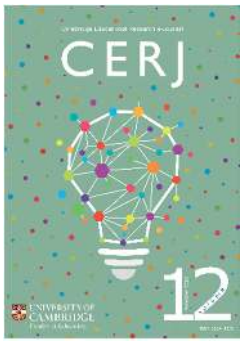
Hidden catalysts: exploring the mediating paths between SES and academic performance of Chinese migrant children



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Hidden Catalysts: Exploring the Mediating Paths Between SES and Academic Performance of Chinese Migrant Children

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ABSTRACT

In China's urbanisation process, over 71.09 million migrant children aged 0-17 have moved with their families from rural to urban areas. However, the household registration (Hukou) system restricts their access to quality education and social services, making their academic performance a significant concern in urban contexts. This study investigates how socioeconomic status (SES) influences the academic achievement of migrant children in Chinese urban public schools. Using Structural Equation Modeling (SEM), it analyses longitudinal data from the China Education Panel Survey (CEPS 2013-2014), with a nationally representative sample of 2,799 lower secondary migrant students in Grades 7 and 9. The findings challenge traditional assumptions of the family investment model regarding the effectiveness of educational support, revealing complex chained mediation effects between SES and academic performance in Chinese migrant families. SES shows no significant direct effect on migrant children's academic performance; however, SES indirectly influences academic performance through cognitive ability and a dual-path paradox in parental engagement (parental communication and parental enrichment activities). Notably, parental communication positively affects academic achievement without enhancing cognitive skills. Conversely, parental enrichment activities have contradictory effects: they negatively correlate directly with migrant children's academic performance, but indirectly positively via cognitive abilities. This research reveals an original contribution by uncovering a dual-path paradox in parental engagement for Chinese migrant families. The findings carry significant theoretical insights into the role of SES in marginalised groups and provide valuable comparative perspectives for international studies on migrants or low-SES families. Practically, they inform targeted policies such as subsidised enrichment programs, school-based cognitive support, and community-driven parental workshops, which aim to mitigate structural educational inequalities prevalent in China's rapid urban transformation.

KEYWORDS

Migrant children, socioeconomic status, parental engagement, cognitive ability, academic performance

Introduction

Over the past four decades, China's rapid economic growth and urbanisation have attracted millions of rural residents to cities in search of better employment opportunities (Kuang & Liu, 2012). Many of these migrants now relocate with their children, attracted by the superior educational and social resources in urban areas. Although they retain their rural household registration (Hukou) (Guo & Zhao, 2019), migrant parents typically work in non-agricultural sectors (Kuang & Liu, 2012). These individuals, commonly known as migrant workers (National Bureau of Statistics of China, 2024), have children who move with them rather than remaining in rural hometowns.

The Hukou system, established in the 1950s to regulate population mobility, ties access to welfare and education to one's place of household registration. For migrant families, this means their children, even when residing in cities, are often excluded from public school enrolment, face higher tuition fees, or are barred from

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taking local high school and university entrance examinations (Hung, 2022). Under the Hukou system, children without local Hukou are classified as 'migrant children'. According to the Annual Education Statistics Report by the Ministry of Education of China (2019), the definition of migrant children has expanded to include those from different provinces and various districts within the same province. By 2020, it included all children aged 0–17 who had lived outside their registered residence for more than six months, excluding intra-city migrants (National Bureau of Statistics of China, 2023). Consequently, the migrant child population rose from 12.8% in 2010 to 23.9% in 2020, reaching over 71.09 million—nearly one in every four children in China. In this paper, migrant children refer specifically to internal rural-to-urban migrants' children.

Education is crucial for migrant families, as academic success is widely viewed as a route to higher social status and better employment prospects. In contemporary China, high scores, elite school admission, and advanced degrees are seen as key pathways to upward mobility and social prestige (Huang & Gove, 2012). This belief reflects the idea that educational success can improve life quality, including social standing, job opportunities, and marriage prospects. Migrant families with rural backgrounds, like urban residents, consider higher education essential for economic advancement and typically believe it is necessary for stable employment and a prosperous future (Koo, 2012; Wang, 2024). For them, educational qualifications are strongly associated with the ability to secure decent jobs and income. Education is thus viewed as both a means out of poverty and a way to ensure a better future for their migrant children. Within China's exam-oriented system, achieving high scores is critical to realising these aspirations. However, migrant children often face major barriers to academic performance.

Migration has long been associated with adverse effects on children's educational and psychosocial outcomes. As early as the 1970s, studies found that frequent relocation, particularly among children from low socioeconomic backgrounds, was associated with educational setbacks (Brawner, 1973; Long, 1975). Subsequent research confirmed that frequent moves correlate with lower academic performance and increased dropout risk (Coleman, 1988; Engec, 2006; Pribesh & Downey, 1999). In addition to disrupting education, migration poses substantial psychosocial challenges. Children who move often are more likely to experience anxiety, depression, and other emotional difficulties, further hindering academic success and social integration (Antia et al., 2020; Chang et al., 2019; Stevens & Vollebergh, 2008). These persistent challenges express the need for comprehensive support systems to help migrant children adapt. Recent studies highlight the importance of addressing both educational and mental health impacts through targeted interventions (Li & Liang, 2024; Safi Keykaleh et al., 2017).

Similarly, research on China's migrant populations reveals persistent educational inequalities (Guo & Zhao, 2019; Liang & Chen, 2007), with discrimination shifting from overt exclusion to more subtle forms of bias (Gu & Yeung, 2020; Hung, 2022; Kuang & Liu, 2012; Wang & Jiang, 2016). Migrant children from rural backgrounds tend to underperform compared to their urban peers, with outcomes significantly shaped by family socioeconomic status (SES) and parental involvement (Guo & Zhao, 2019; Ma et al., 2018; Wang et al., 2021; Zhang, 2021). Low-SES children often face financial instability and limited access to educational resources, which undermines their academic performance.

Although many recent studies have examined the educational performance of migrant children in China (Ma & Wu, 2020; Ren et al., 2020; Wang et al., 2021), limitations remain. Most focus on macro-level capital deficits faced by migrant families, particularly through Bourdieu's framework (Ding & Wu, 2023; Ma & Wu, 2020), while overlooking micro-level family interactions. Some have explored parental engagement from a family perspective (Guo, 2011; Jin et al., 2017; Yu, 2020), yet few have differentiated its forms or analysed their distinct mechanisms of influence. Academic performance is shaped by a complex system involving family SES, internal family interactions, and children's cognitive development. This study develops a structural model integrating these factors to examine how SES, parental engagement, and cognitive ability affect academic performance among migrant children, and how different forms of parental engagement mediate this pathway. By addressing multilevel influences, this research provides a more comprehensive understanding of educational inequality in migrant populations and advances the discourse on migration and education in China.

Theoretical Framework and Hypotheses

SES and Academic Performance

SES has long been recognised as a crucial determinant of educational outcomes (Guo, 2011; Liu et al., 2020; Liu et al., 2022; Long & Pang, 2016; Sirin, 2005; White, 1982; Zhang, 2021). For migrant families, often characterised by lower SES, the effects on children's academic performance are particularly adverse.

In educational research, SES typically includes household income, parental education, and occupational status, which influence the educational resources and support available to children (Gottfried, 1985; Hauser, 1994). According to the Family Investment Model (Conger & Donnellan, 2007; Diemer et al., 2020), higher-SES families can provide access to quality schools, abundant learning materials, and additional academic support—factors critical to academic success (Kalil & Ryan, 2020; Ma et al., 2018; Reardon, 2018). Despite broader access to compulsory education, the SES–achievement gap has widened since the 1990s, which reflects growing disparities in educational quality and escalating costs (Liu et al., 2022). SES also shapes access to social capital, including networks that provide additional opportunities like tutoring, internships, and extracurricular activities (Coleman, 1988), often unavailable to low-SES families. These disparities affect not only resource provision but also children's ability to engage in enrichment activities that foster academic growth (Caro, 2012; Kalil & Ryan, 2020). Moreover, limited access to quality educational information further restricts support for children from disadvantaged backgrounds.

This educational issue is particularly acute among China's migrant families, who generally occupy the lower rungs of the socioeconomic ladder. Their incomes are often unstable and seasonally affected, which limits their ability to invest in education (Ma et al., 2018; Wang, 2024; Yu, 2020). As a result, short-term survival often takes precedence over long-term educational planning. Migrant children also face unstable living conditions and frequent school changes, disrupting educational continuity and academic performance. Their transient lifestyles can lead to social and emotional isolation, which hinders integration into school communities and the formation of peer networks (Hu et al., 2014). Furthermore, long, labour-intensive work hours among parents restrict the time and energy available for educational support. Combined with limited access to quality resources, these factors significantly hinder academic development and reinforce educational inequality among migrant children.

Hypothesis 1: SES has a significant positive impact on academic performance for migrant children.

Parental Engagement

Another significant factor affecting migrant children's education is the limited parental support, despite their shift from a rural left-behind status to urban residency. According to the National Bureau of Statistics of China (2023), nearly 70% of the 138 million migrant children do not live with both parents; specifically, 43.93 million live with both parents, 9.31 million with one parent, and 17.84 million with neither. Though geographically relocated to cities, many remain disconnected from their parents and are effectively "left-behind" in emotional and developmental terms (Hu et al., 2014; Wang, 2024). Despite their physical presence in urban areas, access to quality education and development is often constrained by the absence of parental support. The "left-behind" label thus extends beyond physical separation to reflect broader neglect in parental involvement and care.

In the literature, parental involvement and parental engagement are often used interchangeably, though they denote different levels of participation in children's education. Parental involvement typically refers to school-led or task-driven activities, such as attending parent-teacher meetings or assisting with homework (Epstein, 1995). In contrast, parental engagement implies a more proactive and collaborative role, involving direct support for children's learning through teacher collaboration, school decision-making, and integrating education into daily life (Goodall & Montgomery, 2023). This deeper engagement is more strongly linked to children's academic achievement, self-efficacy, and learning attitudes (Desforges & Abouchaar, 2003; Hoover-Dempsey & Sandler, 1995; Wilder, 2023). In this study, references to parental involvement are treated within the Parental Engagement Framework, as they often reflect behaviours aligned with active, meaningful participation in children's learning.

Numerous studies indicate that higher economic capital is associated with more frequent parent-child interactions, greater parental participation in school, cultural, and leisure activities, and improved academic

performance (Li & Xie, 2020; Wilder, 2023; Wu & Zhang, 2024; Yu, 2020). Families with more resources tend to be more engaged both at home and in school. Parental involvement within families often includes school-related discussions and joint reading (Tan et al., 2020; Wu & Zhang, 2024). A meta-analysis of 37 studies found strong correlations between parental communication about school and academic achievement (Castro et al., 2015), and parents with higher education are more likely to support their children's participation in such activities (Baldwin & O'Flaherty, 2018). This engagement is associated with higher GPAs and improved chances of university admission. Economic capital is positively related to both the frequency and quality of parental involvement, demonstrating the influence of socioeconomic factors on educational engagement (Şengönül, 2022; Yu, 2020).

Maintaining effective parental involvement is particularly challenging for families from lower socioeconomic backgrounds, especially within immigrant communities. Financial constraints and major life events often limit their ability to engage in educational activities at home and school (Kalil & Ryan, 2020; Malone, 2017). A survey of 428 Mexican-American parents found that life disruptions reduced home involvement, while economic pressure diminished school-based engagement (Camacho-Thompson et al., 2016). Despite recognising the value of involvement, low-income families frequently lack the resources to participate meaningfully (Cashman et al., 2021; Şengönül, 2022). Parental education and SES also shape the effectiveness of involvement. A longitudinal study of 463 American families showed that while involvement in less-educated families raised adolescents' aspirations, it did not significantly improve behaviour or performance; in contrast, involvement by highly educated parents positively influenced both (Hill et al., 2004). Vellymalay (2012) similarly found that even in high-performing schools, lower parental education, employment status, and income affected families' understanding of educational value, reducing engagement. These findings suggest that SES not only affects participation levels but also mediates the impact of parental involvement on children's outcomes.

In China, migrant families face several structural barriers to educational involvement. They often have limited education and perform physically demanding jobs, leaving them with neither the resources nor the skills to support their children's learning (Jin et al., 2017; Wu & Zhang, 2024). Long work hours further restrict active participation in schooling (Yu, 2020). Many parents, especially those with low education levels, doubt their ability to assist academically, leading to minimal involvement even when co-residing in urban areas (Murphy, 2020; Xu & Montgomery, 2021). Despite strong educational aspirations rooted in Confucian ideals, viewing schooling as a path to social mobility, these goals are often constrained by economic hardship and limited resources (Koo, 2012; Li & Xie, 2020; Wang et al., 2021). The resulting gap between aspiration and capacity not only weakens the effectiveness of parental involvement but also hinders the educational advancement of migrant children.

Hypothesis 2a: Parental enrichment activities have a significant positive impact on academic performance for migrant children.

Hypothesis 2b: SES positively influences academic performance through parental enrichment activities.

Hypothesis 2c: Parental communication has a significant positive impact on academic performance for migrant children.

Hypothesis 2d: SES positively influences academic performance through parental communication.

Cognitive Abilities

Cognitive ability is central to children's education and a key predictor of academic success (Guo & Zhao, 2019). It comprises working memory and reasoning. Working memory enables children to retain and manipulate information, aiding problem-solving and comprehension (Peng et al., 2019). Reasoning supports the application of knowledge to solve problems creatively and logically (Sternberg et al., 2008). According to Investment Theory, academic performance is shaped not only by innate cognitive ability but also by educational and sociocultural environments that nurture it. Reasoning, for instance, enhances performance by promoting the use of analogies and abstract thinking in complex subjects (Cattell, 1987; Schweizer & Koch, 2002). Recent developments, such as the Theory of Mutualism, propose that cognitive ability and academic achievement develop through mutual reinforcement: academic challenges foster cognitive growth, which in

turn supports achievement (Peng & Kievit, 2020; Van Der Maas et al., 2006). Longitudinal studies consistently identify cognitive ability as one of the strongest predictors of academic success (Laidra et al., 2007; Lechner et al., 2017; Spinath et al., 2010).

Children's cognitive abilities are strongly associated with family background, including parents' social class, education, and occupation (Duncan & Magnuson, 2012; Korous et al., 2020; Zhang, 2021). Higher-SES families often provide cognitively enriching experiences, such as puzzles, critical-thinking games, and stimulating conversations. These activities enhance cognitive development. Davis-Kean et al. (2021) found that higher-SES parents, typically with greater educational attainment, are more likely to engage in practices that foster children's cognitive growth.

In China, cognitive development among migrant and rural children faces significant challenges. Despite national efforts, rural children—especially in poorer areas—often experience nutritional deficiencies, language delays, and social-emotional setbacks that hinder cognitive growth and disadvantage them compared to urban peers (Hu et al., 2014; Wu & Zhang, 2024). Hao and Yu (2017) found that ninth-grade cognitive levels among left-behind and migrant children were 31.6% and 34.7% standard deviations lower than urban children, respectively. These delays are often worsened by unstimulating home environments with limited resources and reduced parental engagement due to economic or educational constraints. Supporting this, an empirical study in Jiangxi Province revealed that 27% of evaluated students exhibited cognitive delays, underscoring the impact of scarce family resources and low parental involvement on rural students' educational outcomes (He et al., 2022).

Cognitively stimulating activities largely depend on parental involvement, which is closely linked to family SES. Parental involvement is thus a key mediating variable between SES and children's cognitive ability (Lu et al., 2021; Zhang, 2021). Neuroscience research shows that higher-SES families engage in more frequent and complex communication with children, enhancing early language development compared to lower-SES peers. These disparities in language input contribute to long-term cognitive differences (Hart et al., 1997). Higher family income also affords greater access to enrichment activities—such as cultural events and educational outings—further supporting cognitive development (Diemer et al., 2020). Hence, understanding how SES influences cognitive and academic outcomes requires attention to both tangible resources (e.g., educational spending, materials) and cognitive stimulation through parental participation (Chang et al., 2009; Cheng, 2024). Parenting styles, language quality, and extracurricular experiences collectively shape developmental trajectories, extending SES influence beyond economics into cognitive and educational domains.

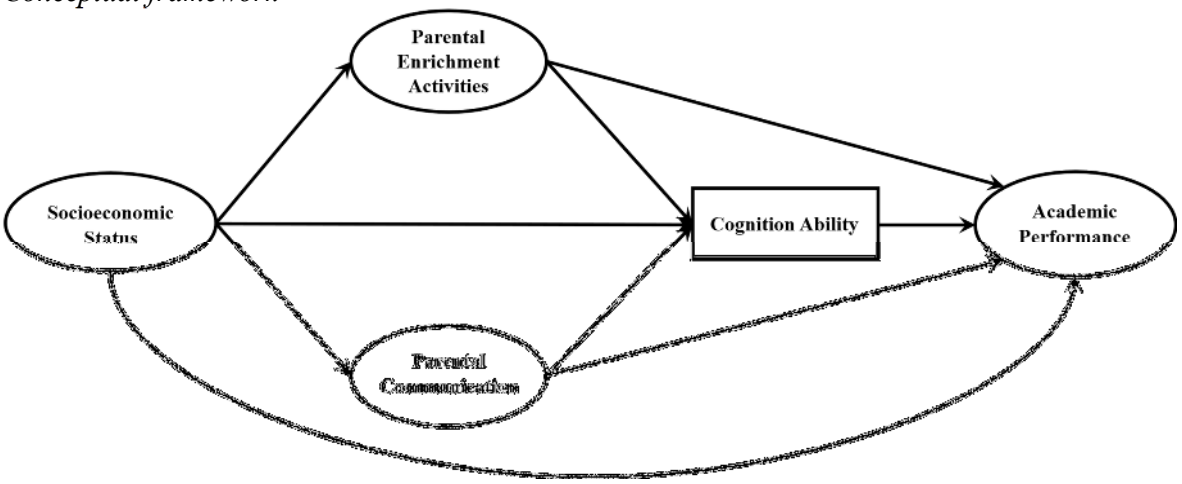
Hypothesis 3a: Cognitive ability has a significant positive impact on academic performance for migrant children.

Hypothesis 3b: SES positively influences academic performance through cognitive ability.

Hypothesis 3c: SES positively influences parental enrichment activities, which subsequently positively affect cognitive abilities, thereby enhancing academic performance.

Hypothesis 3d: SES positively influences parental communication, which subsequently positively affects cognitive abilities, thereby enhancing academic performance.

Figure 1
Conceptual framework



Method

Data and Sampling

This research draws on data from the China Education Panel Survey (CEPS, 2015), conducted by the National Survey Research Centre at Renmin University of China to examine factors influencing secondary school students' educational experiences across diverse regions and socioeconomic backgrounds. The survey sampled 19,487 seventh and ninth graders during the 2013–2014 academic year using a stratified multi-stage design covering 28 counties, 112 schools, and 438 classrooms. This methodology yielded a nationally representative dataset reflecting varied educational settings.

CEPS administered five questionnaires to students, parents, homeroom teachers, subject teachers, and school administrators. The student questionnaire addressed demographics, mobility, family structure, health, academic performance, extracurricular activities, peer and teacher relationships, and future aspirations. The parent questionnaire focused on parental background, lifestyle, parent-child interactions, educational investments, and views on their child's education. For this study, student and parent datasets were merged to identify lower-secondary migrant students in urban public schools based on non-local household registration. Missing data were handled in two steps: first, cases with substantial nonresponse on core variables and those lacking the outcome were removed; second, residual item-level missingness was addressed via multiple imputation (chained equations) using all analysis variables, with estimates pooled via Rubin's rules and consistent with complete-case results. After these procedures, the final analytic sample comprised 2,799 students. This subset enabled focused analysis of SES impacts on educational outcomes. All data handling followed ethical standards set by Renmin University of China, including strict confidentiality and privacy protections. Additional methodological details are available in the CEPS Manual.

Variables and Measurements

In the initial research design, several subjective items were selected to measure SES, including Likert scale assessments of respondents' perceptions of their family's current economic condition and how their family's income compares to others in their community. However, these subjective items can be susceptible to central tendency bias, where survey participants tend to choose neutral response options and avoid using extreme responses (Kulas & Stachowski, 2009; Moors, 2008). This bias can lead to reduced variability in the data, thereby affecting the sensitivity of statistical analyses and the validity of conclusions. To enhance precision, SES was measured using objective indicators: housing conditions, parents' highest educational attainment, and parents' occupations. These indicators were widely recognised as directly and reliably reflecting SES (Gottfried, 1985; Hauser, 1994). Although some indicators, such as housing conditions, may carry different implications across urban contexts, overall, they provided more precise information about SES, which in turn strengthened the analysis of the relationship between SES and academic performance.

Academic performance was measured using standardised mid-term exam scores in Chinese, Mathematics, and English from the 2013–2014 academic year. Although school-level comparability may vary, the scores were officially reported by educational authorities rather than self-reported, offering greater objectivity and reliability than alternative metrics.

Parental engagement in this study was assessed across two dimensions: parental enrichment activities and parental communication. Enrichment activities were measured by three items on the frequency of parents participating in sports, visiting museums or science centres, and attending performances or movies with their child over the past year (1 = Never; 6 = More than once a week). Communication was measured by five items asking about how often parents discussed school events, friends, teachers, mood, and personal concerns with their child (1 = Never; 3 = Often).

Cognitive ability was measured using CEPS-designed tests assessing logical thinking and problem-solving, independent of school curriculum content. Seventh graders completed 20 items; ninth graders 22, covering verbal ability, graphical understanding, and computational/logical reasoning. The tests were completed in 15 minutes, and scores were converted into a standardised total (cog3pl) to enable cross-individual and cross-temporal comparison.

Control variables included gender (male = 1, female = 0), number of siblings (1–5, with 5 indicating five or more), and living arrangement (1 = none, 2 = mother only, 3 = father only, 4 = both parents).

Analytical Strategy

This study used SPSS 26.0 and Mplus 8.3 to test the hypothesised model through structural equation modelling (SEM). Data preparation included filtering, item reversal, scale aggregation, and variable categorisation to enhance analytical accuracy. SEM enabled assessment of latent constructs, estimation of their relationships with observed variables, and evaluation of measurement errors (Byrne, 2013).

Following Kline's (2023) two-step approach, the study first conducted confirmatory factor analysis (CFA) to validate the measurement model, ensuring indicators accurately reflected latent constructs. SEM was then applied to examine direct and indirect relationships between SES and academic performance.

Model fit was assessed using several indices: chi-square (χ^2), χ^2/df ratio, Comparative Fit Index (*CFI*), Tucker-Lewis Index (*TLI*), and Root Mean Square Error of Approximation (*RMSEA*) (Schermelleh-Engel et al., 2003). A *p-value* above 0.05 in the chi-square test suggests good fit; χ^2/df below 3 is preferable. *CFI* and *TLI* above 0.90 are acceptable, with >0.95 indicating excellent fit (Hu & Bentler, 1999). *RMSEA* values below 0.05 reflect very good fit; 0.05–0.08 indicates reasonable fit (Kline, 2023).

To test mediation, this study employed bootstrapping to estimate indirect effects. The technique, widely supported in SEM software (e.g., AMOS, MPlus, R), simulates the sampling distribution through repeated resampling. Following Hayes (2017), 5,000 bootstrap resamples were conducted to compute 95% confidence intervals (*CI*), which balances precision and computation given that the Monte Carlo error of percentile CI bounds decreases at approximately $1/\sqrt{B}$ and is negligible at B=5000. Indirect effects were considered significant at the 0.05 level if the *CI* excluded zero. A bias-corrected bootstrap approach was adopted, as recommended by MacKinnon et al. (2004), for greater accuracy over traditional methods like the Sobel test.

Results

The sample consists of 2,799 lower secondary migrant children, with 1,397 males (49.9%) and 1,402 females (50.1%). Table 1 summarises the descriptive statistics for the primary variables.

Table 1

Descriptive statistics for main variables

	Mean/Frequency	SD/Percent
Academic Performance		
Standardised midterm exam scores 2013 - Chinese	70.985	9.390
Standardised midterm exam scores 2013 -	70.616	9.578

Mathematics			
Standardised midterm exam scores 2013 - English		70.469	9.604
Cognition Ability			
Standardised cognitive ability test scores		0.000	0.840
SES			
What is your parents' highest educational attainment?		4.322	1.938
How is your family's housing condition?		5.201	1.334
What is your father's/mother's occupation?		4.783	1.984
Parental Enrichment Activities			
Frequency of family activities with child - sports		3.586	1.896
Frequency of family activities with child - visiting museums, zoos, science centres		2.278	1.311
Frequency of family activities with child - attending performances, sports events, or movies		2.238	1.396
Parental Communication			
Do you actively discuss with your child about things that happen at school?		2.258	0.608
Do you actively discuss with your child about their relationships with friends?		2.218	0.627
Do you actively discuss with your child about their relationships with teachers?		2.312	0.648
Do you actively discuss with your child about their mood?		2.329	0.673
Do you actively discuss with your child about their concerns or troubles?		2.272	0.670
Gender	Male	1397.000	49.911
	Female	1402.000	50.089
Number of siblings		0.869	0.834
Living with parents	None of them	169.000	6.038
	With mother only	79.000	2.822
	With father only	177.000	6.324
	With both parents	2374.000	84.816

Confirmatory Factor Analysis Results

Before testing the structural model, confirmatory factor analysis (CFA) was conducted to assess the measurement validity of latent variables, including *SES*, *Parental Enrichment Activities*, *Parental Communication*, and *Academic Performance*. Following Hair Jr et al. (2009), items with factor loadings below 0.3 were removed, while 0.3 and 0.5 were used as thresholds for minimal and practical significance, respectively. These criteria guided item retention and model modification to ensure alignment with latent constructs. All retained items showed standardised loadings above 0.3 and were statistically significant, indicating reliable measurement of each latent variable. The CFA model demonstrated acceptable fit (χ^2 = 1103.831, df = 71, χ^2/df = 15.54, $p < 0.000$, CFI = 0.933, TLI = 0.914, $RMSEA$ = 0.072), providing a sound foundation for subsequent structural modelling.

Structural Equation Model Test Results

Following confirmatory factor analysis, structural equation modelling (SEM) was conducted and demonstrated good fit ($\chi^2 = 756.41$, $df = 109$, $\chi^2/df = 6.94$, $p < 0.000$, $CFI = 0.961$, $TLI = 0.947$, $RMSEA = 0.046$). Figure 3 presents all significant standardised path coefficients ($p < 0.05$), visualising relationships within the model. SEM results showed that the direct path from SES to academic performance was not significant ($\beta = –0.037$, $p > 0.05$). However, SES was positively associated with both Parental Enrichment Activities ($\beta = 0.293$, $p < 0.001$) and Parental Communication ($\beta = 0.288$, $p < 0.001$), indicating that higher SES was linked to more frequent parental engagement.

Parental Communication significantly improved academic performance ($\beta = 0.068$, $p < 0.05$), supporting hypothesis 2c, while Parental Enrichment Activities had a negative effect ($\beta = –0.085$, $p < 0.000$), contradicting hypothesis 2a and suggesting varied impacts of parental engagement.

Parental Enrichment Activities positively influenced cognitive ability ($\beta = 0.063$, $p < 0.05$), while Parental Communication had no significant effect ($\beta = –0.040$, $p > 0.05$). Higher SES was significantly associated with better cognitive ability ($\beta = 0.144$, $p < 0.001$), which strongly predicted academic performance ($\beta = 0.355$, $p < 0.000$), supporting hypothesis 3a.

Table 2

Test of the Significance of Path Coefficients and Standardised Path Coefficients

DV	IV	*Estimate*	*SE*	*Est./SE*	*p*	*Standardised*
AP	PEA	-0.568	0.159	-3.572	0.000	-0.085
	PC	1.013	0.364	2.782	0.005	0.068
	SES	-0.242	0.188	-1.286	0.198	-0.037
	SIBS	0.474	0.185	2.568	0.010	0.055
	LWC	0.524	0.189	2.772	0.006	0.058
	SEX	4.076	0.308	13.245	0.000	0.286
	CA	3.014	0.186	16.227	0.000	0.355
PEA	SES	0.284	0.031	9.043	0.000	0.293
	SIBS	-0.060	0.028	-2.167	0.030	-0.047
	LWC	0.073	0.027	2.720	0.007	0.055
	SEX	0.093	0.042	2.211	0.027	0.044
PC	SES	0.126	0.014	9.274	0.000	0.288
	SIBS	-0.054	0.013	-4.044	0.000	-0.094
	LWC	0.035	0.013	2.712	0.007	0.058
	SEX	0.056	0.020	2.865	0.004	0.059
SES	SIBS	-0.487	0.037	-12.982	0.000	-0.370
	LWC	0.041	0.034	1.228	0.219	0.030
	SEX	0.101	0.051	1.971	0.049	0.046
CA	PEA	0.050	0.018	2.711	0.007	0.063
	PC	0.070	0.043	1.632	0.103	0.040
	SES	0.110	0.023	4.748	0.000	0.144
	SIBS	-0.088	0.021	-4.214	0.000	-0.087
	LWC	0.039	0.020	1.987	0.047	0.037
	SEX	0.069	0.032	2.171	0.030	0.041

Note. AP - Academic Performance, PEA - Parental Enrichment Activities, PC - Parental Communication, SES - Socioeconomic Status, CA - Cognition Ability, SIBS - Number of Siblings, LWC - Living With Conditions, SEX - Gender. $p < 0.05$ is statistically significant (Bold).

Standardised total and indirect effects from the SEM revealed complex pathways linking SES, parental engagement, cognitive abilities, and academic performance (AP). While higher SES increased parental

engagement, not all forms led to improved AP. Specifically, SES had a negative indirect effect on AP through parental enrichment activities (*estimate* = –0.025, 95% *CI* = [–0.040, –0.011]), rejecting hypothesis 2b and suggesting that more engagement does not always yield better outcomes. Conversely, parental communication positively mediated the SES–AP relationship (*estimate* = 0.020, 95% *CI* = [0.006, 0.035]), supporting hypothesis 2d and highlighting the critical role of communication quality. Cognitive abilities also significantly mediated SES effects on AP (*estimate* = 0.051, 95% *CI* = [0.031, 0.072]), supporting hypothesis 3b. These findings underscore the importance of both the form of parental engagement and the central role of cognitive development in converting SES advantages into academic success.

The SES–AP pathway via parental enrichment activities and cognitive ability was significant (*estimate* = 0.007, 95% *CI* = [0.002, 0.012]), supporting hypothesis 3c. In contrast, the parallel pathway via parental communication and cognitive ability was not significant (*estimate* = 0.004, 95% *CI* = [–0.001, 0.009]), rejecting hypothesis 3d and suggesting varying effectiveness across mediation routes.

The total indirect effect of SES on academic performance (AP) was significant (*estimate* = 0.057, 95% *CI* = [0.031, 0.083]), highlighting the role of indirect pathways involving parental engagement and cognitive ability. However, the total effect of SES on AP was not significant, rejecting hypothesis 1 and suggesting a more complex relationship influenced by unmeasured factors.

Table 3

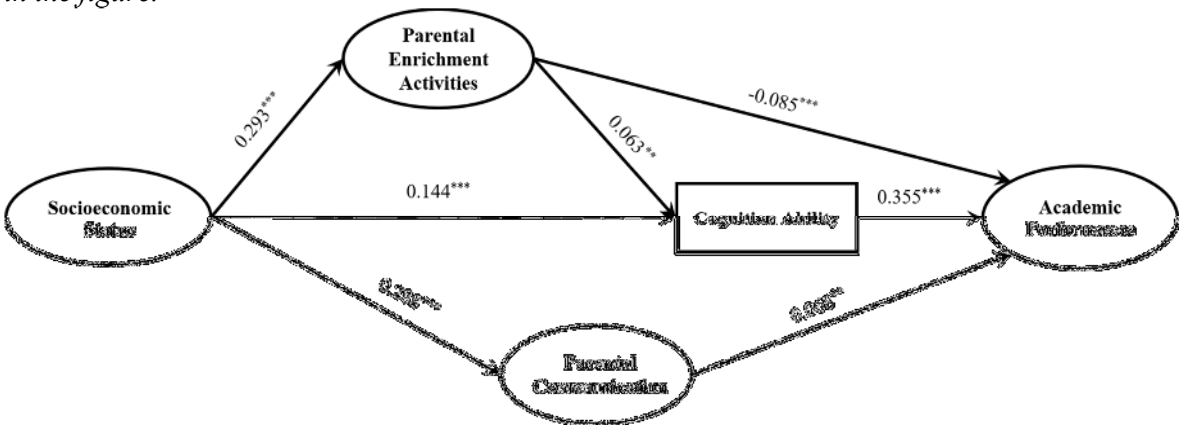
Confidence Intervals of Standardized Total, Total Indirect, Specific Indirect, and Direct Effects

Path		Estimate	95% Confidence Intervals	
			Lower	Upper
Total effects		0.019	-0.036	0.073
Total indirect effects		**0.057**	0.031	0.083
Direct effects		-0.037	-0.093	0.019
Specific indirect 1	SES → PEA → AP	**-0.025**	-0.040	-0.011
Specific indirect 2	SES → PC → AP	**0.020**	0.006	0.035
Specific indirect 3	SES → CA → AP	**0.051**	0.031	0.072
Specific indirect 4	SES → PEA → CA → AP	**0.007**	0.002	0.012
Specific indirect 5	SES → PC → CA → AP	0.004	-0.001	0.009

Note. AP- Academic Performance, PEA-Parental Enrichment Activities, PC-Parental Communication, SES-Socioeconomic Status, CA-Cognition Ability. Confidence intervals that do not contain 0 are statistically significant (Bold).

Figure 2

*SEM with Standardised Coefficients (*p<0.05, **p<0.01, ***p<0.001). Only significant paths are showed in the figure.*



Analysis of demographic variables revealed significant gender differences in parental engagement and academic outcomes. Female migrant children reported higher levels of parental enrichment activities (β = 0.044, $p < 0.05$) and communication (β = 0.059, $p < 0.01$) than males. Girls also outperformed boys in academic performance (β = 0.286, $p < 0.001$) and had slightly higher cognitive ability (β = 0.041, $p < 0.05$). Families with more siblings had lower SES (β = –0.370, $p < 0.001$), which was linked to reduced parental enrichment (β = –0.047, $p < 0.05$), communication (β = –0.094, $p < 0.001$), and cognitive ability (β = –0.087, $p < 0.001$). Interestingly, sibling number positively predicted academic performance (β = 0.055, $p < 0.05$), suggesting potential compensatory effects, such as emotional or peer-style support among siblings despite resource dilution. Living with parents positively influenced academic performance (β = 0.058, $p < 0.01$), as well as parental enrichment activities (β = 0.055, $p < 0.01$), parental communication (β = 0.058, $p < 0.01$), and cognitive ability (β = 0.037, $p < 0.05$). These results highlight the role of parental presence in supporting migrant children's learning and cognitive development.

Discussion

This study employs structural equation modelling to examine how SES, parental engagement, and cognitive ability influence migrant children's academic performance. Using CEPS data, the analysis finds that SES does not directly affect academic outcomes but operates through parental enrichment, parental communication, and cognitive ability. Cognitive ability plays a central mediating and predictive role linking SES to academic success.

SES, Parental Engagement and Academic Performance

This study examines how family SES influences academic performance among migrant children in China and presents findings that diverge from much prior research. While studies in Western contexts (Liu et al., 2022; Sirin, 2005; White, 1982) and some in China (Liu et al., 2020; Long & Pang, 2016; Wu & Zhang, 2024; Zhang, 2021) find that higher SES enhances academic outcomes by increasing access to resources, this study finds no significant SES–academic performance relationship among migrant children. This aligns with some Asian scholars who argue that in Confucian-influenced societies, academic success is viewed as a means of social mobility and is thus less dependent on SES (Davis-Kean et al., 2021; Li & Xie, 2020; Lu et al., 2021). These findings highlight the moderating role of cultural context and suggest that educational research on migrant children in China is necessary to consider the dual influence of tradition and structural transformation. The impact of different forms of parental engagement on academic performance further supports the above findings. Parental communication had a significant positive effect on academic performance (β = 0.068, $p < 0.05$), consistent with studies highlighting how ongoing parent-child communication about school enhances achievement (Tan et al., 2020; Wilder, 2023; Wu & Zhang, 2024; Zhang, 2021). However, parental enrichment activities had a negative effect (β = –0.085, $p < 0.000$), revealing a paradox within China's exam-driven education system. Academic success is often defined by high performance in standardised, memorisation-based assessments, such as dictation and formula recitation. Time devoted to enrichment activities like museum visits or concerts—common among high-SES families—may divert focus and resources from exam preparation, undermining academic performance. This suggests a misalignment between enrichment content and short-term academic demands. Although SES positively correlates with both parental communication and enrichment, these forms of engagement function as distinct mediators with opposing impacts. This divergence may explain why the overall relationship between SES and academic performance among migrant children is not significant.

Notably, SES varies significantly within the migrant population. While rural migrants are often depicted as low-income manual labourers, many families have long settled in urban areas, with incomes sometimes exceeding those of local residents. This study focuses on migrant children in Grades 7 and 9—the final stage of compulsory education—where parental engagement primarily entails educational support and companionship. Both parental communication and enrichment activities are significantly shaped by SES. For low-SES migrant families, whose parents often perform physically demanding jobs, sustained engagement—especially in enrichment activities—poses challenges due to time and resource constraints. Enrichment requires not only money but also availability, making it more SES-dependent than communication. Although

these differences have not yet resulted in significant short-term academic disparities—partly due to enrichment's time-consuming nature—the long-term effects of unequal educational engagement may impact future outcomes. It is also worth noting that both observed effects ($\beta = 0.068$ for communication and $\beta = -0.085$ for enrichment) fall within the range of small effects as defined in prior educational research (Cohen, 1988; Funder & Ozer, 2019). In practical terms, this suggests that while parental engagement shapes academic outcomes in detectable ways, the influence on individual performance is modest, pointing to the need for caution when translating these findings into policy or practice. These findings underscore the need to address the cumulative impact of educational inequality across SES groups in the migrant population.

Cognitive Abilities as a Predictor of Academic Success

Structural equation modelling identified cognitive ability as the strongest predictor of academic performance ($\beta = 0.355$, $p < 0.000$). This supports Investment Theory, which posits that cognitive development is foundational to academic achievement (Cattell, 1987; Schweizer & Koch, 2002), and underscores the importance of educational strategies focused on cognitive growth—particularly in highly competitive systems like China's. Skills such as metalinguistic awareness enhance reading and comprehension, while numerical ability underpins number sense and mathematical proficiency (Geary, 2004). Cognitive ability is also significantly shaped by SES. Research consistently links family income and parental education to children's cognitive development (Duncan & Magnuson, 2012; Zhang, 2021). Although this study found no direct SES–performance relationship, SES positively affects cognitive ability, which in turn supports academic outcomes. Higher-SES families are more likely to provide developmental inputs—adequate nutrition, enriched home learning environments, quality childcare, and safe communities. In contrast, lower-SES migrant families may face barriers to supporting cognitive growth due to financial limitations or limited awareness of these needs. These disparities help explain the indirect but substantial link between SES and academic performance through cognition.

Furthermore, when parental enrichment activities are included as mediators, the model reveals a nuanced dynamic. Although these activities negatively affect academic performance directly, they positively influence cognitive ability, which in turn supports academic achievement. Activities such as cultural visits, sports events, and performances enrich cognitive development, even if they do not immediately enhance test scores. Higher-SES families are more likely to offer such opportunities, inadvertently boosting cognitive growth. Research shows that the link between cognitive ability and academic performance strengthens with age (Peng et al., 2018; Peng et al., 2019), suggesting that enrichment may yield delayed academic benefits as children mature and apply these skills more effectively. In contrast, parental communication improves academic outcomes but does not significantly enhance cognition. This may be because communication mainly promotes short-term focus, motivation, and oral supervision rather than complex cognitive stimulation. As a result, its benefits are more visible in immediate assessments, while enrichment fosters broader, long-term development. These distinctions underscore the need to evaluate parental engagement forms not only by immediate outcomes but also by their developmental trajectories.

Due to limited economic resources and time, low-SES migrant parents often struggle to support school activities or provide enrichment experiences for their children. Although these children have not yet shown significant disadvantages in test scores, the lack of parental engagement may hinder cognitive development and pose long-term risks to their educational trajectories.

This study affirms ongoing debates on education reform. Middle-class parents have criticised the exam-oriented system for prioritising standardised tests at the expense of creativity and well-being, advocating instead for greater focus on cognitive development. However, critics warn that reforming this system may exacerbate inequalities and widen the educational gap between social classes (Rongsan & Min, 2018). This study supports both perspectives: standardised testing has helped reduce inequalities in compulsory education, but may also constrain long-term development. Future reforms must carefully balance cognitive growth and test performance, ensuring migrant children's holistic development without sacrificing educational equity.

Gender Differences, Siblings and Educational Outcomes

This study finds no significant difference in cognitive ability between migrant boys and girls, but girls

significantly outperform boys in academic performance ($\beta = 0.286$, $p < 0.001$). This challenges the traditional belief that boys hold an academic advantage in China (Hannum et al., 2009) and supports findings by Lai (2010) showing that girls surpass boys after elementary school, with gaps widening in middle school. These results may reflect broader societal changes and gender-focused educational reforms that have promoted equity in access and engagement. In particular, migrant girls received more parental enrichment and communication than boys, suggesting a shift in parental attitudes toward investing in girls' education. This changing perception may help explain girls' academic advantage, especially in communities where boys were historically prioritised. The findings highlight a meaningful evolution in both educational outcomes and parental behaviour regarding gender among migrant families.

Among migrant children, living with parents is significantly associated with better academic performance and cognitive ability, highlighting the importance of parental presence in both extracurricular engagement and school-related communication. Increased parental communication and enrichment may help mitigate challenges posed by socio-economic constraints and mobility, offering consistent support that enhances educational continuity and academic outcomes.

This study also highlights the challenges faced by families with more children, where both financial and emotional resources are spread thin. According to the resource dilution theory, more siblings reduce per-child access to parental time, energy, and money, negatively affecting educational outcomes (Downey, 1995). This effect is more pronounced in low-SES migrant families. Consistent with this, the study finds that larger sibling numbers are linked to reduced parental enrichment and communication, which in turn hinder cognitive development. However, growing up with more siblings may also foster life skills such as independence, resilience, and competitiveness, which can indirectly support academic and social success.

Conclusion, Implications and Limitations

This study demonstrates that SES does not directly affect the academic performance of Chinese migrant children. Instead, its impact is mediated through cognitive ability and distinct forms of parental engagement. A key contribution is the identification of a "dual-path paradox": parental communication has a direct positive effect on academic performance but does not enhance cognitive ability, while enrichment activities have a direct negative association yet indirectly improve achievement by strengthening cognitive development. These findings challenge linear assumptions in family investment models and call for greater attention to the differentiated pathways through which SES operates. Gender patterns offer further insight. While academic performance does not differ significantly between migrant boys and girls, parents tend to place higher educational expectations on daughters and provide more practical advice to sons. Girls are more inclined to gender-typical, lower-paid occupations, which reflects persistent gender stereotypes and social norms.

Theoretically, this research contributes to a comprehensive understanding of educational inequality among marginalised populations. While this research focuses on China, its core findings are relevant to migrant communities globally. From a policy perspective, simply improving SES will not directly enhance migrant children's academic performance. Targeted interventions should prioritise cognitive development through accessible programmes in nutrition, extracurricular participation, physical activity, and career guidance. Schools and communities must also promote low-cost, high-impact forms of parental engagement, such as regular parent-child communication workshops. Compared to international models, like "Head Start" in the U.S. and "Sure Start" in the U.K., China's existing initiatives remain limited in scope, funding, and responsiveness to the unique needs of migrant families, who often face economic hardship, limited access to resources, and low awareness of available support.

However, the study's cross-sectional design limits causal interpretation. Future research should adopt longitudinal designs and expand the model to include other mediating factors such as school environment, teacher support, peer networks, and personal resilience. These factors could help capture a more comprehensive understanding of what educational success among migrant children, both in China and globally. In addition, while objective SES measures reduce bias compared to subjective assessments, their meanings may vary across different cities or regions, which could partly limit the generalisability of the findings.

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