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Community Contexts and Educational Inequality

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Abstract: Based on CFPS field data, we analyzed 895 sets of questionnaires. Starting from data filtering and cleaning procedures, including missing value analysis, outlier assessment, and normality testing. This study answered the four questions previously raised, clarifying the impact of community environment on academic achievement, identifying the effects of community type, gender differences, ethnic differences, and life course on academic achievement, clarifying the impact of school environment on academic achievement and its relationship with community environment, and identifying the mediating effect of neighborhood choice on academic achievement.

Keywords: *questionnaires, analysis, previously raised, academic achievement*

I. INTRODUCTION

This chapter proposes research questions and tests hypotheses on the relationship between community environment, academic achievement, neighborhood effect, and school effect through data analysis of the China Family Panel Studies (CFPS). In this chapter, the researchers described the CFPS dataset and collected field research data, as well as the statistical results of analyzing these data, including validity and reliability tests, descriptive analysis of key concepts, and all four scales: community environment, school environment, neighborhood choice, and academic achievement, to determine the mean, standard deviation, and range of each measure. Afterwards, relevant analysis will be conducted to present the descriptive statistics involved in this study to ensure the correct identification and distribution of all data, following this procedure.

II. RELIABILITY ANALYSIS

Hair et al. (2022) defined normality as the shape of the data distribution of a specific metric variable corresponding to a normal distribution, which serves as the benchmark for all statistical methods. This is one of the most fundamental assumptions in multivariate analysis. Before processing data for calibration analysis and structural modeling, it is necessary to evaluate the normality of the data.

To evaluate the normality of data, skewness and kurtosis are two commonly used measures of normality. The skewness of a distribution can be described by its equilibrium, while the kurtosis of a distribution can be described by its height. Compared to a normal distribution, kurtosis represents the peak or flatness of the distribution. According to Kim (2023) and West et al. (2022), if the absolute value of skewness is less than 2 or the absolute value of kurtosis is less than 7, the data forms a normal distribution.

Table 1 Normality Test Based on Skewness and Kurtosis (N=895)

	N	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	skew-se	Statistic	kurt-se
SEI	895	3.482	1.060	-.741	.124	-.594	.247
HCI	895	3.520	1.274	-.617	.124	-1.030	.247
CT	895	3.549	.895	-.909	.124	.852	.247

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WS	895	3.997	.923	-1.391	.124	1.763	.247
MD	895	3.902	1.051	-1.154	.124	.612	.247
SC	895	3.900	1.035	-.921	.124	-.041	.247
NC	895	4.135	.874	-1.655	.124	3.072	.247

SEI: socio economic index; HCI: human capital index; CT: community type; WS: word Score; MG: mathematics grades; SC: school contexts; NC: neighborhood choice.

III. IMPACT OF COMMUNITY TYPE, GENDER, ETHNICITY, AND LIFE COURSE ON ACADEMIC ACHIEVEMENT

3.1 Influence of Community Type on Word Scores

Table 4.13 reports the results of a multilevel linear model on the impact of community type on word test scores. Models 17, 18, and 19 aim to explore the effects of poor, average, and good community environments on word test scores, while Model 20 aims to investigate whether a general or good community environment can help children achieve higher word test scores compared to a poor community environment, while cont It can be seen that communities with different environmental conditions do significantly affect the word test scores of surveyed children. This study found that the impact of community environment on word test scores is consistent with the second section of this chapter, where the better the community environment, the higher the word test scores of surveyed children. Moreover, as far as the influencing factors of the word test scores are concerned, the influence of the control variables of each model in Table 4.13 on the surveyed children's word test scores is basically consistent with Table 4.8. Gender, nationality, age, household registration at the age of 3, father's ISEI, parents' education level, educational expectations and the surveyed children's education stage on their word test scores are all statistically significant, while only the number of brothers and sisters has no significant impact on the surveyed children's word test scores.

Table 2 A Multi-Level Linear Model of the Influence of Community Types on Word Test Scores

	Modle17	Modle18	Modle19	Modle20
Gender (0=Female)	-.100***(.035)	-.101***(.035)	-.099***(.035)	-.100***(.035)
Ethnicity (0=Minority)	.240***(.074)	.247***(.075)	.230***(.075)	.240***(.074)
Age	-.024**(.011)	-.024**(.011)	-.024**(.011)	-.024**(.011)
Household Registration at the Age of 3 (0=Urban Household Registration)	-.078*(.045)	-.079*(.045)	-.079*(.045)	-.078*(.045)
Father ISEI	.003**(.002)	.003**(.002)	.003**(.002)	.003**(.002)
Parents' Educational Level	.058***(.006)	.058***(.006)	.058***(.006)	.058***(.006)
Number of Brothers and Sisters	-.050(.038)	-.049(.038)	-.048(.038)	-.050(.038)
Education Stage (0=Kindergarten)				
Primary School	.227***(.062)	.231***(.062)	.229***(.062)	.227***(.062)
Middle School	.973***(.096)	.967***(.096)	.973***(.096)	.973***(.096)
High School	1.566***(.170)	1.565***(.170)	1.577***(.170)	1.566***(.170)
Educational Expectations (0=Undergraduate or Above)	-.278***(.036)	-.277***(.036)	-.278***(.036)	-.278***(.036)

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Poor Community Environment (0=No)	-.147***(.052)			
General Community Environment (0=No)		.083*(.046)		.148***(.055)
Better Community Environment			.046(.056)	.144**(.066)
Human Capital Index			.003***(.001)	.003***(.001)
Constant Term	-.441***(.152)	-.540***(.155)	-.487***(.152)	-.589***(.156)
Community Random Effect	.226(.027)	.233(.027)	.234(.027)	.226(.027)
Family Random Effect	.255(.054)	.254(.054)	.254(.054)	.255(.054)
Residual	.719(.022)	.719(.022)	.718(.022)	.719(.022)
AIC	4802.529	4807.223	4809.750	4804.525
BIC	4892.326	4897.020	4899.547	4899.935
N	895	895	895	895

Comparing the random effects of Model 1 and Model 20, it can be found that the variation between communities has decreased from 0.325 to 0.226, the variation between households has decreased from 0.283 to 0.255, and the variation between individuals has decreased from 0.897 to 0.719, which is very close to the changes in Model 4. This indicates that the community type, which divides the community environment index by type, can still represent the impact of community environment measurement on the word performance of surveyed children well.

3.2 Impact of Community Type on Mathematics Scores

Table 4.14 reports the results of a multilevel linear model on the impact of community type on math test scores. Models 21, 22, and 23 aim to explore the effects of poor, average, and good community environments on math test scores, while Model 24 aims to investigate whether a general or good community environment can help children achieve higher math test scores compared to a poor community environment, while controlling for other variables.

3.3 Agglomeration Effect of Math Scores

This section mainly examines the agglomeration effect of communities with poor environmental conditions on the math test scores of surveyed children. Similarly, the category of communities with poor environmental conditions, as well as categories with socioeconomic environment index and human capital index below the mean, are used as measurement indicators of poor community environment. The agglomeration effect of community environment on the mathematical test scores of surveyed children also includes three aspects: firstly, whether communities with low socio-economic indices have a negative impact on the growth value of children's mathematical scores; Secondly, whether communities with low human capital index have a negative impact on the growth of children's math scores in the survey; The third question is whether communities with poor environments have a negative impact on the growth of children's math scores in the survey.

Table 3 A Multi-Level Linear Model of the Agglomeration Effect of Community Contexts on Math Scores

	Modle46	Modle47	Modle48	Modle49	Modle50
Gender (0=Female)		-.611*** (.194)	-.602*** (.193)	-.601*** (.193)	-.588*** (.194)
Ethnicity (0=Minority)		-.162(.353)	-.136(.347)	-.134(.348)	-.176(.350)
Age		1.507*** (.075)	1.522*** (.075)	1.522*** (.075)	1.512*** (.075)
Household Registration at the Age of 3 (0=Urban		-.618*** (.233)	-.647*** (.230)	-.648*** (.230)	-.626*** (.231)

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Household Registration)					
Father ISEI		-.001(.009)	-.002(.009)	-.002(.009)	-.001(.009)
Parents' Educational Level		.019(.034)	.020(.034)	.020(.034)	.022(.034)
Number of Brothers and Sisters		.100(.191)	.147(.189)	.145(.190)	.101(.189)
Education Stage (0= Primary School)					
Middle School		-.906*** (.308)	-.972*** (.308)	-.971*** (.308)	-.926*** (.307)
High School		-.923 (1.262)	-.972(1.255)	-.978(1.257)	-1.063 (1.259)
Educational Expectations (0=Undergraduate or Above)		1.224*** (.206)	1.215*** (.205)	1.215*** (.205)	1.223*** (.205)
Socio Economic Index		.025(.211)		-.019(.207)	
Human Capital Index			-.521** (.207)	-.521** (.207)	
Community Environment (0=Poor/Better)					-.453** (.229)
Constant Term	2.557*** (.132)	-9.719*** (.839)	-9.638*** (.832)	-9.633*** (.834)	-9.902*** (.838)
Community Random Effect	.506(.477)	.467(.211)	.423(.240)	.425(.240)	.380(.221)
Family Random Effect	.426(.228)	.293(.316)	.212(.168)	.209(.075)	.141(.112)
Residual	3.590(.102)	2.652(.075)	2.654(.075)	2.654(.075)	2.652(.076)
AIC	4229.491	3796.189	3790.005	3791.997	3792.339
BIC	4248.133	3866.097	3859.913	3866.566	3862.248
N	895	895	895	895	895

IV. IMPACT FROM KEY SCHOOLS AND COMMUNITY CONTEXTS

Table 4.27 reports the interaction effect model of the influence of school environment and community environment on word performance. It incorporates the interaction terms between key schools and community environments, key classes and community environments, as well as the interaction terms between school environments and community environments constructed based on key schools and key classes, on the basis of the models in Table 4.25.

Table 4 Interactive Effect Model of the Influence of School Contexts and Community Contexts on Word Scores

	Modle67	Modle68	Modle69	Modle70
Gender (0=Female)	-.193***(.038)	-.182***(.038)	-.185***(.038)	-.187***(.038)
Ethnicity (0=Minority)	.230***(.081)	.229***(.081)	.232***(.081)	.239***(.080)
Age	-.012(.011)	-.013(.011)	-.013(.011)	-.012(.011)
Household Registration at the Age of 3 (0=Urban Household Registration)	-.077(.049)	-.071(.049)	-.068(.049)	-.067(.049)
Father ISEI	.002(.002)	.002(.002)	.002(.002)	.002(.002)

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Parents' Educational Level	.062***(.007)	.062***(.007)	.061***(.007)	.061***(.007)
Number of Brothers and Sisters	-.038(.042)	-.045(.042)	-.041(.042)	-.040(.042)
Education Stage (0= kindergarten)				
Primary School	.196***(.068)	.189***(.067)	.200***(.068)	.209***(.068)
Middle School	.630***(.104)	.616***(.104)	.599***(.104)	.588***(.104)
High School	1.023***(.186)	1.045*** (.184)	1.002***(.185)	.991***(.185)
Educational Expectations (0=Undergraduate or Above)	-.222***(.039)	-.220***(.039)	-.217***(.039)	-.215***(.039)
Community Contexts (0=poor)				
General	.147**(.060)	.131**(.060)	.142**(.061)	.142**(.061)
Better	.149**(.073)	.152**(.073)	.164**(.075)	.157**(.075)
Key School(0=no)	.282**(.135)		.255*(.135)	
Key School×General Community Contexts	-.128(.165)		-.137(.166)	
Key School×Better Community Contexts	-.174(.188)		-.155(.190)	
Key Class(0=no)		.353**(.149)	.319**(.150)	
Key Class×General Community Contexts		.000(.176)	.024(.177)	
Key Class×Better Community Contexts		-.270(.199)	-.252(.201)	
School Contexts(0=poor)				.342***(.109)
School Contexts×General Community Contexts				-.068(.131)
School Contexts×Better Community Contexts				-.190(.151)
Constant Term	-.669***(.170)	-.657***(.170)	-.667***(.170)	-.674***(.170)
Community Random Effect	.268(.032)	.191(.027)	.195(.027)	.184(.027)
Family Random Effect	.145(.192)	.103(.137)	.098(.144)	.101(.139)
Residual	.949(.032)	.723(.022)	.723(.022)	.723(.022)
AIC	5142.410	5130.929	5131.471	5126.250
BIC	5254.656	5243.176	5260.555	5238.497
N	895	895	895	895

V. IMPACT OF NEIGHBORHOOD CHOICE ON ACADEMIC ACHIEVEMENT

In the current era dominated by mobility, cross regional residential mobility has become a very common social phenomenon. As for the research object of this article, children in school age are more likely to experience residential mobility due to education. So, does investigating children's residential mobility help them achieve higher academic achievement? Research has found that early childhood mobility experiences have a positive impact on educational achievement during their youth; Meanwhile, according to the research findings in the previous section, both community and school environments have a significant impact on the word and math scores of surveyed children. Therefore, does the impact of residential mobility on the educational achievement of surveyed children stem from the

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improvement of school and community environments? That is to say, will the impact of community environment on the academic achievement of survey subjects be mediated through residential mobility (neighborhood choice)? This is the question that this section attempts to answer. In the first part, the author will focus on exploring the impact of neighborhood choice on the word performance of surveyed children; In the second part, we will focus on exploring the impact of neighborhood choice on the math scores of surveyed children; In the third part, Sobel Goodman mediation analysis will be used to examine the mediating effect of neighborhood choice on community environment and academic achievement.

5.1 Impact of Residential Mobility on Word Scores

Table 4.29 reports the estimated impact of residential mobility on the word performance of surveyed children. Due to the fact that this chapter uses a sample of children successfully tracked by the Chinese Family Tracking Survey in 2020 as the research object, rather than all children samples from the 2018 survey, all variables used for analysis in this chapter are from the 2020 tracking survey data. Therefore, in conducting the analysis, the author reestablished an unconditional average model for word test scores to estimate the variation of word scores among communities, families, and individuals among successfully tracked surveyed children in 2020. According to the estimation results of Model 75, the correlation coefficient between communities is 0.2556, the correlation coefficient between families is 0.2592, and the correlation coefficient between individuals is 0.4852. This means that 25.56% of the variation in the vocabulary scores of surveyed children comes from the community, 25.92% from the family, and 48.52% from individual children. Compared with the 2018 survey on the variation of children's word scores among communities, the proportion of differences in children's word scores that can be explained by community factors has increased from 21.6% to 25.56%.

Table 5 A Multi-Level Linear Model of the Impact of Residential Mobility on Word Scores

	Modle75	Modle76	Modle77	Modle78	Modle79	Modle80
Gender (0=Female)		-.219***	-.220***	-.225***	-.225***	-.220***
		(.054)	(.054)	(.054)	(.054)	(.054)
Ethnicity (0=Minority)		.067	.061	.071	.065	.056
		(.104)	(.102)	(.103)	(.101)	(.101)
Age		.135***	.136***	.134***	.134***	.135***
		(.026)	(.026)	(.026)	(.026)	(.026)
Household Registration at the Age of 3 (0=Urban Household Registration)		-.186***	-.191***	-.184***	-.188***	-.197***
		(.067)	(.067)	(.067)	(.066)	(.066)
Father ISEI		-.001	-.002	-.002	-.002	-.002
		(.002)	(.002)	(.002)	(.002)	(.002)
Parents' Educational Level		.047***	.047***	.047***	.048***	.048***
		(.010)	(.010)	(.010)	(.010)	(.010)
Number of Brothers and Sisters		-.164***	-.170***	-.162***	-.168***	-.167***
		(.061)	(.060)	(.060)	(.060)	(.060)
Education Stage (0= Primary School)						
Middle School		.473***	.472***	.479***	.477***	.473***
		(.091)	(.091)	(.091)	(.091)	(.091)
High School		.745***	.740***	.741***	.737***	.741***
		(.162)	(.162)	(.162)	(.162)	(.162)
Educational Expectations (0=Undergraduate or Above)		.112*	.114**	.104*	.107*	.108*
		(.058)	(.058)	(.058)	(.058)	(.058)
Residential Mobility(0=no)		.263***	.179*	.191**	.119*	.197**
		(.086)	(.093)	(.092)	(.097)	(.087)
Socio Economic Index (0=low)			.142**		.131**	
			(.064)		(.064)	

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Human Capital Index (0=low)				.133** (.064)	.123* (.063)	
Community Type (0=poor)						.182*** (.063)
Constant Term	.033 (.043)	-2.112*** (.357)	-2.153*** (.356)	-2.145*** (.356)	-2.180*** (.356)	-2.202*** (.357)
Community Random Effect	.422 (.051)	.152 (.075)	.128 (.086)	.131 (.085)	.105 (.103)	.095 (.115)
Family Random Effect	.428 (.106)	.553 (.055)	.553 (.056)	.550 (.057)	.550 (.057)	.552 (.057)
Residual	.801 (.056)	.589 (.046)	.592 (.047)	.593 (.047)	.596 (.047)	.596 (.048)
AIC	2504.952	2202.349	2199.594	2200.040	2197.860	2196.581
BIC	2524.139	2274.301	2276.343	2276.789	2279.406	2273.331
N	443	443	443	443	443	443

Tip: Due to the requirement of the Sobel Goodman mediation analysis that the independent variable be a 0-1 variable; in order to compare with the results of the mediation analysis in the following sections, this chapter will treat the socioeconomic index and human capital index as 0-1 variables according to the treatment method when dividing them into community types. 0 represents a low socioeconomic index and human capital index, and 1 represents a high socioeconomic index and human capital index. At the same time, merge the categories of community environment in general and community environment in good community types, assign 0 to those with poor community environment, and assign 1 to those with average/good community environment.

VI. MEDIATING EFFECT OF NEIGHBORHOOD CHOICE ON MATH SCORES

The mediating effect of neighborhood choice on community environment and surveyed children's math scores also includes three aspects: firstly, when using community type as a measurement indicator of community environment, whether neighborhood choice mediates the relationship between community environment and surveyed children's math scores. According to the model results of mediating variable path analysis, the quality of community type significantly affects the mathematical performance of surveyed children ($p<0.01$), and the quality of community type significantly affects the residential mobility of surveyed children ($p<0.000$); Meanwhile, community type and residential mobility will jointly affect the survey of children's math scores ($p<0.1$), And after incorporating the variable of residential mobility, the effect of community type on the mathematical performance of surveyed children decreased. The results of the Sobel Goodman mediation analysis show that whether it is Sobel mediation analysis or Goodman mediation analysis, neighborhood choice will mediate community environment and survey children's math scores at a confidence level of 0.05, and the explanatory proportion of neighborhood choice for the overall effect is 33.18%. This means that not only does the community environment represented by the community type significantly affect the math scores of surveyed children, but also the community environment 33.18% of the impact of environmental factors on children's math scores was achieved through residential mobility.

Table 6 Results of the Sobel-Goodman Mediation Analysis of Math Scores

	Community Type	Socio Economic Index	Human Capital Index
Sobel Mediation Analysis	.050**(.017)	.071**(.025)	.067**(.023)
Goodman Mediation Analysis I	.050**(.017)	.071**(.025)	.067**(.023)
Goodman Mediation Analysis II	.050**(.017)	.071**(.025)	.067**(.023)

Proportion of Mediating Variables Explaining the Overall Effect	33.18%	48.82%	47.92%

VII. CONCLUSIONS

The causal relationship between community environment and educational outcomes has always been an important academic topic in the study of neighborhood effects abroad. This article uses children's data from the China Family Panel Studies (CFPS) in 2018 and 2022 to evaluate the impact of community environment on the word and math scores of urban children in China's social context. The results showed that the better the living environment of the surveyed children in the community, the higher their scores in vocabulary and mathematics; The impact of community environment on children's word and math scores will not only result in group heterogeneity due to the investigation of children's gender and ethnicity, but also generate agglomeration effects due to the investigation of children's length of residence in the community; At the same time, the community environment will also have a joint impact with the school environment on the vocabulary and math scores of the surveyed children; In addition, the influence of community environment on children's word and math scores will also play a mediating role through neighborhood choice. Of course, these conclusions need to be carefully explained and limited.

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