, which affects their children's academic achievement (Becker 1964). Gross (1993) showed that students' cognitive skills are positively related to their parents' socioeconomic status.

The cultural capital theory stresses that family cultural resources and environment determine children's educational aspirations and performances. Compared to families with insufficient cultural capital, parents with rich cultural capital are more aware of the rules of schools, invest more cultural resources, pay more attention to cultivate the children's educational aspiration and interest, help children with school curriculum, and enable them to perform in academics outstandingly (Bourdieu and Passeron 1990). Sewell and Hauser (1993) showed that parents' educational expectations have significant effects on junior students' academic performances. Social capital theory emphasizes the participation of parents in education and children's learning behaviors and achievement; parents with higher social economic status usually participate in their children's learning activities more intensively, pay more attention to communication with teachers, manage the children's school absence and other risky behaviors, and improve the children's academic performance (Coleman 1988). Empirical studies showed that parental educational participation, such as discussing school things with children, checking their homework, and participating in school activities, could improve children's academic performances (Pong et al. 2005).

Due to the heterogeneity of allocation of educational resources across rural and urban areas, districts, and schools, when talking about the relationship between family background and educational achievement of children in China, scholars also regard the school quality as an important factor. The outstanding teaching resources and peers that concentrate in key schools have important impacts on the accessibility of educational opportunities of the next stage for children. Families with higher social economic status can make use of their advantages to gain access to better education opportunities for their children, to enhance their possibilities of obtaining higher education (Li 2006; Liu 2008; Zhao and Hong 2012). Research shows that the parental social economic status can affect their children's schooling quality significantly. The higher the social

economic status of a family, the better schools their children attend (Wen 2006; Chen and Fang 2007; Li 2008; Wu 2013b).

In spite of the different theoretical perspectives, most research pays attention to the paths and mechanisms of how the social economic status of a family affects the children’s academic achievements. Among these, human capital theory stresses the role of the economic resources of family and educational investment in children’s education, cultural capital and social capital theory pays more attention to the role of parent’s educational level and participation on children’s academic performance, and the perspective of school quality argues that the social economic status of a family affects children’s academic performance and chance of continuing schooling through affecting school qualities.

Actually, the impacts of any type of factors cannot exist independently. All family economic resources, family environment and school qualities are important. The issue is that all of them are exogenous factors which only take effect through students’ behaviors, i.e., through children’s academic achievements.

Analysis framework and research hypothesis

Based on existing studies, this article aims to explore the mechanisms and paths of the impact of family socio-economic status on the children’s academic achievement at the microlevel. Through the organizing of existing literature, combined with the situation of education in China, the following analysis framework (Fig. 1) is proposed.

The daily experience shows that the impact of family socio-economic status on children’s academic achievement is not direct, but rather through the following two paths:

First, families with relatively high socio-economic status will strive to secure quality educational opportunities for their children, such as those provided by key schools and markets in the system, which in turn will affect their academic achievements. The key schools, which have excellent teachers and students, not only have a direct impact on their differences in academic achievement, but also affect their learning attitudes and behaviors through teachers and peers, thereby affecting their academic achievement and further educational opportunities.

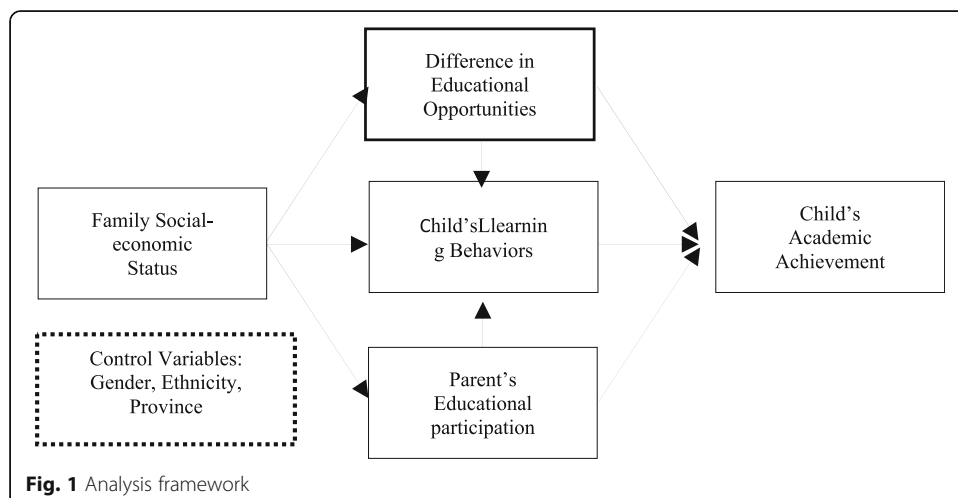


Fig. 1 Analysis framework

In addition, the development of the education and private tutor market that are related to primary and secondary education provides alternatives and supplements to formal school education. Families with better economic conditions can purchase additional educational products and services for their children (such as home tutoring and tutoring classes), thus consolidating the influence of family SES on children's academic achievement.

Second, family socio-economic status affects children's learning behavior and academic performance by affecting parents' educational expectations towards children and their educational participation. Parents' educational expectation and behavioral support for children are, to a certain extent, also affected by their socio-economic status, resources, and ability. There are significant differences in the educational support that families of different resources can provide. Parents' behavioral support for their children's education (such as checking homework, discussing school conditions, etc.) can foster the formation of good study habits of children and influence their academic performance (Steinberg et al. 1992; Fan and Chen 2001; Zhao and Hong 2012).

Based on the discussions, this paper proposes four research hypotheses.

Hypothesis 1: Family socioeconomic status has an important impact on the quality of the educational opportunities that children have access to. The higher the family's socioeconomic status, the higher the qualities of children's educational opportunities attend.

Hypothesis 1a: Controlling other variables, the higher the family's socioeconomic status, the higher the quality of children's school attendance.

Hypothesis 1b: Controlling other variables, the higher the family's socioeconomic status, the more educational services children receive from the market.

Hypothesis 2: Parents' participation in their children's education is affected by their socioeconomic status. The higher the family's socioeconomic status, the higher the degree of participation in education for their children is.

Hypothesis 3: Parental education participation and the quality of children's educational opportunities affect children's learning attitude and behavior.

Hypothesis 3a: Controlling other variables, the better the school quality the children attend, the more active their learning behaviors are.

Hypothesis 3b: Controlling other variables, the more parental education is involved, the more active the children's learning behaviors are.

Hypothesis 4: Parental participation in children's education and the quality of children's educational opportunities affect their academic achievement.

Hypothesis 4a: Controlling other variables, when the level of parental education participation is higher; the children's academic performance is better.

Hypothesis 4b: Controlling other variables, the better the quality of the school the children attend, the better their academic performance is.

Hypothesis 4c: Controlling other variables, the more educational services children receive in the market, the better their academic performance is.

Data, measurement, and methods

Data

The data in this paper is from the Chinese Family Panel Studies 2010 baseline survey data (CFPS2010). CFPS2010 covered 14,960 households in 25 provinces, municipalities, and autonomous regions in China involving three questionnaire surveys for each

household: namely the family questionnaires, adult questionnaires for those aged 16 and above, and the children's questionnaires for those aged 16 and under. The children's questionnaire was divided into the part reported by the parents and by the part by children themselves (10–15 years old). The research object of this article is children aged 10–15 years who are having compulsory education and who have filled in self-administered questionnaires. We matched the data obtained from the children's questionnaire with the data from the family and parent questionnaires while removing samples containing missing variables. Finally, we obtained 2750 cases for analysis in the paper.

Measurement

Family SES is one of the key explanatory variables of this article. The following three indicators were used in the analysis for measurement. The first indicator is the net income of households per capita in 2009; the second is the years of education of the father; the third indicator is the years of education of the mother.

Parental participation in their children's education is an important mediator of the influences of family SES on the academic achievement of children. In the surveys, four interview questions were engaged to measure the parents' participation in their children's education. First, "when the child is learning, will you always cease watching your favorite TV programs?" Second, "have you often discussed what happens in school with the child since the beginning of this school year?" Third, "Do you often ask the child to complete his homework?" Fourth, "Do you often check the child's homework?". The measures are ordered from 1 to 5, indicating never, rarely (once per month), occasionally (1–2 times per week), frequent (2–3 times per week), and very often (6–7 times a week). In the multiple regression analysis, we took the average of these measures as the value of parents' educational participation for analysis.

The quality of the school that children attend has a very important influence on their learning behavior and academic achievement. Four measurements were used to measure the quality of children's school attendance: first, children's satisfaction with the school; second, children's satisfaction with the class advisor; third, children's satisfaction with the Chinese teacher; and fourth, children's satisfaction with the Mathematics teacher. The scale of these indicators ranged from 1 to 5. The higher the value means the higher level of the satisfaction. In the multiple regression analysis, we take the average of these four as the value of the school quality. Although the subjective evaluation of children may not fully reflect the quality of the school they attend, it still reflects to a great extent their perception and evaluation of the quality of the school. We look forward to further studies that can make up for the deficiencies in the school's quality measurement in this paper.

The educational services that children received in the market are measured by the following two indicators: first, whether the children participated in a remedial class in the previous semester, and, second, children's extracurricular tutoring/tutoring expenditures last year.

The measurement of children's learning behavior, including their daily learning habits, was surveyed with the following four interview questions. First, "I study very hard"; second, "I concentrate on learning in class"; third, "I only play after completing my homework"; and fourth, "I check it several times to make sure it is correct after

finishing my homework.” The measurements of the variable range from 1 to 5, representing very disagree, disagree, neutral, agree, and agree very much respectively.

The measurement of children’s academic achievement involves two types of indicators. First, the parental assessments of language and mathematics scores, which were surveyed with “What do you know about the language/mathematics scores of your child last semester”. It is an ordinal variable ranging from 1 to 4, with 1 poor, 2 medium, 3 good, and 4 excellent. The second category includes the CFPS2010 benchmark scores of children’s words and math ability, with the degree of difficulty adjusted based on the level of children’s education. The scores were standardized according to the province of the child and the grade of enrollment in the analysis.

In studies of the relationship between children’s academic achievement and family background, the ranking of family socio-economic status is usually measured at the national level. It is necessary to pay special attention to the fact that the opportunities of secondary education for children in China are rather regional, and the selection of middle schools from elementary schools, of high schools from middle schools, and of colleges from high schools is implemented based on the regional (county, city, and province) processes gradationally. The access to educational opportunities at a higher level does not depend on the children’s ranking at the national level, but on their relative location within the region. In the same way, their competitors are also not country-level students but the peer group in that specific region.

Therefore, both the influence of family background and the measurement of academic achievement should be relative and regional based. In the multiple regression analysis, we controlled the regional differences in children’s academic achievement and family socioeconomic status by adding provincial dummy variables. In the structural equations, we also standardized measures such as children’s academic achievements, remedial class expenses, and family socioeconomic statuses according to provinces and grades, that is, controlling for the differences in grades and regions in the analysis. For that, the control variables also include gender and ethnicity.

Table 1 reports the sample distribution and descriptive statistics of each of the measured and latent variables. In our sample, urban samples took 38.3%, rural samples 61.7%, boys accounted for 50.6%, and girls 49.4%; 63.7% of children enrolled in primary school and 36.3% enrolled in middle school.

Method

To simultaneously estimate the relationship between observable indicators and latent variables and the relationship within these latent variables themselves, structural equation model is used to estimate the relationship between family background variables and children’s academic achievement. Based on the analysis framework (Fig. 1) and research hypotheses of this paper, the structural equation model was set as follows (see Fig. 2). For the corresponding relationship between latent variables and measured indicators, please refer to Table 1.

First, the socio-economic status of exogenous latent variables has a direct impact on children’s quality of school attendance, education services children receiving on market, parental education participation, and children’s academic behavior, and indirectly affects children’s academic achievement. We set the socio-economic status of the family

Table 1 Descriptive statistics of the main variables ($N = 2750$)

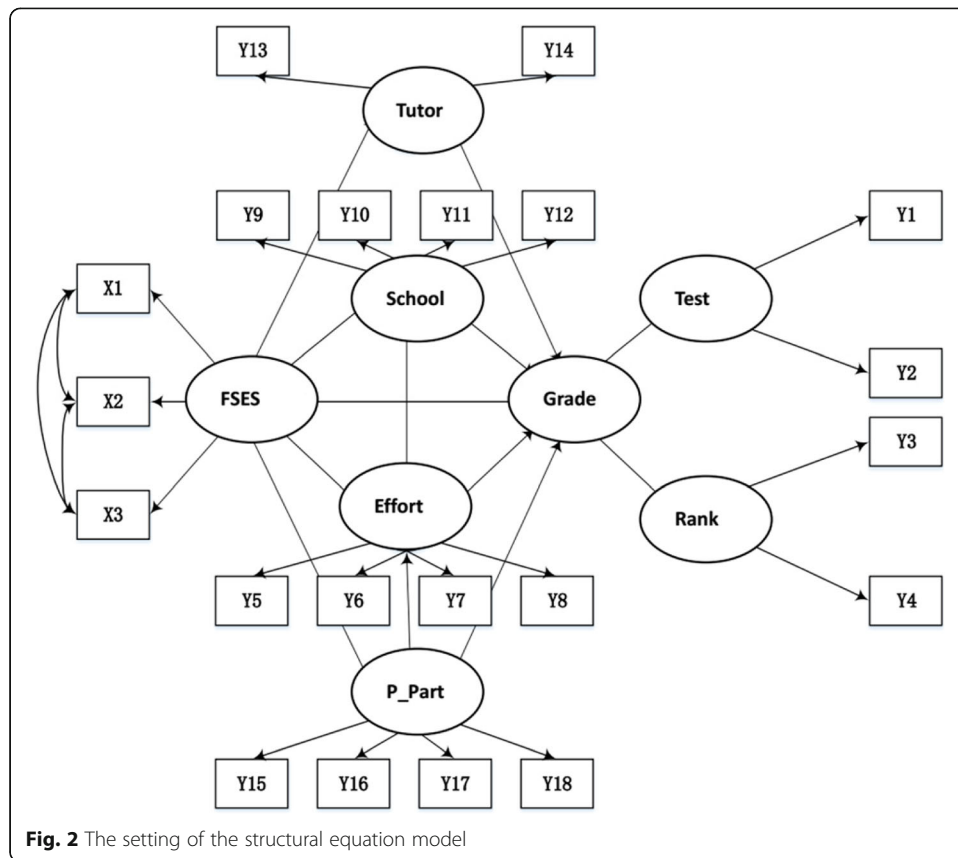
Latent variables	Indicators	Mean/ proportion	SD
Basic test (TEST)	Y1 word test score(0–34)	21.709	7.076
	Y2 numeric test score(0–34)	11.138	4.394
Rank of performance (RANK)	Y3 rank of Chinese test score reported by parents(1–4)	2.701	.936
	Y4 rank of Math test score reported by parents(1–4)	2.642	1.006
Learning behaviors (Effort)	Y5 Working hard(1–5)	3.475	.872
	Y6 Concentration on class(1–5)	3.671	0.813
	Y7 Play only after finishing homework (1–5)	3.300	.993
	Y8 Check answers after finishing homework(1–5)	3.646	.896
School quality (School)	Y9 Satisfaction with the school(1–5)	3.838	1.028
	Y10 Satisfaction with the class advisor(1–5)	4.161	.969
	Y11 Satisfaction with Chinese teacher(1–5)	4.163	.963
	Y12 Satisfaction with Math teacher(1–5)	4.134	.959
Educational service (Tutor)	Y13 whether or not attended tutoring class(1 = yes)	.138	.345
	Y14 Tutoring class expenditure	1.547	2.751
Parent participation (P_Part)	Y15 Stop watching TV when the child is studying(1–5)	3.448	1.310
	Y16 Discuss situations in school with the child(1–5)	3.086	1.187
	Y17 Always require the child to finish homework(1–5)	3.916	1.040
	Y18 Always check answers of homework for the child(1–5)	2.882	1.378
Family social-economic status(FSES)	X1 log of mean family income per capita	8.338	.979
	X2 Father's years of education	6.841	4.297
	X3 Mother's years of education	5.238	4.583
Demographic variables	X4 urban(1 = urban;0 = rural)	.383	.486
	X5 Gender(1 = boy;0 = girl)	.506	.500
	X6 Ethnicity(1 = Han;0 = Minority)	.895	.306
	X7 Level of education(1 = middle school;0 = primary school)	.363	.481

as the only exogenous variable other than gender, ethnicity, and region. Past research shows that parents' parenting style, the quality of children's school, and children's own educational expectations and learning behaviors are all affected by the socio-economic status of the family extensively.

Second, key schools typically have excellent teachers and students, which not only has a direct impact on children's academic achievements, but also affects their learning attitudes and behaviors through teachers and peers. We propose that the quality of children's school and parental education participation can directly affect children's academic achievement and can also have an indirect effect on children's academic achievement through the mediator of children's academic behavior.

Third, there is no direct measure for latent variable children's academic achievement in Fig. 2. Instead, in the model, it is regarded as a high-level latent variable measured by the children's benchmark test (Test) and performance ranking (Rank).

Fourth, as it can be arbitrary to assume the correlation between the measurement error terms of the variables which is to be adjusted according to LISREL, it is assumed that the error terms of all endogenous variables are not relevant.



Fifth, the urban-rural differences in the mechanisms of family background affecting children’s academic achievement are examined by comparing the urban sample with the rural sample.

Multiple regression analysis results

Table 2 reports the results from the multiple regression analysis of the children’s words and math benchmark test scores. Model 1, model 2, model 3, model 4, and model 5 respectively control for the urban and rural areas, family socioeconomic status, and parental education participation scores.

In terms of urban-rural differences in children’s academic achievement, model 1 shows that after controlling for variables such as provinces, grades, and ethnicities, urban children’s benchmark scores are 0.755 units higher than those in rural areas. As the mean value of children’s benchmarks is 21.775 and the standard deviation is 7.706, the urban-rural difference in children’s academic achievement accounts for about 0.1 standard deviation. After controlling the household per capita income and years of education of parents, model 2 shows that the difference between children’s benchmark scores in urban and rural areas is statistically insignificant. This shows that the difference between urban and rural areas is largely due to differences in the socio-economic status of the family.

The results of model 2, model 3, model 4, and model 5 consistently show that the family’s socioeconomic status, parental education participation, whether children attend tutorial classes, the quality of children’s school, and the extent of children’s learning

Table 2 The multiple regression analysis of the children's benchmark test scores

	Model1	Model 2	Model 3	Model 4	Model 5
Urban (control group: rural)	.775*** (.147)	.247 (.155)	.108 (.159)	.083 (.158)	.114 (.158)
Parental education years		.139*** (.018)	.120*** (.018)	.116*** (.018)	.118*** (.018)
Log of family per capita income		.290*** (.076)	.270*** (.076)	.251*** (.076)	.260*** (.075)
Score of parental educational participation			.283*** (.083)	.250*** (.082)	.219*** (.083)
Whether attended tutorial class			.456** (.210)	.461** (.209)	.462** (.208)
Score of school evaluation				.641*** (.110)	.565*** (.112)
Score of children's effort					.377*** (.106)
Constant	4.921*** (1.436)	1.489 (1.544)	.828 (1.563)	-1.046 (1.587)	-2.193 (1.616)
Other controls	Yes	Yes	Yes	Yes	Yes
R square	.573	.587	.589	.595	.596
Sample size	2750	2750	2750	2750	2750

(1) SE is reported in brackets. (2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (3) Other control variables include gender, grade, ethnicity, and province dummy variables

efforts all have significant effect on the academic achievement of primary and secondary school students.

The results of the full model (model 5) show that the higher the family's socioeconomic status, the better children's academic achievement: for every 1 year of increase in parental education, the child's benchmark score will increase by 0.118; for every 1% increase in household income, the child's benchmark test score will increase by 0.26. The higher the parental education participation scores (such as checking homework, discussing school issues, etc.), the better the children's academic performance achieved. In terms of the impact of educational opportunities on children's academic achievement, the quality of children's school attendance, and the educational services provided by the market (whether attended a remedial class) have significant positive effects on academic performance. The more satisfied the child is with the school, the higher the score of the benchmark test. Controlling other variables, the benchmark score of the child who participated in the remedial class is 0.46 higher than children who did not attend the tutoring class.

Table 3 further reports on the influence of family socioeconomic status on parental education participation, whether children attend tutorial classes, the quality of children's school attendance and children's learning efforts. Among them, whether the children are on the tutorial class is analyzed with a binary logistic regression approach, and the rest outcomes are analyzed with multiple regression analysis.

Statistics show that urban families and families with higher socioeconomic status place greater emphasis on children's education participate more in the children's education, are more likely to purchase education services for their children in the market, and strive for quality educational opportunities. In terms of parents' participation in education, urban parents' education participation score is 0.23 higher than that of rural parents. For every 1-year increase in years of education of parents, their educational participation score would increase by 0.050. In terms of educational opportunities, urban children are more likely to participate in extracurricular tutorial classes and attend better-quality schools. The incidence of urban children participating in

Table 3 The effect of family SES on mediators

	Parental participation	Whether tutorial class	School quality	Child's effort
City (control group: rural)	.228*** (.036)	1.541*** (.160)	.049* (.027)	-.083*** (.028)
Parent educational years	.050*** (.004)	.136*** (.022)	.010*** (.003)	-.006* (.003)
Log of family income per capita	.009 (.018)	.393*** (.084)	.029** (.013)	-.023* (.014)
Parent educational participation				.081*** (.015)
Evaluation of school				.201*** (.020)
constant	3.006*** (.358)	- 8.075*** (1.389)	3.084*** (.268)	3.042*** (.285)
Other controls	Yes	Yes	Yes	Yes
R square/adjusted R square	.178	.280	.060	.111
Sample size	2750	2750	2750	2750

(1) SE is reported in brackets. (2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (3) Other control variables include gender, grade, ethnicity, and province dummy variables

extracurricular remedial classes was 4.66 ($e^{1.54}$) times higher than that of rural children, and urban children rated their school 0.049 higher than rural children. The level of education of parents and family per capita income both have significant positive effects on children's quality of attending school and participation in tutorial classes.

In terms of children's learning behavior, we found that the higher the family's socioeconomic status, the lower the enthusiasm children have towards learning. The enthusiasm for learning among urban children is significantly lower than that among rural children. And different from family SES, parental education participation and quality of schooling have significant positive effects on children's learning behavior. The higher the degree of parental education participation, the more active the children's learning behaviors are. The better the quality of children's school is, the higher their enthusiasm for learning. This implies that higher family socioeconomic status cannot directly increase children's enthusiasm for learning, but must be mediated by parent's education participation.

Results from the structural equation models

Multiple regression analysis provided preliminary evidence for understanding the influence of family background on children's academic achievement and various mediator variables. However, multiple regression analysis cannot simultaneously analyze the intrinsic relationship among the independent variables. The assumption that all variables are not biased due to measurement error may not be realistically either. To better deal with measurement errors issues and to further clarify how the family background affects children's academic achievement, we introduce structural equation analysis.

The goodness of fit of the structural equation model

The evaluation of the goodness of fit of the structural equation model is a prerequisite for explaining the relationship between the measured and the latent variables. In general, χ^2 , χ^2/df , RMSEA (Residual Error Root Mean Square), GFI (Model Fit Index), and AGFI (Adjusted Model Fit Index) are often used as the main tests of the goodness-of-fit.

χ^2 statistic reflects the differences between the model-estimated covariance matrix E and the sample covariance matrix S. The smaller the χ^2 value is, the better the model fit is. However, the χ^2 value and χ^2/df value are very easily affected by the sample size. With large sample, a slight difference will make χ^2 and χ^2/df to yield significant results. GFI and

AGFI are traditionally used indicators for evaluating the goodness of fit of structural equations. The closer their values are to 1, the better the model fits. RMSEA not only excludes the influence of sample size, but can also perform statistical tests on the values. Therefore, RMSEA is usually used as the primary indicator for evaluating the merits of the model. The smaller the RMSEA value is, the better the model fits. It is generally accepted that RMSEA less than 0.08 is an acceptable model, less than 0.05 is a better model, and less than 0.01 is considered a perfect model (Markus 2012; Kline 2015).

Table 4 reports the goodness of fit of implementing the model in the total sample and subsamples. In the hypothetical model (Fig. 2), the χ^2 value is 676.5, the degree of freedom is 176, and the χ^2/df is 3.8, which meets the general evaluation criteria that χ^2/df is less than 5 in the case of large samples. Besides, the RMSEA is 0.032, with a probability of less than 0.050 being 1, both GFI and AGFI are also closer to 1. According to the results of goodness-of-fit tests with various subsamples, our hypothetical model fits the inherent structure of data quite well.

Table 5 summarizes the relationship between the measured and latent variables. The analysis shows that the factor loading of the measurement index is statistically significant, and the loading of most measurement indexes reaches 0.5. This shows that, overall, the indicators used in the analysis have a high degree of validity, and the latent variables are measured well. It should be noted that in the measurement model, the loading of three measurement indicators is less than 0.5: the loading of children’s mathematics test score is less than 0.5, which indicates that the mathematics test does not reflect the children’s language and math ability well. The loading of parents requiring that their children finishing homework is also less than 0.5, which means that the measurement indicator also does not reflect the parental education participation very well. Although the loading of the log of household per capita income is less than 0.5, but as an exogenous variables, factor loading does not reflect the extent to which the indicator measures the latent variables of family socioeconomic status, but indicate how much the household per capita income can explain the differences in family socioeconomic status. Therefore, it is not a measurement that we focus on. We look forward to further research that can make up for this article’s ambiguity about children’s academic achievement and parental education participation measurement.

Path analysis of family background affecting children’s academic achievement

Figure 3 and Table 6 report the path diagrams and test results of the relationship between the latent variables. Overall, the model specified in this paper explains 1.2% of

Table 4 Goodness of fit tests of the structural equation model

Goodness of fit	All sample	Rural sample	Urban sample	Primary-school sample	Middle-school sample
Chi-square	676.463	384.375	470.936	441.037	386.396
df	176	176	176	176	176
Chi-square/df	3.844	2.184	2.676	2.506	2.195
RMSEA	.032	.026	.040	.029	.035
P(RMSEA < 0.05)	1.000	1.000	1.000	1.000	1.000
GFI	.977	.979	.959	.977	.964
AGFI	.970	.972	.946	.969	.953
Sample size	2750	1697	1053	1755	995

Table 5 Goodness of fit of measured models ($N = 2750$)

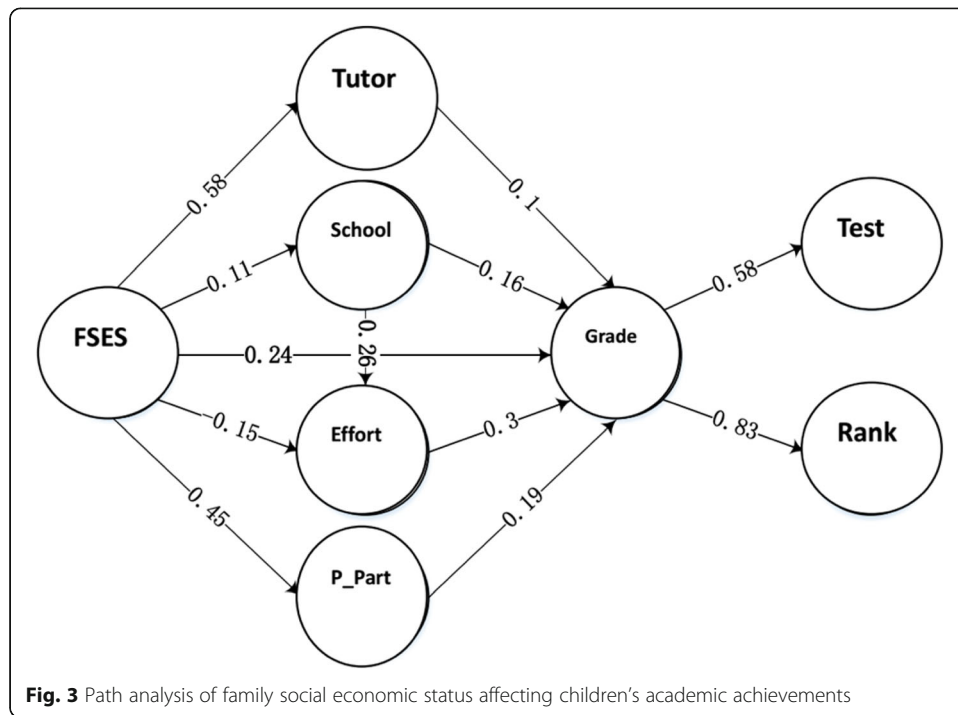
Latent variable	Measured variables	Standardized factor loading	Multiple correlation coefficient
Baseline test (Test)	Y1 word test score	.664	.441
	Y2 math test score	.441(0.044)***	.194
Test score rank (Rank)	Y3 Chinese test score ranking reported by parents	.804(0.035)***	.648
	Y4 Math test score ranking reported by parents	.763(0.033)***	.583
Learning behaviors (Effort)	Y5 Working hard(1–5)	.650	.423
	Y6 Concentration on class(1–5)	.616(0.031)***	.381
	Y7 Play only after finishing homework (1–5)	.519(0.027)***	.270
	Y8 Check answers after finishing homework(1–5)	.505(0.027)***	.256
School qualities (School)	Y9 Satisfaction with the school(1–5)	.533	.284
	Y10 Satisfaction with the class advisor(1–5)	.862(0.034)	.744
	Y11 Satisfaction with Chinese teacher(1–5)	.730(0.029)	.533
	Y12 Satisfaction with Math teacher(1–5)	.548(0.026)	.301
Educational services (Tutor)	Y13 whether or not attended tutoring class(1 = yes)	.667	.445
	Y14 Tutoring class expenditure	.681(0.041)***	.464
Parent educational participation (P_Part)	Y15 Stop watching TV when the child is studying(1–5)	.521	.271
	Y16 Discuss situations in school with the child(1–5)	.573 (0.032)***	.328
	Y17 Always require the child to finish homework(1–5)	.468(0.029)***	.219
	Y18 Always check answers of homework for the child(1–5)	.639 (0.035)***	.408
Family social economic status (FSES)	X1 log of mean family income per capita	.380 (0.022)***	.145
	X2 Father's years of education	.632(0.021)***	.399
	X3 Mother's years of education	.770(0.022)***	.593

(1) The first indicators of the latent variable serve as the reference sale. (2) SEs are reported in brackets. (2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (3) Other control variables include gender, grade, ethnicity, and province dummy variables

the difference in quality of schools that children attend, the 33.3% of the difference in children's access to market education services, 20.3% of the difference in parental education participation, 10.4% of the difference in children's learning behavior differences, and 34.4% of the difference in children's academic achievement. The following shows the relationship from the family socioeconomic status to the mediating variables to the children's academic achievement variables.

Differences in family socioeconomic status and educational opportunities

The scarcity of quality schooling resources makes the competition to be fierce. From Fig. 3 and Table 6, it can be seen that the effect coefficient of family socio-economic status on the quality of school children attending is 0.11 standard units, that is, if the family's socioeconomic status is increased by 1 standard unit, the quality of children's school would be increased by 0.11 standard units. The research hypothesis 1a in this article (the higher the family socioeconomic status, the higher the quality of the children's school) is supported by the data. However, family socio-economic status does not explain the quality of children's schooling to a large extent. The family background



only explains the 1.2% difference in the quality of children's school. This shows that in the compulsory education stage, due to the restriction of the nearest admission principle, the influence of family socio-economic status on children's quality of attending schools is relatively limited, and the difference in the quality of their schooling may be mainly due to factors other than the family, such as differences between urban and rural areas and regional differences. It should be noted that this may be related to our use of household-based survey data and insufficient measurement of school quality.

Table 6 The path coefficients of family SES affecting children's academic achievement (N = 2750)

	Education participation	School quality	Educational services	Learning behaviors	Academic achievement	Baseline test score	Score ranking
Family social economic status(FSES)	.451*** (.032)	.110*** (.025)	.577*** (.032)	-.151*** (.033)	.241*** (.049)		
Educational participation of parents (P_Part)				.213*** (.036)	.185*** (.039)		
School quality (School)				.262*** (.027)	.159*** (.030)		
Educational services (Tutor)					.103** (.042)		
Learning behaviors (Effort)					.295*** (.038)		
Academic achievement (Grade)						.580*** (.038)	.826*** (.57)
R square of the structural equation model (%)	20.3	1.2	33.3	10.4	34.4	33.6	68.3
R square of the reduced equation (%)	20.3	1.2	33.3	.1	15.5	5.2	10.6

(1) Independent variables are listed in the row, and the dependent variables are listed in the column. (2) SEs are reported in brackets. (3) *p < 0.1, **p < 0.05, ***p < 0.01

Unlike the mechanism for obtaining quality school opportunities, the extracurricular remedial class is an education service provided by the market. Families are free to purchase. The mechanisms affecting their acquisition are mainly the market accessibility and family purchase willingness and ability. The results of the analysis support the hypothesis 1b of this study (the higher the family's socioeconomic status, the more likely the child receives educational services in the market). From Table 6, it can be seen that family socio-economic status explained 33.3% of the difference in children's access to market education services, and its standardized effect coefficient was 0.577.

Family socio-economic status and parental education participation

Although parents in China generally have high educational expectations for their children (Ma 2010), parents of different socioeconomic status may provide different behavioral support for their children's education due to constraints in their own abilities and resources (such as discussing what happens in schools with their children and checking the homework for their children).

Figure 3 and Table 6 show that family socio-economic status explains 20% of the difference in parental support for children's education, with a standardized coefficient of 0.45. Even though most parents recognize the importance of education, families with different socioeconomic status may create different learning environments (Zhao and Hong 2012; Wang and Shi 2014). Thus, the hypothesis 2 of this study (the higher the social economic status of the family, the higher the degree of parental participation in the education of the children) is supported by the data.

Family background and children's learning behavior

The development of children's learning behaviors and habits cannot be separated from the influence of the imperceptible and enduring influence of parents. The results of the analysis in Table 6 show that family socioeconomic status has a significant negative impact on children's learning enthusiasm. The higher the family's socioeconomic status, the lower the enthusiasms for learning the children have. Parental education participation has a significant positive effect on children's learning behavior. The more parents participate in education, the more active the children's learning behavior is (hypothesis 3a is supported). Although children's learning behavior is affected to a certain extent by family background, these variables only explain a small part of children's learning behavior differences. A reasonable speculation is that children's learning behavior is more influenced by factors outside the family (schools, communities, peers, etc.).

Differences in educational opportunities and children's learning behaviors and academic achievements

High-quality schools not only have excellent teachers, but also have a good source of students. The quality of the school children attend not only directly affects children's academic achievement, but also affects their learning behavior through teachers and peers. From the analysis with results shown in Table 6, the quality of the children's school not only has a significant positive effect on their academic achievement (hypothesis 4b that the higher the quality of the child's school, the better his/her academic performance is supported), but also positively affects their learning behavior (hypothesis 3b

the better the quality of the children’s school, the more active is their learning behavior) is supported by the data. The analysis also shows that children’s participation in extracurricular tutoring and tutoring expenses has a significant positive effect on their academic achievement. Research hypothesis 4c (the more education services children receive in the market, the better their academic performance) is supported.

Parental education participation and children’s academic achievement

The results of Table 6 also lend support to Coleman’s argument that parental education participation not only has an indirect effect on children’s academic achievement through affecting children’s learning attitudes and behaviors, but also has a direct impact on children’s academic performance. The higher the degree of parent participation, the better the academic performance of children, and the hypothesis 4a is supported by data. The research of Zhao and Hong (2012) also showed that parents who have more abundant social network capital can have better communication with teachers and other parents, which indirectly improves children’s academic performance.

The total effect of family background on children’s academic achievement

Table 7 further reports the standardized total effect of various factors on children’s academic achievement so that we can compare their relative importance. It can be seen from Table 7 that family socioeconomic status has the greatest impact on the total effect of children’s academic achievement (the total standardization effect is 0.394), followed by the child’s own learning behavior, followed by parental education participation and children’s school quality, and finally the education services provided by the market (the total standardization effect is 0.103). This shows that even during the stage of compulsory education that appeal to social equity, the family background still has a relatively large impact on children’s academic achievement. At the same time, we can also see that the influence of family socioeconomic status on children’s academic achievement is not simplistic and direct, and there is a large room to improve children’s academic performance through the family and school.

Table 7 The standardized total effects of various factors on children’s academic achievement (N = 2750)

	Education participation	School quality	Educational services	Learning behaviors	Academic achievement	Baseline test score	Score ranking
	.451*** (.032)	.110*** (.025)	.577*** (.032)	-.026 (.027)	.394*** (.038)	.228*** (.025)	.325*** (.026)
Family social economic status(FSES)				.213*** (.036)	.248*** (.040)	.144*** (.024)	.205*** (.031)
Educational participation of parents (P_Part)				.262*** (.027)	.236*** (.031)	.137*** (.019)	.195*** (.023)
School quality (School)					.103** (.042)	.059** (.025)	.085** (.036)
Educational services (Tutor)					.295*** (.038)	.171*** (.023)	.244*** (.028)
Learning behaviors (Effort)						.580*** (.038)	.826*** (.57)

(1) Independent variables are listed in the row, and the dependent variables are listed in the column. (2) SEs are reported in brackets. (3) *p < 0.1, **p < 0.05, ***p < 0.01

How family background affects vary across urban and rural

Nowadays in China, regional factor (urban or rural) is an important variable affecting education. Not only does the distribution of education resources across urban and rural areas differ tremendously, but urban and rural households also have quite different socioeconomic status, lifestyles, and education patterns. The analysis in Table 2 shows that urban children have significantly better academic performance than rural children. With the structural equation model, we further compare the paths of the effect of family background across urban and rural areas.

Table 8 reports the path coefficients among the various latent variables and the explanatory power of the structural equation model. In general, there are three differences in ways that family background influences the academic achievement of rural students and urban students. First, the influence of family socioeconomic status on urban students' achievement is greater than that of rural students. The socioeconomic status of the family explained 20.8% of the difference in academic performance for urban students, and 6.4% of the difference in the academic performance of rural students.¹ Second, the family background has significant urban-rural differences on the purchase of education services, and the family socio-economic status explains 29.5% of difference in the purchase of educational services by urban families, and 11.6% of difference in the purchase of education service by rural students. Third, the rural student's academic achievement is more explained by their own learning behavior; the path coefficient of the learning effort on the academic performance for rural children's is 0.16 higher than for urban children.

Conclusions and discussion

Children's education is related to the quality of the future labor force of a country and thus the country's competitiveness. Most of the existing studies focus on the influence of family background on college education attainment. Actually, the educational attainment of the higher education is affected by the education attainment during their childhood period. In the literature of the relationship between family background and academic performance in middle school (Fang and Feng 2008) and high school (Yang 2005), the discussion is also limited in the correlation between family background and academic achievement. There is a lack of discussion on the mechanisms of childhood academic achievement, that is, the path through which the family background can affect education attainment during childhood, which needs further examination in the research of education. Therefore, this article tries to explore the mechanisms producing the differences in children's academic achievement during the compulsory education period and the influence of family background from the starting point.

Based on the empirical analysis of China Family Panel Studies Baseline Data (CFPS2010), the study found that:

First, the family background has a large impact on children's academic achievement, which is consistent with the conclusions of existing studies. Contrary to the findings of existing research, this study found that factors such as family background, differences in educational opportunities, and children's learning behavior explained 34.4% of differences in children's test scores, within which family SES explained 15.5% of the difference.² This shows that, on the one hand, the family background still has a great influence on children's academic achievement, even in the period of compulsory

Table 8 The differences in the path coefficients of family SES on children's academic achievement

	Education participation		School quality		Educational services		Learning behaviors		Academic achievement		Difference
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
Family social economic status(FSES)	.348*** (.043)	.426*** (.056)	.114*** (.035)	.079** (.039)	.341*** (.070)	.543*** (.053)	-.110** (.043)	-.094* (0.051)	.149*** (.053)	.323*** (.077)	-.174* (.093)
Educational participation of parents (P_Part)							.201*** (.042)	.261*** (.060)	.200*** (.048)	.134** (.064)	.064 (.083)
School quality (School)							.255*** (.035)	.275 (.044)	.150*** (.038)	.187*** (.050)	-.037 (.063)
Educational services (Tutor)									.063 (.048)	.094 (.066)	-.031 (.082)
Learning behaviors (Effort)									.431*** (.049)	.271*** (.064)	.160** (.081)
R squares of structural equation models (%)	12.1	18.1	1.3	.6	11.6	29.5	10.0	13.2	27.5	37.9	
R square of simplified equations (%)	12.1	18.1	1.3	.6	11.6	29.5	0	1	6.4	20.8	
Sample size	1697	1053									

(1) Independent variables are listed in the row, and the dependent variables are listed in the column. (2) SEs are reported in brackets. (3) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. (4) The difference in path coefficient of the last column in the table is calculated based on the formula provided in Clogg et al. (1995). (5) $z = (b_1 - b_2) / [(seb_1^2 + seb_2^2)^{1/2}]$

education that appeals to social justice. It is in this sense that extensive public policy efforts in promoting education equity at the stage of compulsory education are needed. On the other hand, the influence of family socioeconomic status on children's academic achievement is not simplistic and direct. There is a large room for schools and families to take action in improving children's academic performance.

Second, differences in educational opportunities and parental education participation are two important paths for families to affect children's academic achievement. The existing studies separately demonstrate the impact of educational opportunities and parental involvement. However, these two forces act on the children simultaneously. The analysis using the structural equation model shows that although Chinese parents hold relatively high educational expectations for their children, but family socio-economic status still has a greater impact on children's educational opportunities, no matter via providing quality schooling opportunities or providing market-based educational resources. At the same time, parents with different socio-economic status are also heterogeneous to a great extent in their behavior support for children.

Third, the analysis of this paper also shows that there are significant urban-rural differences in the path and mechanism of the influence of family background: family socioeconomic status has a greater impact on urban student's academic performance than for rural students. Besides, compared with urban students, the academic achievement of rural students is more dependent on their own learning behavior. In summary, there are two paths of family background affecting children's academic achievement: First, families use their social and economic resources to compete and purchase quality educational resources (key schools in the state system and educational services in the market) and thus affect children's academic achievement. Second, parents cultivate children's interest in learning and learning habits through educational participation and behavioral support for their children, thereby affecting children's academic achievement.

The empirical analysis of these two paths contributes to the existing literature on family background and education for educators. At the same time, it also provides clear implications to help reduce the class differences in children's academic achievement during the compulsory education period, and thus raise the overall quality of China's human capital, and promote education fairness. At the family level, family education is very important for children's academic performance. Parents with lower socioeconomic status can cultivate good learning behavior of children through their own educational participation (such as through care and supervision of their children's study, and active communication with teachers). This would improve children's academic performance and reduce the impact of family socioeconomic status on children's academic achievement and thus reduce the class differences in schooling progression and even in the labor market. At the school level, under a given allocation of educational resources, schools can improve students' academic achievement through the following two ways: first, enhancing teachers' knowledge and teaching skills; and second, through communication with parents, creating a positive educational atmosphere in school and at home, enhancing children's interest in learning, and cultivating good learning habits of children. At the national level, relevant departments shall strive for the success of every school providing compulsory education, improve school facilities, upgrade the quality of teachers, and achieve a balanced allocation of educational resources, thereby reducing the impact of school factors on children's academic performance.

Given the applicability of the data, there are still issues that need attention by future research. First, with cross-sectional data, this study cannot fully capture the causality of certain paths, such as the impact of participating in extracurricular tutoring classes on children's academic achievement. Second, the measurements in the quality of school children attend and parents' education participation need further improvement. Third, further test is needed on the interaction between family and school to better explore the effect of families and schools on individual's education attainment.

Endnotes

¹This may be explained by the higher heterogeneity in family background and educational opportunities in urban areas compared to the rural counterpart. But this argument needs further data analysis and tests to confirm.

²This can be learnt from the proportions of power explanation of each latent variable by the structural equation model and the simplified model in Table 6.

Abbreviations

AGFI: Adjusted Goodness of Fit Index (LISREL), like GFI but adjusts for model complexity (like adjusted multiple *r*-squared), theoretically ranges from 0 (poor fit) to 1 (perfect fit), considered satisfactory when > .90; CFPS2010: The baseline of Chinese Family Panel Study in 2010; DF: Degree of freedom; GFI: Goodness of Fit Index (LISREL), like multiple *r*-squared, theoretically ranges from 0 (poor fit) to 1 (perfect fit), considered satisfactory when > .90; RMSEA: Root Mean Square Error of Approximation, calculates the size of the standardized residual correlations, theoretically ranges from 0 (perfect fit) to 1 (poor fit), considered satisfactory when < .05; SES: Social-economic status

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Availability of data and materials

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Authors' contributions

ZQ contributed to the study conception and design. ZL participated in the analysis and interpretation of data. ZL prepared the manuscript. ZQ was responsible for the critical revisions of the manuscript. Both authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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