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Family Income and Student Educational and Cognitive Outcomes in China: Exploring the Material and Psychosocial Mechanisms

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Abstract: Leveraging data from a nationally representative school-based adolescent survey, the current study aimed to provide a comprehensive assessment of how family income is associated with multiple cognitive and educational outcomes in China and examine the underlying material and psychosocial mechanisms. We found robust associations of family income with school grades, cognitive ability, and study attitude, but not with homework engagement. Moreover, we found that home amenities, i.e., measuring home-based material resources, played the largest mediating role in explaining family income effects on cognitive ability and study attitude. Among the non-monetary or intangible intervening factors, children's own and peers' educational aspirations along with mother-child communication were the most important mechanisms. To a lesser extent, family income effects were also attributable to harmonious parent-child and between-parent relationships. The key take-home message is that home environments constitute a prominent setting outside of school exerting powerful influences shaping school outcomes for Chinese adolescents. Our study contributes to a better understanding of how family economic resources are transmitted to children's cognitive and educational advantages via home material resources, family non-monetary features, children's agency, and peer influence. Policy implications and future research are discussed.

Keywords: family income; cognitive ability; academic performance; homework engagement; study attitude; China

1. Introduction

It has long been recognized that family social class or socioeconomic status (SES) greatly impacts child development, laying the foundation for growth, change, and functioning throughout life. Numerous studies have confirmed that family background and contexts play a salient—possibly the most important—socio-environmental role across children's life domains in contributing to their physical, emotional, psychological, behavioral, and cognitive and educational outcomes (Coleman 1966; Duncan and Magnuson 2012; Mare 1981; Morris et al. 2007; Poulain et al. 2019; Wen 2017). In turn, family-based disparities in developmental trajectories shape children's differential human capital formation and SES achievement in adulthood, which facilitate intergenerational status reproduction and exacerbate inequalities (Duncan et al. 2010). A key aspect of the original family background is parental SES. How family structural origin affects children's learning behaviors and academic performance is a central concern in studies on social mobility and stratification (e.g., Black and Devereux 2011;

Solon 1999), child development (e.g., Repetti et al. 2002; Wen and Lin 2012), and education research (e.g., Bailey and Dynarski 2011; Lareau 2002).

Educational and cognitive outcomes in childhood are important because they constitute the backbone of human capital and predict adulthood status and life quality as measured by a wide range of indicators such as SES, marriage, family, and health (Adler 2013; Hackman et al. 2010; Kell et al. 2013; Torr 2011). Recent evidence shows that over half of the family level variation in a child's SES is attributed to parental SES (Erola et al. 2016). In addition, the "socioeconomic achievement gap"—the disparity in academic achievement between students from high- and low-SES backgrounds—has increased across the globe in the past 50 years despite increased accessibility to formal schooling (Chmielewski 2019). The existence of significant disparities in socially important attributes associated with family origin has drawn the attention of researchers and policy makers to the "challenge of the gradient," as they undermine social justice and impede upward mobility (Adler 2013; Jackson 2013). To date, studies have progressed from describing associations between family SES and children's success in school and adult life to identifying mechanisms by which these associations occur. That said, most evidence is based on samples collected in the U.S. or other developed countries. Given that a key proposed pathway linking family SES to children's educational and cognitive outcomes is the culturally based home environment (Lareau 1987, 2002), it is important to examine these associations in specific settings.

In addition, different indicators of family SES such as parental education and family income are often conceptualized interchangeably, although they likely lead to different strength in inheritance of status and operate via different mechanisms (Erola et al. 2016). Another problem with many studies is that they are narrowly focused on one outcome and/or one dynamic inside one setting, despite the fact that children are enmeshed in various ecosystems and influenced simultaneously by external forces in multiple environments (Bronfenbrenner 1979). Building the evidence based on the importance of specific aspects of family socioeconomic background is a crucial first step toward developing effective interventions targeting the mediating pathways to reduce persistent disparities.

This article addresses these questions in China. Leveraging data from a recent nationally representative school survey of Chinese 7th and 9th graders, the current study attempts to fill these gaps through an analysis of the associations between family income and student academic performance, cognitive ability, and study attitude and behavior as well as through further statistical analysis of the multidimensional pathways underlying these associations. In so doing, it casts light upon the patterns and mediators of the intergenerational transmission of advantage or disadvantage in general, and family income effects on adolescent educational and cognitive outcomes in specific, in the Chinese setting.

2. Background

2.1. Intergenerational Transmission of Status

In a classic monograph, Blau and Duncan (1967) presented a path model revealing that a father's structural position, measured by educational and occupational attainment, proved to be a powerful predictor of his son's first job and current occupational status via the son's educational attainment as the intervening variable. This pattern has come to be known as the Blau–Duncan model, a recursive model of the occupational status attainment of American male adults, which stimulated much of the subsequent interest in mobility and stratification research (Colclough and Horan 1983; Sewell and Hauser 1992). Since the publication of this pioneering work, numerous studies have ascertained the applicability of the basic ideas of this status-attainment paradigm for a broad range of populations and geographies. During the period from 1968 through 1980, as summarized by Colclough and Horan (1983), 48 articles on this topic were published in *American Sociological Review* and the *American Journal of Sociology*; the majority of them replicated and extended the original Blau–Duncan model by

including additional variables and/or refining the measurement of the original variables to improve the model fitness.

The major thrust of findings from this research supported the assumptions underlying the original model, namely, ascribed positions as measured by family SES contributed to subsequent attainment. More recent advances in our understanding of intergenerational transmission of status have been reviewed in Solon's (1999) chapter and Black and Devereux's (2011) chapter in the *Handbook of Labor Economics*. Clearly, interest in research on the relationship between offspring's social mobility and the social status of their family of origin remains widespread. In this literature, studies have used increasingly more sophisticated modeling techniques and improved measurement of earnings, and have found that the basic empirical relationship that the earnings of parents correlate to those of their children stands in most situations. Moreover, the educational gaps between children from high- and low-SES families have even widened in the past decades (Bailey and Dynarski 2011; Downey et al. 2004).

That said, the status-attainment model was not received without critiques. Discrepancies between population subgroups were found and viewed as a threat to the status attainment paradigm (Colclough and Horan 1983). The model seemed to be less satisfactory for blacks compared to whites and fit less well among females than among males, suggesting that in some subpopulations more macro-level structural constraints might operate to undermine the predictive power of family SES for children's attainment (Chaudry and Wimer 2016). The status-attainment link has also been found to be weaker among Chinese and Chinese-diaspora people (which will be further reviewed below). In addition, studies striving for causal effect estimates for the status-attainment link have produced mixed results. For example, a study conducted in Norway detected no causal effect of family income on children's educational attainment (Løken 2010), whereas findings from U.S.-based studies suggested that increased family income had a significant and positive effect on children's school achievements (Akee et al. 2010; Dahl and Lochner 2012; Duncan et al. 2011). All these studies leveraged data from natural experiments and performed sophisticated econometric analyses. These inconsistent findings testify to the need to examine the achievement processes across different settings.

2.2. Mechanisms

Considerable literature has focused on the mechanisms through which the intergenerational transmission of status occurs. A main intervening variable proposed in the original Blau–Duncan model is the child's educational attainment. This is to be expected, as in a market economy higher human capital is rewarded with higher earnings. The positive association between parental income and children's educational attainment has been routinely observed in countries all over the world; for a review, see Black and Devereux (2011). Shortly after the publication of Blau and Duncan's model, Sewell et al. (1969) presented one of the earliest and most well-known extensions to this paradigmatic exemplar in status attainment research, known as the "Wisconsin model", where social psychological variables such as educational aspirations, significant-other influence, and academic performance were added as mechanisms by which family SES is translated into children's attainment outcomes. However, the underlying reasons for family influences on these psychosocial intervening variables remained elusive.

The family is a multidimensional system and constitutes the most proximate social milieu in which the child is reared. Theorizing rooted in sociology, economics, and developmental psychology has flourished and provided rich conceptual frameworks on family influences on child development. In general, family resources or deficits can be grouped into monetary and nonmonetary categories. Perhaps one of the most intuitive explanations is that family economic resources benefit child development because parents have the purchasing power to make direct human capital investment (Becker 1993; Kaushal et al. 2011). Children from higher-income families are more likely to live in safe and affluent neighborhoods, have access to educational products (e.g., books and computers) at home, attend high-quality schools, and participate in extracurricular enrichment classes or activities

(Chin and Phillips 2004), all of which stimulate children's cognitive development and enhance their educational achievement.

Meanwhile, nontangible assets in the home not directly related to consumption and not measurable by monetary amount *per se* are found to be even more crucial (Heckman 2006; Mayer 1997). These include the family's social resources, usually tapped by parenting practices and cultural orientations manifested in values, beliefs, and behaviors in the home environment (Boudon 1974; Bourdieu 1984). Child development theories generally point to the merits of an authoritative parenting style, which is an approach to child-rearing that combines warmth, high responsiveness, and reasonable demands. Parents who exhibit this style listen to their children and provide love, support, and autonomy in addition to setting fair limits and exerting reasoning-oriented regulation (Baumrind 1971). Evidence of the developmental benefits of authoritative parenting is abundant (Kuppens and Ceulemans 2019; Pinquart 2017), including beneficial effects on children's academic achievement (Pinquart 2016).

While socioeconomic factors and parenting can independently shape children's development, some aspects of parenting are correlated with economic resources. A qualitative study focusing on American whites and blacks documented that regardless of race, middle-class parents tended to adopt a "concerted cultivation" parenting strategy to purposefully nurture their children's cognitive and social development, whereas working-class parents tended to intervene less, allowing their children to grow more naturally (Lareau 2002). Quantitative studies have also reported associations between parental SES and parenting practices. For example, lower-SES parents are more likely to be harsh and punitive compared to higher-SES parents (Roubinov and Boyce 2017). Lower SES families also tend to have heightened family conflict, lower levels of support, and higher risk of exposures to family violence (Repetti et al. 2002).

Family SES can also influence developmental outcomes via children's own agency. For example, research indicates that children's own educational aspirations contribute to their ultimate academic achievement and educational attainment (Khattab 2015). The level of child agency, measured by perceived self-control, self-efficacy and work ethic, was found to be positively related to both social class of family origin and educational performance (Burger and Walk 2016). In general, extant research has focused more on how external and contextual factors explain intergenerational transmission of status while paying less attention to a child's own role in the transmission.

Moreover, Bandura's social learning theory (Bandura 1977), Bronfenbrenner's bioecological model (Bronfenbrenner 1979), and Vygotsky's sociocultural theory (Vygotsky 1978) consistently emphasize the influence of significant others on the focal child's development. Other than parents and siblings living in the same household, peers constitute a major group of significant others, especially for older children who have begun carving out their own identity and status. Many studies have documented peer effects influencing learning, educational aspirations, and other outcomes of education net of individual characteristics (Wilkinson et al. 2000). It can be argued that peer effects and family effects are intertwined, considering that families often affect the formation of their children's peers by self-selecting into schools, neighborhoods, and outside-of-school extracurricular activities. Despite this, evidence shows that peers' academic achievement levels affect individual achievement independently of family and school effects (Hoxby 2000; Lin 2010).

So far, scholars have largely followed sociological and economic traditions in mobility and status research without significantly incorporating the contribution and operationalization of social psychological theorizing (Burger and Walk 2016). Little work has been done to simultaneously investigate the mediating role of home physical environment and material resources, within-family socialization patterns, child agency, and peer influences in family SES effect on children's school outcomes. Research drawing on both the theory of cultural and social reproduction and the social psychological theory of child development would be in a strong position to provide more holistic perspectives of the status-attainment link. Another major limitation in this literature is that the majority of studies have been conducted in Western, economically developed countries. The basic model of

intergenerational transmission of status and its elaborations need to be reexamined in non-Western cultural settings.

2.3. *The Case in Chinese Families*

Two circumstances are particularly relevant for the status-attainment model to *not* work well. First, the society is highly egalitarian with resource and opportunity allocation centrally planned and regulated by state policies rather than governed by meritocracy and market mechanisms, such that higher education or greater human capital would not lead to higher income or better quality of life. Meanwhile, access to educational resources is not dependent on economic resources, and high-SES families cannot mobilize resources to pass on family advantages to their children via children's receiving better education. This would be the situation in Maoist China under a strict socialist system, where socioeconomic mobility was extremely rigid and political status served a critical role in determining individual status and achievement (Bian 2002). Another relevant circumstance is that the dominant values on education are so strong or weak that they are largely detached from economic resources. Chinese families today likely fit the latter.

Today's China resembles many countries in the world in that education is a major vehicle for status attainment, and the relationship between education and income is strong (Wang 2012). Following deeply rooted traditional Confucian beliefs about the importance of learning for becoming knowledgeable, intelligent, and virtuous (Tsai 2014), Chinese parents in mainland China and elsewhere place a high value on children's education and exhibit enthusiasm for investing in children's education. An international survey of parents' aspirations for and actions related to their children's education revealed that Chinese parents are among the most committed to their children's education when compared to parents around the globe (HSBC 2017). In fact, recent research shows that Chinese parents' happiness is tightly dependent on their children's academic performance (Chen et al. 2020), and qualitative evidence indicates a nearly universal emphasis on children's school outcomes in Chinese families regardless of social origin differences in SES and location (Hong and Fuller 2019; Hu 2019; Murphy 2014). As such, it follows to expect weaker explanatory power of the status-attainment model for individual achievement in China.

Two studies have specifically examined this hypothesis and produced supportive findings. Liu and Xie (2015) used data from the 2010 baseline survey of the China Family Panel Study to examine the influences of family resources on Chinese children's cognitive achievement, measured by verbal ability. Their results indicated family non-monetary resources, particularly parenting, were of greater and more stable importance to children's cognitive ability than monetary resources. They also found little correlation between family income or wealth and parenting attitudes/practices. Li and Xie (2020) analyzed national data from mainland China, Taiwan, South Korea, the U.S., Germany, and Australia and documented a much weaker effect of family background on educational expectations in East Asian societies, including China, than in the West; East Asian parents and children tended to have high educational expectation, irrespective of family SES. Findings from these two studies suggest that the status-attainment model should work differently in different social contexts and may not work as effectively in East Asian cultures than in Western cultures. On the other hand, another recent study also using national data from China showed significant social class differences in child education consumption (Xiaoshan Lin 2019), and a number of local studies documented the positive relationship between family SES and children's cognitive ability in various subjects via mediators such as parenting practices and children's agency as measured by self-concept and behaviors (Guo et al. 2018; Li et al. 2020; Tsui 2005; Zhang et al. 2019). In addition, research shows different components of SES relate to Chinese children's outcomes through divergent mechanisms (Ren et al. 2020). Clearly, much more information is needed regarding the application of the status-attainment model in China, particularly with regard to examining potential mechanisms involved as the intervening variables are usually amenable and policy relevant.

2.4. Current Study

Using data from a nationally representative school-based adolescent survey, the current study aims to provide a comprehensive assessment of how family income is associated with multiple cognitive and educational outcomes that are known to shape lifelong socioeconomic achievement. We also attempt to enrich the status-attainment model by exploring a host of mediators, some of which are theorized but less empirically tested. Figure 1 presents the conceptual model that guides our empirical analysis.

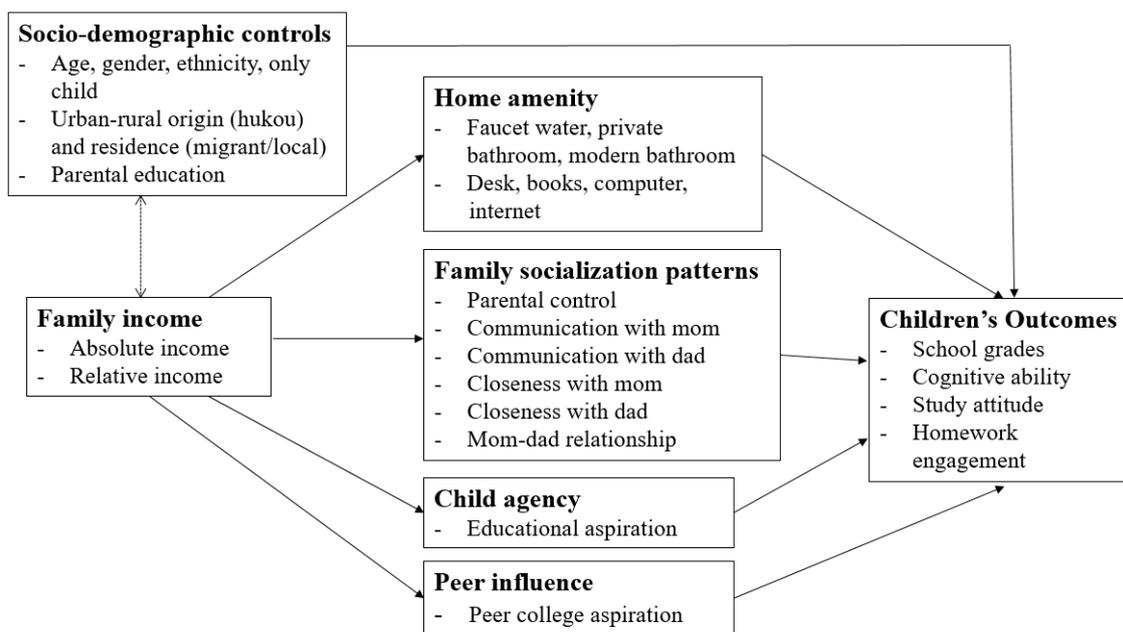


Figure 1. Conceptual Model.

We include both absolute/objective and relative/subjective income as the key predictors insofar as, compared to absolute SES, relative SES may be even more important to well-being outcomes (Liu et al. 2017; Quon and McGrath 2014), but less is known about whether relative SES is linked to overall child development (Ye et al. 2019). We examine four outcomes—school grades, cognitive ability, study attitude, and homework engagement—among 7th and 9th graders in China. These outcomes capture academic performance, cognitive ability, and attitude and behaviors toward school work. We hypothesize that higher family income benefits children's cognitive and educational outcomes via better material resources at home, positive within-family socialization patterns, prosocial child agency as manifested in higher educational aspiration, and positive peer influence tapped by peer college aspirations. We expect family income to affect these outcomes both directly and indirectly via these pathways, net of socio-demographic characteristics that might confound the key associations of interest. The relative strengths of the mediating effects cannot be hypothesized a priori given the ambivalent theoretical perspectives and mixed findings from previous work.

3. Data and Measures

3.1. Data

Conducted by the National Survey Research Center at Renmin University during the 2013–2014 school year, the China Education Panel Survey is the first national, representative, and longitudinal survey of junior-high students in China. Note that the 9th grade is the last year of junior secondary or junior high school in the Chinese educational system. The survey applied a multistage sampling method with probabilities proportional to size. Covering all 31 provinces in mainland China, the data were gathered with a four-stage probability sampling design that randomly selected 19,487 students in Grades 7 and 9 from 438 classes across 112 junior high schools in 28 counties (districts) in China.

Students, along with their parents, teachers, and school leaders, constituted the final survey sample. The data had a response rate of 98.74%. Focusing on adolescent development, we excluded students younger than 12 years or older than 17 years, leaving a total sample of 19,369. After eliminating cases with missing values in the outcome variables ($N = 1445$) and age, gender, ethnicity, and rural–urban group ($N = 733$), we imputed for the missing values of the other variables used in the analyses using multiple imputation methods based on age, gender, ethnicity, and rural–urban group (Royston 2004). The analytical sample in this study thus included 17,919 7th or 9th graders aged 12–17 years.

3.2. Measures

The measures included four outcomes, two family income variables as key predictors, nine mediators, and six control variables. Table 1 presents sample statistics of all the variables included in the analysis.

Table 1. Sample Descriptive Statistics.

Outcomes	Mean (SD)/%	Range
Student-reported school grades	3.09 (1.11)	[1, 5]
Student cognitive ability score	48.22 (18.37)	[0, 100]
Parent-reported student study attitude	3.33 (0.96)	[1, 5]
Student-reported homework engagement	3.29 (0.82)	[1, 4]
Key predictors		
Perceived family income status	2.81 (0.59)	[1, 5]
Relative family income in the community	2.69 (0.69)	[1, 5]
Hypothesized mediators		
Home amenities	4.96 (2.00)	[0, 7]
Parental control	18.76 (3.14)	[8, 24]
Mother-child communication	10.69 (2.87)	[5, 15]
Father-child communication	9.44 (2.88)	[5, 15]
Mother-child closeness	2.71 (0.50)	[1, 3]
Father-child closeness	2.58 (0.57)	[1, 3]
Parental relationship (good)	80%	[0, 1]
Student educational aspiration		
Below academic high school	11.73%	[0, 1]
Academic high school	7.97%	[0, 1]
Associate degree	15.51%	[0, 1]
Bachelor's degree	32.35%	[0, 1]
Graduate degree	32.44%	[0, 1]
College aspiration among many close friends	66.74%	[0, 1]
Control variables		
Age	13.94 (1.24)	[12, 17]
Male	50.00%	[0, 1]
Han ethnicity	91.70%	[0, 1]
Only child	43.90%	[0, 1]
Urban-rural group		
Urban locals	38.81%	[0, 1]
Urban migrants	6.38%	[0, 1]
Rural locals	43.51%	[0, 1]
Rural migrants	11.30%	[0, 1]
Parental education	3.09 (1.54)	[1, 6]

Sample size = 17,191.

3.2.1. Outcomes

Two performance and ability outcomes were examined. Academic performance was indicated by student self-reported school grades, including five categories: “not good,” “below average,” “average,”

“above average,” and “very good,” with higher values indicating better grades. The mean was 3.09, close to the “average” school grades. Following the Taiwan Education Panel Survey (Yang et al. 2003), cognitive abilities were measured by students’ scores on a cognitive ability test designed to evaluate their logical thinking and problem-solving abilities, and characterized by international comparability and national standardization. The test covered three dimensions of abilities including language, figure, and computational logic, and can provide an accurate measurement of students’ cognitive skills. It included 20 questions for 7th graders and 22 questions for 9th graders and the percentage points of correct answers students provided were used as the measure. The average of cognitive test scores was 48.22 out of 100.

Two additional attitude outcomes were included. Study attitude was tapped by parent responses to the question “Overall speaking, how would you rate this child’s study attitude?,” with the response categories including “not serious at all,” “not very serious,” “average,” “pretty serious,” and “very serious,” and higher values indicating more serious study attitudes. The mean was 3.33, slightly higher than average. Homework engagement was captured by student agreement with the statement “I do my best on homework even when I don’t like it,” with the response categories including “completely disagree,” “somewhat disagree,” “somewhat agree,” and “completely agree,” and higher values indicating greater diligence in doing homework. The mean was 3.29, about halfway between the two highest levels of homework engagement.

3.2.2. Family Income

Absolute family income was measured by parent responses to the question “How is your current family economic situation?,” with the response categories including “very difficult,” “pretty difficult,” “average,” “pretty affluent,” and “very affluent.” Relative family income was measured by parent responses to the question “Compared to other people in your community would you say your family income belongs to which of the following categories—low, pretty low, neither high nor low, pretty high and high?” Higher values indicated higher absolute or relative family income. The means that of the two income variables, both corresponded to a slightly below-average level.

3.2.3. Mediators

Four categories of mediators were tested. Home amenity captured home-based material resources. Students were asked the following dichotomous question about home amenities: “At your home, do you have the following items: a desk to use for yourself, many books, a computer, internet access, faucet water, private bathroom, and modern bathroom?”. We added the “yes” answers for each item and created a home amenity variable ranging from 0 to 7. The mean was close to 5.

Family socialization patterns were measured by a set of variables. The parental control scale included eight items based on this question asked of student respondents: “Are your parents strict with you on homework and exams, school performance, going to school every day, the time to come home after school every day, who you make friends with, dressing and appearance, internet surfing time, and TV-watching time?” Each item had three response categories: “They don’t monitor,” “They monitor but aren’t strict,” and “They’re very strict.” The responses to the eight items were added to create the scale ranging from 8 to 24 for each parent. The scale exhibited good internal reliability with a 0.77 alpha coefficient. The mean was 18.74, corresponding to a bit more than the second level of strictness.

The parent-child communication scale included five items based on the following questions for student respondents: “Does your mom/dad often discuss the following matters with you: things that occurred at school, your relationships with friends, your relationships with teachers, your mood, and your worries or concerns?” Each item had three response categories: “never,” “occasionally,” and “often.” The responses to the five items were added to create a scale ranging from 5 to 15 for each parent. The scale exhibited good internal reliability with a 0.83 alpha coefficient. Parent-child closeness was measured by the question “How is your relationship with mom/dad?,” with three response categories, “not close,” “so-so,” and “very close,” and higher values indicating greater closeness.

A closeness variable was created for each parent ranging from 1 to 3. On average, students were slightly closer to their mothers than their fathers and communicated with mothers more often than fathers.

The between-parent relationship variable was created based on student agreement with two dichotomous statements: "My parents fight often" (yes/no) and "My parents get along well" (yes/no). If the parents did not fight often and got along well, the parental relationship was coded 1; otherwise it was coded 0. About 80% of student respondents reported that their parents had a good relationship. This is a proxy indicator for parental conflicts or lack thereof.

Child agency was captured by student educational aspiration based on the question "What is the highest educational level you wish to obtain?" The response categories included "no aspiration or below academic high school" (coded 1), "academic high school" (coded 2), "associate degree" (coded 3), "bachelor's degree" (coded 4), and "graduate degree" (coded 5). The majority of student respondents (about 65%) had college or higher educational aspirations.

Peer influence was measured by college aspiration among best friends at school. The question asked, "Among the best friends at school you mentioned, how many want to go to college?" The response categories were "none," "one or two," and "many," which were further grouped into a "many" (coded 1) versus "not many" (coded 0) dichotomous variable. About 67% of student respondents said many of their best friends at school aspired to go to college.

3.2.4. Control Variables

Six potential confounding factors were controlled: age (continuously measured in years), gender (male versus female), ethnicity (Han versus non-Han), only child (yes versus no), urban-rural group (urban locals, urban migrants, rural locals, rural migrants), and the student-reported highest educational level of their parents, including six response levels: no school or elementary, junior high, professional high school, academic high school, associate degree, and bachelor's degree or above. These variables are known to be linked to both family SES and child developmental outcomes. For example, research shows only children outperform children with siblings in both physical and academic outcomes (Falbo and Poston 1993), and higher-SES families are more likely to have one child in China due to rural-urban inequalities and the higher prevalence of only children in urban areas. Urban-rural group is also an important confounding factor to control, due to the stratification significance of China's unique household registration system (hukou) (Liu and Xie 2015).

The sample included students aged 12 to 17 with the mean age close to 14 years. Gender distribution was perfectly balanced. The vast majority of student respondents were Han, and about 44% were only children. The urban-rural group variable included information on rural-urban hukou status, and current residence differentiated by locals versus migrants. Urban locals, the most socioeconomically advantaged group, were treated as the reference group. The average parental education was at the professional high school level.

4. Analysis and Results

4.1. Family Income and Cognitive and Educational Outcomes

Table 2 presents the results of ordinary least square (OLS) linear regression models using students' self-reported school grades, objective score on the cognitive test, parent-reported study attitude, and student-reported homework engagement as the dependent variables. Models 1–4 tested the effects of absolute family income, and Models 5–8 tested the effects of relative family income. All eight models controlled for age, gender, ethnicity, only child status, urban-rural group, and parental education. We also fit ordinal logit models for school grades, study attitude, and homework engagement given their ordinal nature. The results remained qualitatively similar.

Table 2. The Associations between Family Income and Cognitive and Educational Outcomes.

	Absolute Family Income				Relative Family Income			
	School Grades	Cognitive Ability	Study Attitude	Homework Engagement	School Grades	Cognitive Ability	Study Attitude	Homework Engagement
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Absolute family income	0.09 *** (0.01)	2.30 *** (0.22)	0.11 *** (0.01)	−0.01 (0.01)				
Relative family income					0.06 *** (0.01)	1.21 *** (0.19)	0.08 *** (0.01)	−0.00 (0.01)
Age (year)	−0.06 *** (0.01)	−5.13 *** (0.10)	−0.02 *** (0.01)	−0.08 *** (0.01)	−0.06 *** (0.01)	−5.13 *** (0.10)	−0.02 *** (0.01)	−0.08 *** (0.01)
Male	−0.27 *** (0.02)	0.70 ** (0.25)	−0.34 *** (0.01)	−0.17 *** (0.01)	−0.27 *** (0.02)	0.67 ** (0.25)	−0.34 *** (0.01)	−0.17 *** (0.01)
Han	0.10 ** (0.03)	0.42 (0.46)	0.15 *** (0.03)	−0.02 (0.02)	0.11 *** (0.03)	0.70 (0.46)	0.16 *** (0.03)	−0.03 (0.02)
Only child	0.04 * (0.02)	3.26 *** (0.28)	0.02 (0.02)	−0.00 (0.01)	0.04 * (0.02)	3.40 *** (0.28)	0.03 (0.02)	−0.00 (0.01)
Urban migrants	−0.00 (0.04)	−0.86 (0.53)	−0.03 (0.03)	−0.09 *** (0.03)	−0.00 (0.04)	−0.84 (0.53)	−0.03 (0.03)	−0.09 *** (0.03)
Rural locals	0.09 *** (0.02)	−2.04 *** (0.32)	0.02 (0.02)	0.06 *** (0.02)	0.09 *** (0.02)	−2.13 *** (0.32)	0.02 (0.02)	0.06 *** (0.02)
Rural migrants	0.12 *** (0.03)	0.99 * (0.45)	0.06 * (0.03)	−0.02 (0.02)	0.12 *** (0.03)	1.04 * (0.45)	0.06 * (0.03)	−0.02 (0.02)
Parental education	0.12 *** (0.01)	1.69 *** (0.10)	0.08 *** (0.01)	−0.01 * (0.00)	0.12 *** (0.01)	1.75 *** (0.10)	0.08 *** (0.01)	−0.01 * (0.00)
Constant	3.25 *** (0.11)	106.75 *** (1.72)	3.12 *** (0.10)	4.53 *** (0.08)	3.31 *** (0.11)	109.49 *** (1.69)	3.19 *** (0.10)	4.50 *** (0.08)
R-squared	0.054	0.214	0.063	0.027	0.053	0.211	0.062	0.027

Sample size = 17,199; Coefficients presented; Standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The coefficients for family income were significant and positive in both models for school grades, cognitive ability, and study attitude. At face value, the coefficient sizes seemed larger for absolute family income than for relative family income. We then simultaneously tested the two income variables and found absolute income coefficients were larger than relative income coefficients for all three outcomes, but only the difference for cognitive ability was statistically significant (data not shown). According to the OLS regression results, one level higher in absolute family income corresponds to 0.09 level higher in school grades, 2.3 percentage points higher in cognitive test score, and 0.11 level higher in parent-rated study attitude. Regardless of the measure, no family income effect was detected for homework engagement. In the subsequent analyses that aimed to test the hypothesized mediating effects, we thus excluded homework engagement due to its insignificant main effect.

4.2. Mechanisms Underlying the Family Income Effects

4.2.1. Family Income and the Hypothesized Mediators

After detecting the main effects of family income on school grades, cognitive ability, and study attitude, we moved on to test the intervening effects of the hypothesized mediators as shown in Figure 1. According to [Baron and Kenny \(1986\)](#), the most widely cited article for mediation methods ([MacKinnon et al. 2007](#)), to establish mediation, after showing the main effect of the independent variable on the dependent variable, the independent variable must affect the mediator and the mediator must affect the dependent variable. In addition, if these conditions all hold in the predicted direction, then the effect of the independent variable on the dependent variable must be less in the equation with the mediator added, and perfect mediation holds if the independent variable has no effect when the mediator is controlled.

Table 3 shows the effects of family income on the hypothesized mediators with 3A for absolute family income and 3B for relative family income as the key predictor after the control variables are adjusted. Other than parental control, all the other mediators were significantly and positively associated with both family income variables. These results indicate that family income is positively linked to all the mediators, with parental control being the only exception. We thus excluded parental control from the mediator pool in next steps.

4.2.2. The Hypothesized Mediators and Cognitive and Educational Outcomes

Table 4 presents the results of the associations between the mediators and the three outcomes. Three mediators, including parental relationship, educational aspiration, and peer college aspiration, were significantly and positively associated with all three outcomes. For school grades, communication with mother was also important and beneficial, but home amenities, communication with father, closeness to mother, and closeness to father were not significant covariates. For cognitive ability, the only mediators not showing a significant effect were closeness to mother and closeness to father. For study attitude, all the mediators were significant and positive covariates.

Table 3. (A) The Associations between Absolute Family Income and the Hypothesized Mediators. (B) The Associations between Relative Family Income and the Hypothesized Mediators.

(A)									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Home Amenity	Parental Control	Communication with Mother	Communication with Father	Closeness to Mother	Closeness to Father	Parental Relationship	Educational Aspiration	Peer College Aspiration
	(OLS)	(OLS)	(OLS)	(OLS)	(Ordinal logit)	(Ordinal logit)	(Logit)	(OLS)	(Logit)
Absolute family income	0.86 *** (0.02)	0.03 (0.04)	0.25 *** (0.04)	0.14 *** (0.04)	0.16 *** (0.03)	0.12 *** (0.03)	0.25 *** (0.03)	0.06 *** (0.02)	0.14 *** (0.03)
Age	-0.07 *** (0.01)	-0.26 *** (0.02)	-0.14 *** (0.02)	-0.19 *** (0.02)	-0.14 *** (0.01)	-0.12 *** (0.01)	-0.08 *** (0.02)	-0.11 *** (0.01)	-0.13 *** (0.01)
Male	-0.11 *** (0.02)	-0.33 *** (0.05)	-0.70 *** (0.04)	0.11 * (0.04)	-0.17 *** (0.03)	0.08 * (0.03)	-0.15 *** (0.04)	-0.31 *** (0.02)	-0.57 *** (0.03)
Han ethnicity	0.52 *** (0.04)	-0.32 *** (0.09)	0.32 *** (0.08)	-0.09 (0.08)	0.02 (0.06)	-0.04 (0.06)	-0.10 (0.07)	-0.19 *** (0.04)	-0.35 *** (0.06)
Only child	0.60 *** (0.03)	0.13 * (0.06)	0.52 *** (0.05)	0.21 *** (0.05)	0.11 ** (0.04)	0.08 * (0.04)	-0.12 ** (0.04)	0.11 *** (0.02)	0.18 *** (0.04)
Urban migrants	0.07 (0.05)	-0.11 (0.10)	-0.04 (0.09)	0.14 (0.09)	-0.14 (0.07)	-0.14 * (0.07)	0.04 (0.08)	-0.07 (0.04)	-0.11 (0.07)
Rural locals	-0.92 *** (0.03)	0.07 (0.06)	0.10 (0.05)	0.21 *** (0.06)	0.14 ** (0.04)	0.18 *** (0.04)	0.13 ** (0.05)	-0.03 (0.04)	-0.19 *** (0.04)
Rural migrants	-0.20 *** (0.04)	0.11 (0.09)	-0.18 * (0.08)	0.02 (0.08)	-0.22 *** (0.06)	-0.13 * (0.05)	-0.02 (0.07)	-0.03 (0.05)	-0.16 ** (0.06)
Parental education	0.27 *** (0.01)	0.04 * (0.02)	0.25 *** (0.02)	0.15 *** (0.02)	0.09 *** (0.01)	0.06 *** (0.01)	0.03 (0.01)	0.19 *** (0.01)	0.17 *** (0.01)
R-squared	0.367	0.015	0.066	0.020				0.093	

Table 3. Cont.

(B)									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Home Amenity	Parental Control	Communication with Mother	Communication with Father	Closeness to Mother	Closeness to Father	Parental Relationship	Educational Aspiration	Peer College Aspiration
	(OLS)	(OLS)	(OLS)	(OLS)	(Ordinal logit)	(Ordinal logit)	(Logit)	(OLS)	(Logit)
Relative family income	0.60 *** (0.02)	0.00 (0.04)	0.18 *** (0.03)	0.14 *** (0.03)	0.12 *** (0.03)	0.12 *** (0.02)	0.20 *** (0.03)	0.07 *** (0.01)	0.15 *** (0.02)
Age	−0.06 *** (0.01)	−0.26 *** (0.02)	−0.14 *** (0.02)	−0.19 *** (0.02)	−0.14 *** (0.01)	−0.12 *** (0.01)	−0.08 *** (0.02)	−0.11 *** (0.01)	−0.13 *** (0.01)
Male	−0.12 *** (0.02)	−0.33 *** (0.05)	−0.70 *** (0.04)	0.11 * (0.04)	−0.17 *** (0.03)	0.08 * (0.03)	−0.15 *** (0.04)	−0.32 *** (0.02)	−0.57 *** (0.03)
Han ethnicity	0.61 *** (0.04)	−0.31 *** (0.09)	0.34 *** (0.08)	−0.07 (0.08)	0.03 (0.06)	−0.03 (0.06)	−0.08 (0.07)	−0.19 *** (0.04)	−0.34 *** (0.06)
Only child	0.64 *** (0.03)	0.14 * (0.05)	0.53 *** (0.05)	0.22 *** (0.05)	0.12 ** (0.04)	0.08 * (0.04)	−0.11 ** (0.04)	0.12 *** (0.02)	0.18 *** (0.04)
Urban migrants	0.07 (0.05)	−0.11 (0.10)	−0.04 (0.09)	0.13 (0.09)	−0.14 (0.07)	−0.14 * (0.07)	0.03 (0.08)	−0.07 (0.04)	−0.12 (0.07)
Rural locals	−0.94 *** (0.03)	0.07 (0.06)	0.10 (0.05)	0.21 *** (0.06)	0.14 ** (0.04)	0.18 *** (0.04)	0.12 * (0.05)	−0.03 (0.02)	−0.19 *** (0.04)
Rural migrants	−0.18 *** (0.04)	0.11 (0.09)	−0.17 * (0.08)	0.03 (0.08)	−0.21 *** (0.06)	−0.13 * (0.05)	−0.02 (0.07)	−0.03 (0.03)	−0.15 ** (0.06)
Parental education	0.28 *** (0.01)	0.04 * (0.02)	0.25 *** (0.02)	0.15 *** (0.02)	0.09 *** (0.01)	0.05 *** (0.01)	0.03 (0.01)	0.18 *** (0.01)	0.17 *** (0.01)
R-squared	0.347	0.015	0.065	0.020				0.093	

Sample size = 17,191; Coefficients presented; Standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4. The Associations between the Hypothesized Mediators and Cognitive and Educational Outcomes.

Mediators	School Grades	Cognitive Ability	Study Attitude
Home amenity	−0.01 (0.00)	1.32 *** (0.07)	0.02 *** (0.00)
Communication with mother	0.02 *** (0.00)	0.32 *** (0.06)	0.03 *** (0.00)
Communication with father	0.00 (0.00)	−0.13 * (0.05)	0.01 *** (0.00)
Closeness to mother	0.03 (0.02)	−0.58 (0.30)	0.07 *** (0.02)
Closeness to father	0.02 (0.02)	0.10 (0.27)	0.08 *** (0.01)
Parental relationship	0.06 ** (0.02)	0.71 * (0.31)	0.07 *** (0.02)
Educational aspiration	0.33 *** (0.01)	2.49 *** (0.10)	0.16 *** (0.01)
Peer college aspiration	0.13 *** (0.02)	1.73 *** (0.28)	0.10 *** (0.02)
Control variables			
Age (year)	−0.01 * (0.01)	−4.72 *** (0.10)	0.01 (0.01)
Male	−0.13 *** (0.02)	2.05 *** (0.25)	−0.25 *** (0.01)
Han ethnicity	0.18 *** (0.03)	0.44 (0.45)	0.19 *** (0.03)
Only child	−0.00 (0.02)	2.13 *** (0.28)	−0.02 (0.02)
Urban migrants	0.03 (0.03)	−0.62 (0.52)	−0.00 (0.03)
Rural locals	0.09 *** (0.02)	−0.83 ** (0.31)	0.03 (0.02)
Rural migrants	0.14 *** (0.03)	1.40 ** (0.43)	0.08 ** (0.02)
Parental education	0.05 *** (0.01)	0.79 *** (0.10)	0.04 *** (0.01)
Constant	1.24 *** (0.11)	91.21 *** (1.83)	1.47 *** (0.10)
R-squared	0.221	0.266	0.152

Sample size = 17,191; Coefficients presented; Standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.2.3. Mediating Effects

Based on the previous results, we tested the mediating effects. Table 5 shows the results from two models for each outcome. The first model was the baseline model, in which we included absolute family income and all the controls. We chose to focus on absolute family income rather than relative family income in the mediation analyses considering the more stable and larger effects of the former. In the second model, we added all the mediators that were significantly linked to both income and the outcome in the previous analyses. We then calculated the effect reduction percentage for family

income from the baseline model to the second model for each outcome, and present them in the last row of this table. We also performed the Sobel–Goodman mediation test separately for each mediator and present the results in Table 6.

Table 5. Mediating Effects.

	School Grades		Cognitive Ability		Study Attitude	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Absolute family income	0.09 *** (0.01)	0.05 *** (0.01)	2.30 *** (0.22)	1.02 *** (0.22)	0.11 *** (0.01)	0.07 *** (0.01)
Home amenity				1.21 *** (0.08)		0.01 (0.00)
Communication with mother		0.03 *** (0.00)		0.27 *** (0.05)		0.03 *** (0.00)
Communication with father				−0.12 * (0.05)		0.01 *** (0.00)
Closeness to mother						0.07 *** (0.02)
Closeness to father						0.08 *** (0.01)
Parental relationship		0.07 *** (0.02)		0.54 (0.30)		0.07 *** (0.02)
Educational aspiration		0.33 *** (0.01)		2.49 *** (0.10)		0.16 *** (0.01)
Peer college aspiration		0.13 *** (0.02)		1.70 *** (0.27)		0.10 *** (0.02)
Age	−0.06 *** (0.01)	−0.01 * (0.01)	−5.13 *** (0.10)	−4.72 *** (0.10)	−0.02 *** (0.01)	0.01 (0.01)
Male	−0.27 *** (0.02)	−0.13 *** (0.02)	0.70 ** (0.25)	2.03 *** (0.25)	−0.34 *** (0.01)	−0.25 *** (0.01)
Han ethnicity	0.10 ** (0.03)	0.17 *** (0.03)	0.42 (0.46)	0.33 (0.45)	0.15 *** (0.03)	0.18 *** (0.03)
Only child	0.04 * (0.02)	−0.01 (0.02)	3.26 *** (0.28)	2.11 *** (0.28)	0.02 (0.02)	−0.02 (0.02)
Urban migrants	−0.00 (0.04)	0.03 (0.03)	−0.86 (0.53)	−0.66 (0.52)	−0.03 (0.03)	−0.01 (0.03)
Rural locals	0.09 *** (0.02)	0.10 *** (0.02)	−2.04 *** (0.32)	−0.84 ** (0.31)	0.02 (0.02)	0.03 (0.02)
Rural migrants	0.12 *** (0.03)	0.14 *** (0.03)	0.99 * (0.45)	1.39 ** (0.43)	0.06 * (0.03)	0.08 ** (0.02)
Parental education	0.12 *** (0.01)	0.05 *** (0.01)	1.69 *** (0.10)	0.77 *** (0.10)	0.08 *** (0.01)	0.03 *** (0.01)
R-squared	0.054	0.221	0.214	0.267	0.063	0.154
Effect reduction for family income		44.44%		55.65%		36.36%

Sample size = 17,191; Coefficients presented; Standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 6. Proportions of Total Effect Mediated.

	School Grades	Cognitive Ability	Study Attitude
Home amenities	N/A	67.9%	40.3%
Mother-child communication	23.8%	10.6%	22.9%
Father-child communication	N/A	N/A	8.1%
Mother-child closeness	N/A	N/A	9.3%
Father-child closeness	N/A	N/A	5.6%
Parental closeness	4.2%	1.7%	5.2%
Educational aspiration	44.3%	15.8%	24.7%
Peer college aspiration	18.0%	7.9%	12.7%

Results from Sobel-Goodman mediation test.

For school grades, the coefficient of family income decreased from 0.09 in Model 1 to 0.05 in Model 2, a 44% reduction. Meanwhile, the R^2 of the model increased from 5.4% in Model 1 to 22.1% in Model 2, indicating that the model explained about 22% of the variability of school grades around its mean. As shown in Table 6, the Sobel–Goodman mediation test results indicate that educational aspiration exhibited the largest mediating effect, followed by mother-child communication and then peer college aspiration. Parental relationship was also a significant mediator, although the effect size was small.

For cognitive ability, the coefficient of family income decreased from 2.30 in Model 3 to 1.02 in Model 4, a 56% reduction. Meanwhile, the R^2 of the model increased from 21.4% in Model 3 to 26.7% in Model 4 indicating that the model explains about 27% of the variability of cognitive ability around its mean. The mediating test results show that the most remarkable mediator for cognitive ability was home amenities, explaining about 68% of the total effect of family income on cognitive ability. The next most power mediator was educational aspiration followed by mother-child communication and then by peer college aspiration. Interestingly, neither closeness to mother nor closeness to father sit on the pathway from income to cognitive ability. The mediating effect size of parental closeness was small but statistically significant. The role of communication with dad was intriguing, as its coefficient was negative in Model 4 of Table 5 showing a negative correlation with cognitive ability. This negative effect, likely a statistical artefact or reversely caused, makes communication with dad ineligible to serve as a mediator for the income and cognitive ability link.

For study attitude, the coefficient of family income decreased from 0.11 in Model 5 to 0.07 in Model 6, a 36% reduction. Meanwhile, the R^2 of the model increased from 6.3% in Model 5 to 15.4% in Model 6, indicating that the model explained about 15% of the variability of cognitive ability around its mean. Although home amenities appeared to be a significant covariate of study attitude in Table 4, its effect was rendered nonsignificant when other mediators were added to the model (see Model 6, Table 5). However, the indirect effect via home amenities was the strongest among all the mediating effects (see Table 6). The second largest mediator was educational aspiration followed by mother-child communication and then by peer college aspiration. The other mediators all exhibited significant but weaker mediating effects.

5. Discussion

Capitalizing on recent data from the China Education Panel Survey, the present study was designed to examine the role of family income in contributing to educational and cognitive outcomes among Chinese adolescents and explore four categories of mechanisms underlying these associations. As hypothesized, family income was linked directly to school grades, cognitive ability, and study attitude, as well as indirectly via some or all of these mechanisms depending on the specific outcome. The key take-home message is that home environments constitute a prominent setting outside of school exerting powerful influences shaping school outcomes. As far as we know, this is the first study conducted in China to test a comprehensive conceptual model of absolute and relative family income on adolescents' academic performance, cognitive ability, and attitude and behavior toward school work, which are known predictors of educational achievement and status attainment in adulthood

(Berger et al. 2009). As such, this research corroborates and augments the status-attainment model among Chinese adolescents and provides novel evidence contributing to the current debate about the patterns and sources of intergenerational transmission of family advantage or disadvantage via children's academic and cognitive achievement.

Our sample consisted of 7th and 9th graders recruited from junior high schools in China. For school grades, cognitive ability, and study attitude, both absolute income and relative income were significant. Hence, assuming the observed income effects are causal, these findings confirm that being rich as well as being richer than others (as perceived by the parent) improve adolescents' educational and cognitive outcomes, thereby facilitating the intergenerational transmission of status. Moreover, we found that absolute income seemed to be more consistently and more strongly linked to our outcomes than relative income. Previous work has shown that absolute rather than relative income is a better socioeconomic predictor of physical or objective wellbeing outcomes (Fisk and Merlo 2017; Joseph et al. 2018), whereas changes in relative income have larger effects on emotional or subjective well-being outcomes than do changes in absolute income (Ball and Chernova 2008; Zhou et al. 2019). The explanations for absolute income effects emphasize materialistic or monetary mechanisms, while those for relative income highlight the psychosocial pathways related to perceived relative deprivation and consequent social comparison (Adler 2013). Research on the impact of absolute and relative family income on educational and cognitive outcomes is scarce among the Chinese youth population, but is needed to enrich insights into the related theories and the policies or interventions that aim to improve them (Luo et al. 2018). Our finding that absolute income is a stronger predictor than relative income may testify to the significance of materialistic or monetary resources as critical mechanisms.

Indeed, home amenities, that is, measuring home-based material resources, played the largest mediating role in explaining family income effects on cognitive ability and study attitude. Higher values in the variable of home amenities indicated better living conditions (i.e., having faucet water and modern, private bathrooms) and home products directly promoting cognitive development and school engagement (i.e., availability of a study desk, many books, a computer, and internet access). In our ad hoc analysis, we simultaneously examined the effects of the seven items constituting the home amenity variable and found the coefficients of all, except for computers, were both positive and highly significant after the control variables including parental education were adjusted for, and when internet was taken out of the equation, the computer coefficient also became highly significant (data not shown). Consistent with the family's human capital investment perspectives (Becker and Tomes 1986), these findings suggest that ensuring basic living standards and providing relatively inexpensive educational products such as desks and books, as well as making a computer and internet available, are efficient steps parents can take to promote their children's cognitive development and study attitude. Presumably these material resources are not only important in their own right but also good proxies for family expenditures on a variety of cognitively stimulating goods and services that enhance their children's learning and skill- and credential-building.

Surprisingly, the home amenity variable was not significantly linked to school grades, which was a measure for academic performance. The nonsignificant effect might have been driven by a few countervailing factors. On the one hand, a large and diverse body of research has revealed the benefits of a positive physical environment, including good housing conditions, on child development (Evans 2006). On the other hand, the relationship between the use of computers and/or internet and student academic performance is complex. While academic benefits of computer or internet use at school or at home have been reported (Bodhi and Kaur 2017), research has also found that using computer devices in the classroom (Carter et al. 2017) and excessive recreational internet use (Camerini et al. 2018; Islam et al. 2018) are correlated with impaired academic performance. The academic impacts of computer and/or internet use likely depend on the intensity, purpose, and setting of the use. More research is warranted to investigate the relationship between child development and the physical and material environment in China.

Among the non-monetary or intangible intervening factors, the adolescent's own educational aspiration was the most important mechanism exhibiting the largest mediating effect for family income impacts on school grades and the second largest for cognitive ability and study attitude. Its positive main effects were also significant and consistent in all the outcomes we examined net of the control variables and the other mediators. These findings lend strong support to the theories that highlight the salient role of children's "own voice" and "own volition" in contributing to their developmental trajectories (Bandura 2001; Haring et al. 2019). In this view, children should not be considered a "blank slate" on to which adult wishes or society's expectations are projected; rather, children are able to exert intrapersonal influences (Bandura 2018; Haring et al. 2019). That is, to varying degrees in different contexts, children have the ability to develop and express their own thoughts, make their own decisions, and act on their own behalf to control their own lives. Meanwhile, researchers are recommended to be mindful of how agency is socio-culturally conditioned and that multilevel environmental forces intersect to shape this agency (Huijismans 2011; Kumpulainen et al. 2014). The current study shows that higher family SES is positively correlated with higher educational aspiration, but we were not able to investigate pathways linking these structural positions to educational aspiration. Future research should pay more attention to studying determinants of agency outcomes such as educational aspiration, self-regulation, and self-efficacy to provide evidence on how family, education, and community regimes can work together to form supportive social contexts promoting children's sense of agency that enables their socio-emotional well-being and status attainment in adulthood (Hilppö et al. 2016).

The influence of peers should not be ignored either. We found having many close friends at school who aspire to go to college was a beneficial contributor to these cognitive and educational outcomes independent of a wide range of covariates, including the student's own educational aspiration. It also emerged as one of the top four most powerful mediators explaining the family income effect in this study. In other words, our research documents the existence of the effects of peer agency over and above the child's own agency in a national sample of Chinese adolescents. One implication of the observed school peer influence is that sorting across schools or classrooms within schools by prior cognitive ability could exacerbate educational inequalities, and consequently reinforce existing disadvantage, due to the multiplier effects of peer influence (Dickerson et al. 2018). That said, endogeneity in peer influence exists because like-minded individuals tend to be drawn to each other and form friendship groups. The causality, magnitude, composition, and determinants of these peer effects need to be further studied in Chinese contexts.

Another important result from this research is that family income matters for parenting practices, which is inconsistent with the previous hypothesis and finding that the SES-parenting link is weak in Confucianism-dominant cultures due to the nearly universal high educational aspiration and parental willingness to invest in children's education (Li and Xie 2020; Liu and Xie 2015). Both absolute income and relative income were positively and significantly associated with parent-child communication and closeness. It is plausible that family economic resources facilitate frequent sharing of thoughts and feelings, enhance relational closeness between the parent and the child, and in turn promote children's cognitive and educational outcomes. In this sequence, mother-child communication stood out to be the most important mediator, with father-child closeness being the least important. While we cannot thus conclude that the mother is a more important parent than the father for child development, this finding clearly underscores the critical role of mothering in cultivating children's cognitive and educational potential. Few studies on parenting have incorporated gender perspectives in the Chinese settings. It would be informative to understand differential developmental implications of mothering versus fathering to more effectively support families from disadvantaged environments.

Consistent with prior studies (Reynolds et al. 2014; West et al. 2013), harmonious parent-child and between-parent relationships were also found to be beneficial even after SES factors were accounted for. This result reinforces the developmental significance of non-monetary family assets. Interestingly, the main and mediating effects of these relational factors were larger for study attitude than for more objective outcomes such as school grades and cognitive ability. Facing the stronger and more consistent

main and mediating effects of home amenities, own and peer educational aspiration, and mother-child communication, perhaps harmonious family relationships per se are not sufficient to boost children's cognitive and educational development, but they definitely accord added value to these outcomes.

Due to the nature of the cross-sectional observational study design, it is difficult to derive causal relationships from these findings. Our measures were all based on self-reports, which are inevitably subjected to response bias due to issues such as participants' memory loss and information bias due to social desirability tendency. In addition, despite drawing on a comprehensive conceptual model, our measurement was thin on child agency and peer influence, and school and neighborhood effects were completely omitted. While it can be expected that the ecological systems theory of child development (Bronfenbrenner 1979) should be applicable to various cultural settings, empirically testing it can prove challenging due to its complexity. Prior work conducted in the U.S. showed family was more influential than school and neighborhood contexts in influencing youth risky behavior (Wen 2017). We urge researchers in the future to investigate the relative effects of child agency as well as the contexts of families, schools, communities, and peers on socio-emotional well-being, cognitive development, and socioeconomic outcomes in China.

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