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Parental-Reported Attitudes toward Children's School Performances, Children-Perceived Parental Attitudes, and Academic Achievements：Evidence from China

By

Hongyi Fang

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Faculty Advisor: Derek Neal
Preceptor: Victor Lima

Abstract

Parental-child interactions are highly relevant for child development. However, there exists little evidence for a causal relationship between the two, and researchers do not usually separate different forms of interactions when studying the effectiveness. This paper is an attempt to establish causality while focusing on a specific form. It uses survey panel data from China to study how parental-reported attitudes toward school performances affect educational outcomes. An important feature in this paper is that the reduced form analysis controls for child-perceived parental attitudes, previous educational outcomes, and schools' characteristics, all of which are confounders that most previous researchers have left out in their studies. The result shows that a unit increase in the constructed parental-reported attitude variable, i.e. parents are more concerned about school performances, leads to a 0.0531-point increase and a 0.0111-point increase in children's total subject score and cognitive test score. Additionally, the paper uses instruments to address concerns about measurement errors and omitted variable bias. The result is again statistically significant and confirms the conventional wisdom that "tiger parents" produce children with higher academic achievement. Interestingly, while children's perceptions are significant and sometimes have a stronger correlation with educational outcomes than parental-reported attitudes do, perceptions do not matter once endogeneity is accounted for.

1. Introduction

Many studies have shown that parental-child interactions significantly influence children's development (Jeynes, 2003; Jeynes, 2005; Wilder, 2014). Although there is no clear definition of such interactions, in the child development field, the common forms of the interaction are communication, home supervision, educational aspiration, and parenting styles, while outcomes are usually different types of test scores (Fan and Chen, 2001; Castro et.al, 2015; Wilder, 2014). Researchers have indicated the importance of different forms (Paulson, 1994; Gonzales and Blanco, 1991; Yap and Enoki, 1995) at different education levels (Jeynes, 2005; Jeynes, 2007; Mattingly et al., 2002).

There exist multiple meta-analyses which summarize thousands of studies on the topic (Fan and Chen, 2001; Jeynes, 2003, 2005, 2007, 2012; Erion, 2006; Senechal and Young, 2008; Patall, Cooper, and Robinson, 2008; Hill and Tyson, 2009; Wilder, 2014; Castro et.al, 2015). These meta-analyses provide more generalizable results, but their findings are considerably different. For example, Jeynes (2003) implies a positive correlation between different parental involvements and academic achievements, but parental involvement has a greater impact on teachers' evaluation of children's academic behaviors and attitudes rather than children's GPA. Patall, Cooper, and Robinson (2008) have a conclusion contrary to most studies, showing a weak and small correlation between parents' assistance with children's homework and academic achievements. Considering these heterogeneous outcomes, researchers should be cautious about generalizing the relationship between parental-child interactions and academic achievements across different definitions of interactions or different measures of academic achievements, as suggested by Fan and Chen (2001).

In light of this, this paper focuses on the effect of one specific form of interactions on two different measures of academic capability for middle school children. It explores the effect of parental attitudes toward children's performances at school. The attitude is about not only homework and exams but also general school behaviors and teacher-child interactions, and it is constructed by a set of 4 questions regarding strictness and communication (Figure 1). The first 2 questions about strictness are a direct measure of parents' attitudes, and the last 2 questions about active discussion reflect these reported attitudes in action[1].

The two different measures of academic capability are total subject scores and cognitive test scores, and I perform reduced form analysis on each separately. Since the total subject scores vary from school to school and different regions have different subject tests, I also include the school fixed effects. The cognitive test is used because it examines the more underlying academic capability. While schools design their subject tests based on their curricula, the cognitive test asks questions that are not directly reflective of class materials. Instead, it attempts to assess children's academic skills, such as critical thinking and logic. The cognitive test was designed based on the Item Response Theory, which ensures comparability across individuals even with different test questions.

For the reduced form analysis, I control for potential confounders, which are omitted by most previous researchers when they argue for the importance of different forms of parental-child interactions for academic achievement. Social behaviors tend to be correlated with each other, so it may be hardly possible to unravel the different factors behind academic achievement. Attempts that control for various confounding variables, though rare, are thus valuable in offering a less

[1] The reasons why this set is chosen are specified in the following paragraphs. To control for children's perceptions, I need to use the same set of questions for both children and parents about parental attitudes, and this set is exhaustive. Moreover, the set is internally consistent.

biased and more consistent picture of the effect of parental-child interactions. For instance, Zellman and Waterman (1998) find that with controls for a child's ability, ethnicity, and SES, there is a significant positive correlation between parental in-school involvement and children's reading scores. However, even these limited number of studies that consider confounders only focus on children's past achievements and family background, but there could be other potential factors that lead to omitted variable bias. Therefore, in addition to common controls such as children's previous achievements, SES, and parents' education levels, this paper adds children-perceived parental attitudes as a control[2]. While parents' survey answers indicate how much they care about children's school performances, children do not always perceive the attitudes perfectly.

Researchers who study parenting styles have already widely explored this difference between parental intentions and children's perceptions. For example, Huang et al. (2019) find that although parental-reported and child-perceived parenting correlate positively, there are significant differences between the two. Paulson (1994) concludes that children's reports of parenting, instead of parents', have a significant correlation with their academic outcomes. Although parenting style is only a specific topic under parental-child interactions, any parental behaviors can be an element of parenting styles. Therefore, children's perceptions might matter in all studies of parental-child interactions and thus should be controlled for.

To control for children's perceptions, I use the same 4 questions that are answered by both parents and children and construct one variable for each party. This is the reason why the set of questions is chosen – it is exhaustive in the dataset. No other questions related to school

[2] In what follows, parental attitudes will be mostly referred to as "parental-reported attitudes" and "children's perceived attitudes" to distinguish the two concepts. I will occasionally use the phrase "parental attitudes" as a more general concept, especially in the discussion of the results after I establish that children's perceptions do not matter.

performances are answered by both parents and children. The two sets of questions for parents and children also satisfy, respectively, the requirement of Cronbach's alpha in psychometrics. It is a widely used metric to measure the internal consistency of a chosen set of questions, usually in survey settings (e.g. Huang et. al, 2019; Paulson et. al, 1998; Paulson, 1994a). If the chosen set is internally consistent in measuring the outcome of interest, Cronbach's alpha statistics are high. Then, I perform principal component analysis (PCA) on both sets of questions to construct variables for the parental-reported attitudes and the children-perceived attitudes.

In addition to perceptions, this paper controls for school characteristics. Children attending different schools can have different educational improvements, and different school environments can shape how children generally perceive other people. Also, as mentioned above, schools design academic assessments differently. However, no previous study controls for this factor, leading to potential selection bias. Since the survey includes school-level identifiers, I incorporate school fixed effects into the model to control for the school-level variations.

Controlling for children's perceptions along with other factors, I find that a one-point increase in the constructed score for parental-reported attitudes, meaning parents are more concerned about school performances, correlates to a 0.0531-point and a 0.0111-point increase in subject test scores and cognitive scores, respectively. Meanwhile, a one-point increase in the constructed score for children's perceptions, meaning children perceive that their parents are more concerned about school performances, correlates to a 0.0409-point and a 0.0439-point increase in subject test scores and cognitive scores, respectively. Noticeably, the result for the cognitive test indicates that if children's perceptions are controlled for, the relationship between parental-reported attitudes and educational outcomes is weaker than the one between children's perceptions and outcomes. Also, the former is less statistically significant than the latter. This

suggests that children's perceptions may have a stronger influence on the underlying academic capability than parental attitudes do.

Nevertheless, this result does not indicate a causal relationship. Another problem that most of the previous studies are susceptible to is endogeneity, which is not fully addressed by the above reduced form analysis either. Patall, Cooper, and Robinson (2008) suggest that one potential explanation for its abnormal result mentioned above is a bidirectional relationship between parental-child interactions and academic outcomes. Children with poorer academic achievements may require more parental involvement in homework. Similarly, in this paper's context, a simple OLS model can suggest that either parents who care more about school performances produce children with higher academic achievement or children who do poorly at school make their parents more concerned about their school performances.

To address this concern of endogeneity, I use a quantifiable question answered by parents– "how often do you have dinner with your child" – as an instrument for the parental-reported attitude variable. Dinner time is important for parents to show their attitudes because of the traditional Chinese dining style. Unlike in Western culture, where each person has their own plate of dinner, dishes are shared by everyone and are placed in the middle of the dining table in Chinese culture. Therefore, if family members decide to eat dinner at home, they usually eat at the same time and at the same table. Since a meal takes longer than 10 minutes to finish, conversations usually occur at the table. Among all the topics that parents and children may talk about, school is one of the most common topics given the children's ages. Therefore, a lack of dinner time can be highly correlated with parents caring less about school performances. Moreover, the frequency of dinner with children should have no direct effect on children's

educational outcomes. Even if parents talk about schoolwork at the dining table, the effect of this action on academic achievements will have to channel through parental attitudes.

I also use a similar, quantifiable question answered by children – "how often do your parents go to museums/zoos with you" – as an instrument for the children's perception variable. On the one hand, this instrument is relevant. Visitors tend to talk when walking around out of curiosity, excitement, etc. This communication should help children better perceive their parents' general behaviors. Even if parents and children do not talk much during the visits, parents' companionship with children should help with children's perceptions because of the time spent together. On the other hand, this instrument is valid, not correlating with any unobservable in the original OLS. Children who are better at school performances might "earn" more leisure time from their parents and do more extracurricular activities. However, museums and zoos are typically considered places for enriching learning, as opposed to movie theaters and concerts. Regardless of children's performances, parents should be equally willing to take them to museums and zoos for educational purposes. Moreover, these places are usually free to students if not to the public, so there should be little concern about any correlation between family background and frequency of museum/zoo visiting.

The results from 2SLS suggest that the OLS regressions attenuate the estimated effect of parental-reported attitudes. A one-point increase in the constructed score for parental-reported attitudes leads to a 0.0940-point and a 0.0982-point increase in subject test scores and cognitive scores, respectively. Since the coefficients are highly significant for both outcomes, I can conclude that parents who are more concerned about school performances affect children's educational outcomes positively. Put differently, "tiger parents" indeed produce children with higher academic achievement.

The children's perception variable, interestingly, become insignificant for both outcomes. The magnitude is smaller than before in the subject test model, and the sign even becomes negative in the cognitive test model. The negative sign means children who perceive their parents to be closer to "tiger parents" have lower underlying academic achievement. However, since perceptions are not significant in either model, we should consider the 2SLS result as that children's perceptions do not really matter but not that perceived "tiger parents" negatively affect academic achievements.

This paper focuses on one form of parental-child interaction, has a clear definition of parental attitudes about school performances, and controls for confounding variables. The research design provides a better estimate of the effect of parental attitudes than previous studies do and shows that children's perceptions matter when we study parental-child interactions. Separating the effects of different interactions is hardly possible even in lab experiments. In light of this, the reduced form analysis in this paper is at least a good alternative to tease out the effect of parental attitudes toward school performances. The paper can also be considered as a check to the conventional wisdom that "tiger parents" produce children with better academic outcomes.

The paper also provides policy implications. Since parents who care more produce children with higher academic achievement, schools should help parents understand schoolwork and children's performances at school better. For example, schools can host more parent days and/or teacher-parent meetings, upload students' academic progress, etc. Schools should also provide seminars about early adolescence psychology to help parents better present themselves in front of children and better understand children's needs.

The rest of the paper proceeds as follows. Section 2 explains the dataset. Section 3 presents the OLS model and its result. Section 4 presents the 2SLS model and its result. Section 5 discusses the results. The last section concludes.

2. Data

2.1 Data Source

The longitudinal dataset used in the paper is the Chinese Education Panel Survey (CEPS) by the National Survey Research Center (the Center) at Renmin University of China. It started in 2013 and surveys middle school students and their parents. The survey includes questions about local education policies, school curriculum, teacher-student relationships, student-student relationships, family environment, parent-teacher relationships, and demographic information about parents and students. In total, there are over 300 variables. Up to now, only the surveys from 2013-2014 and 2014-2015 are available. I use the first round (7^{th} graders) to establish a baseline for children's academic capability and draw variables mostly from the second round (8^{th} graders).

With the average education level of the population and the proportion of the mobile population as stratification variables, the Center selected 28 county-level units (counties, districts, and cities) as survey sites from across the country. The survey was executed on a school basis, and 112 schools and 438 classes were randomly selected for the survey in the selected county-level units. All students in the selected classes were included in the sample, and a total of about 20,000 parent-child dyads were surveyed in the first round. Around 10,000 dyads participated in both rounds, and they are identified with the same student ID's in both rounds.

The sample has relatively balanced statistics. A brief descriptive statistics table is shown in Table 1. Around half of the students are identified as boys. The average education degrees for both fathers and mothers are secondary vocational school (around 12 years, the same number of years of education as high school). According to the 2010 Census[3], the average year for education is 9.08. Around 11% of the sample receives minimum living security funds provided by the government (MLSF). According to the 2010 Census[4], the proportion of citizens who received MLSF was about 6%, which is lower than in the sample.

Children brought surveys home for parents to fill out, and they brought back the completed surveys to schools the next day. Children completed their own survey in class before they were handed the parent surveys, so there should not be any interference from parents with children's answers. One might be concerned about children affecting parents' answers at home, which could lead to measurement errors. However, it is reasonable to assume that parents are not as easily affected by children as children are by parents because of the usual Chinese parenting styles. In traditional Chinese culture, adults consider children to have little capacity to understand and make the best decisions for themselves (Ho, 2008). Therefore, one typical characteristic of Chinese parents is directiveness: parents think they are responsible for regulating children's behaviors and academic performance (Lin and Fu, 1990). Therefore, it is not likely that children would affect parents' answers. Moreover, since the surveys are neither identified with names nor intentionally shared in the respondents' immediate environments, there are no conceivable benefits for children to manipulate their parents' answers.

2.2 Variables

[3] Since the survey data was collected in 2013, the 2010 Census should better show whether the sample reflects the population than the 2020 Census. http://www.stats.gov.cn/tjsj/zxfb/202105/t20210510_1817182.html
[4] http://www.mca.gov.cn/article/sj/tjgb/201107/201107151705659.shtml

2.2.1 Educational outcomes

Two measures are used for this dependent variable, so there will be separate regressions for each measure in the rest of the paper. The two measures are (1) the 2014-2015 total test scores for Chinese, math, and English, the three most important subjects in China, and (2) the 2014-2015 cognitive test scores. Both scores were reported by schools, so the information should be accurate. The perfect score for (2) is 35. Since the subject perfect scores in (1) for different schools are different (100, 120, 130, 150), the total perfect scores in (1) are also different for schools (300, 360, 390, 450). I standardize both scores to z scores for a more intuitive interpretation.

Although (1) is not designed with comparability across years or schools, I still use it because it is the most traditional and important way to evaluate students' achievement at school in China. For middle schoolers, what high schools they can go to almost solely depends on the total subject scores of the high school entrance exam, which only takes place once per year during the end of 9^{th} grade. Therefore, any parental-child interactions related to schoolwork would very likely focus on the subject tests, and the subject test scores should reflect the effect of parental attitudes toward school performances. To use the subject test scores as the outcome while accounting for the idiosyncratic design of tests, I add the school fixed effects to the models.

I also include the second measure because it assesses the more general academic capability. The cognitive test was designed according to the 3PL model (difficulty index, discriminative power index, guessing index) in the Item Response Theory such that the scores are standardized. Nevertheless, to have a more intuitive interpretation, I again standardize the scores to z scores. The test items are not directly related to specific materials taught at school, and they are designed to test general skills such as critical thinking and logic. The test items are all in the multiple-

choice format and are internally consistent according to Cronbach's alpha. The test has 3 dimensions: language, graphs and space, and algebra and logic. There are 11 aspects in total, which are shown in Figure 2.

2.2.2 Parental-Reported Attitudes

In this paper, the definition of parental-reported attitudes toward school performances is the first principal component of a set of 4 items. While the first two items are directly about strictness, the last two are about actions reflecting strictness. The items chosen are (1) How strict are you about your child's homework and exam (P_HW_Exam); (2) How strict are you about your child's school performance (P_School); (3) Do you actively discuss school performance with your child (Dis_School); (4) Do you actively discuss teacher-related issues with your child (Dis_Teacher). The scale for the first two questions ranges from "not at all," "a little," to "very." The scale for the last two questions ranges from "never," "sometimes," to "usually."

Although all questions showed up in both rounds, I use the 2014-2015 responses for this variable because they should reflect what parental attitudes were for the past year, which would, in turn, be reflected in the children's latest scores in 2014-2015.

2.2.3 Children-Perceived Attitudes

The children-perceived attitude variable is constructed in the same way as the parental-reported attitude variable. Both parents and children answer the same questions on the same scale, which is why the paper can control for children's perceptions. For children, the framing of the questions is (1) How strict do you think your parents are about homework and exam (S_ HW_Exam); (2) How strict do you think your parents are about school performance (S_School); (3) Do your parents actively discuss school performance with you (S_Dis_School); (4) Do your

parents actively discuss teacher-related issues with you (S_Dis_Teacher). I use the 2014-2015 responses for the same reason as above.

The heat map for correlations of the 8 questions (for parents and children) is shown in Figure 3. There is no negative correlation, so the directions of parental attitudes and children's perceptions agree. There are four pairs with correlations over 0.5: parental active discussions on school performance and on teachers; parents' intended strictness about homework/exam and about school performance; children's perceived parental activeness of discussing school performance and teachers; children's perceived parental strictness about homework/exam and about school performance. This suggests that both parents' and children's answers are internally consistent, respectively[5].

2.2.4 Previous Academic Achievement

There are two separate measures for the two separate regressions. The two measures are (1) the 2013-2014 total scores for Chinese, math, and English, and (2) the 2013-2014 cognitive test scores. The perfect score for (2) is 35, and the score for (1) is standardized with mean 70 and std 10. I standardize both scores to z scores for the reason specified above.

2.2.5 Controls and Fixed Effects

I use four controls: (1) Dummy for child's gender (Boy); (2) Dummy for whether the family receives MLSF (MLSF); (3) Father's education level (F_Edu); and (4) Mother's education level (M_Edu). (2) is used because the survey does not include specific household income measures, but whether families receive minimum living security funds should indicate their SES. There is no race control because race in China is mostly homogeneous. Along with these, I also use the

[5] I also check the internal consistency by using Cronbach's alpha test in the following subsection.

school fixed effects to control for schools' characteristics, such as the idiosyncratic subject test design.

2.3 Cronbach's Alpha Test for the Parent and Children Variables

For questions (1) – (4), the answers were in the 3-point Likert scale. I perform Cronbach's alpha test for answers from parents and children respectively, both of which passed the test with the conventional 0.70 threshold. The results are shown in Table 2.

3 OLS Model and Result

3.1 Principal Component Analysis (PCA) for Communication Gaps and Investments

Since the parental-reported attitudes and children-perceived attitudes are both measured by sets of questions, I need a metric to construct the regressors. One common way to reduce dimensionality is principal component analysis (PCA). While it simplifies data, it preserves as much information from the original set of x questions as possible. The first principal component (PC) explains the largest possible variance in the set of variables, the second PC explains the next highest variance while it is not correlated with the first PC, and so on until the x-th PC. Therefore, I perform PCA for the two sets of questions and use the first PCs in the regressions. The explained variation per PC is shown in Table 3.

3.2 Main Econometric Model: OLS

The hypothesis is that parents who report they are more concerned about school performances produce children with higher academic achievement. It is tested by, for student i and t = 2014 (so t-1 = 2013),

$$Score_{it} = \beta_0 + \beta_1 * Pfpc_{it} + \beta_2 Score_{i(t-1)} + \beta_3 * Sfpc_{it} + \vec{\alpha} * \vec{X} + \vec{\delta} * \vec{Z} + \mu_i$$

$$Cog_{it} = \gamma_0 + \gamma_1 * Pfpc_{it} + \gamma_2 Cog_{i(t-1)} + \gamma_3 * Sfpc_{it} + \vec{\alpha} * \vec{X} + \vec{\delta} * \vec{Z} + \theta_i$$

Where the variables are:

- $Pfpc$: the first PC for the set of questions measuring parental-reported attitudes toward school performances
- $Score$: the total subject test score
- Cog: the cognitive test score
- $Sfpc$: the first PC for the set of questions measuring children-perceived attitudes toward school performances
- $\vec{X}$: the vector of controls
- $\vec{Z}$: the school fixed effects
- μ_i, θ_i: idiosyncratic characteristics not observable by researchers, clustered at the individual level

3.3 OLS Result

The results from both regressions (Table 4, Table 5) provide some evidence for the conventional wisdom that "tiger parents" correlate with children with higher academic achievement. For each model, the first three columns are without controlling for children-perceived attitudes while the last three include the control. Columns (1) and (4) are without any control and school fixed effects. Columns (2) and (5) are with common controls for the family background but without controlling for previous educational outcomes and school fixed effects. Column (3) is the model specified above without children's perceptions, and column (6) is the model specified above.

According to column (6) in the two tables, a one-point increase in the PCA score for parental-reported attitudes, meaning parents are more concerned about school performances, correlates to a 0.0531-point and a 0.0111-point increase in subject test scores and cognitive scores, respectively. Also, the models explain 62.9% and 30.0% of the variation in the dataset,

respectively. The parental-reported attitude variable is highly significant in the subject test model but less significant in the cognitive test model.

Comparing columns (3) and (6), we can see that when we add school fixed effects and children's perceived attitudes, the relationship between parental-reported attitudes and educational outcomes becomes weaker. The variable for children's perceptions is positive and very significant in column (6) of both tables, and it has a greater magnitude than the parental-reported attitude variable in the cognitive test model. This implies that the results from previous studies that do not control for children's perceptions and school fixed effects cannot be interpreted causally. Moreover, the effect of parental attitudes on academic achievements, especially on children's underlying academic skills, might have been exaggerated without taking children's perceptions and school fixed effects into account.

4 2SLS Model and Result

4.1 2SLS Model

To further address the concern of endogeneity, I use a 2SLS model with instruments. The OLS result above has shown that previous studies are susceptible to omitted variable bias, but the simple OLS model might still be subject to biases. There is no reason to believe that the OLS model includes all necessary variables that affect parental attitudes/children's perceptions and educational outcomes.

To address the endogeneity concern, firstly, I use a more quantifiable question – "how often do you have dinner with your child" – as an instrument for parental-reported attitudes. On the one hand, dinner time satisfies the relevance condition for an instrument because it is tightly related to parental attitudes. The traditional Chinese dining style is a sharing style, with dishes

placed in the middle of the dining table. At dinner time, everyone sits at the table because no one dish is exclusively for one person. Also, it would be very rude to quickly get all the food into one's bowl and walk away with the food. In light of this, if family members decide to eat dinner at home, they usually eat at the same time and at the same table. Since a usual meal takes at least 10 minutes to finish, conversations naturally occur at the table. This means dinner time can be highly correlated with parental attitudes: parents can show how concerned they are about children, including their school performances, through conversations at the dining table. On the other hand, the frequency of dinner with children should have no direct effect on children's educational outcomes, satisfying the validity condition. Even if parents talk about schoolwork at the dining table, the effect of this action on academic achievements will have to channel through the attitude variable. Whether to have dinner together also is not decided by children's school performances given the Chinese dining style specified above.

Secondly, I use another quantifiable question for children – "how often do your parents go to museums/zoos with you" – as an instrument for children-perceived attitudes. This correlates with children's perceptions because visitors usually exchange views when they visit museums/zoos. Communications help children better perceive their parents' general behaviors, including parental attitudes. Even if communications occur not so frequently, simply spending time together still helps children understand their parents better. This question is also valid because it does not affect educational outcomes directly, for children do not obtain knowledge that can directly help with their test scores at these places. Children who behave better at school might be "rewarded" more leisure time and thus might go out more. Nevertheless, museums and zoos are regarded as places for enriching learning, so whether children have higher academic achievement or not should not affect the chance of them going to these places with their parents. Put

differently, parents would not just bring "smart" kids or "bad" kids to museums/zoos. Also, admission to these places is also usually free for students if not for the public, so there should be no correlation between family background and frequency of museum/zoo visiting.

4.2 2SLS Result

Regarding the common concern about the first stage (weak instruments), I consider the IVs weak if the relative absolute bias of IVs to OLS (μ) is more than 10%. To construct a hypothesis test at significance level $\alpha = 0.05$ that $H_0: \mu \geq \sqrt{10}$, i.e. the IVs are not weak, we need the F-stat to be greater than $\chi_1^2(10,0.95) \approx 23$ in no more than 5% of the times.

According to the first stage result, the F statistics are 546.19 and 265.94 for parental-reported attitudes and children's perceptions in the subject test model, and the F statistics are 555.66 and 265.34 for parental-reported attitudes and children's perceptions in the cognitive test model. This means the instruments are not weak based on the chosen relative bias threshold. There might be a concern about the arbitrarily chosen threshold, but given the big numbers of the F statistics, I can safely conclude that the instruments are not weak, as suggested by the intuitions in the previous subsection.

The comparison between the 2SLS models and the OLS models is shown in Table 6. Columns (1) and (3) are the results from 2SLS regressions. According to the 2SLS models, a 1-point increase in the PCA score of parental-reported attitudes would lead to a 0.0940-point increase and a 0.0982-point increase in the total subject test score and the cognitive test score, respectively. For both dependent variables, the estimates of parental-reported attitudes are more positive in 2SLS than in OLS (columns (2) and (4)), meaning the previous models are subject to attenuation bias. While the parental attitude variable becomes less significant in the 2SLS subject test model than in the OLS model, it is much more significant in the 2SLS cognitive model.

Furthermore, children's perceptions have a smaller effect in the 2SLS subject test model than the OLS one, and the sign in the 2SLS cognitive model is even negative. This negative sign means if children perceived their parents as "tiger parents," their underlying academic skills are likely to be negatively affected. Nonetheless, the perception variable is not significant at all in both 2SLS models, so we should refrain from reading too much into the results. The only conclusion we should make is that children's perceived parental attitudes do not matter much once we control for several more important factors.

5 Discussion

5.1 Comparison between 2SLS and OLS: Attenuation Bias

There are two potential explanations for the attenuation of the parental-reported attitudes in the OLS models. The first one is the classical measurement error. Parents might not answer truthfully because they would not like to be considered in a certain way. For example, due to the large literature on the correlation between "tiger parents" and children's worsened mental health, parents might not want to show that they are too concerned about their children's schoolwork and thus skew down their answers. However, this untruthful answer can go either direction. It could also be that parents do not want to show that they care little about their children and thus seem irresponsible, so they skew up their answers. Therefore, we can consider the noise in the parental-reported attitude variable random, which would lead to an attenuation bias.

The second one is the omitted variable bias (OVB). We can consider the simplest model. The OVB is given by $\hat{\beta}_1 = \beta_1 + \beta_2 \frac{Cov(x_1,x_2)}{Var(x_2)}$. If we simplify our models, we can consider x_1 as the parental attitude variable while x_2 as the omitted variable. If β_2 is expected to be negative, meaning an increase in x_2 would lead to a decrease in the educational outcome, then we would

expect $Cov(x_1, x_2)$ to be positive, meaning if x_2 increases, then x_1 would increase (parents are more concerned about school performances).

One potential x_2 can be how rebellious teenagers are. Since the subjects of the study are 7th and 8th graders, they are likely experiencing puberty and thus would not like to follow their parents. If children are more rebellious, it is likely that the educational outcome decreases ($\beta_2 < 0$). Meanwhile, parental-reported attitudes are likely to increase (x_1 increases) because parents with rebellious children tend to be more concerned about their children's school performances.

5.2 Comparison between 2SLS and OLS: the Role of Perceptions

The 2SLS and OLS models provide very different results for the children's perception variable. In the OLS models, when I add the perceptions as a control, parental-reported attitudes correlate less with children's educational outcomes, and perceptions are very statistically significant and have a stronger correlation with the cognitive outcome than parental reports do. This means that all previous reduced form analyses have exaggerated the correlation between parental attitudes and academic achievement. However, in the 2SLS models, children's perceptions are not statistically significant at all. This suggests that we should not over-interpret the magnitudes of the perceptions in both OLS models. Neither should we establish a causal relationship between children's perceptions and academic achievement. Nevertheless, researchers should still control for children's perceptions when they study parental-child interactions given the OLS result. Intuitively, children, especially those who are underage, might understand their parents very differently from what their parents attempt to convey.

5.3 Survey Biases

Another concern with the data is that it was collected through surveys. There are several main biases in survey research: sampling bias, nonresponse bias, response bias, and framing

effect. However, based on the design of the survey, we should not be too concerned about these biases.

First, the Center randomly selected subjects after blocking for mobile population and educational levels. The stratifications are useful because regions with different characteristics are sampled into the survey. If there were no stratification, it would be more likely that the sample includes disproportionally large data points from one socioeconomic group, which would lead to a biased estimate of the effect.

Second, the Center ensured that all randomly chosen children and their parents, once they were sampled in, completed the survey, so there should not be a concern of nonresponse bias.

Third, the survey only uses identifiers for children, classes, and schools. The results are published online and not intentionally shared with the survey subjects' immediate surroundings. Therefore, individuals should not be worried about privacy issues or social reputation when they answered the questions. Also, parents and children completed the survey separately, so there should be no interference from either side, as discussed in Section 2.

Fourth, the questions are framed in a way that no one choice is clearly preferred by the researchers. Extreme answers on the Likert scale might not be favorable, but answers in between can be considered better or worse based on subjective judgments. Therefore, parents and children are not prompted to choose their answers in a specific way.

5.4 External Validity

Since the Center samples randomly across regions based on blocking, there should be nothing particular about the sample, and the sample should reflect how the population behaves (as shown in Section 2). The sample size is also large enough (around 9,500) for us to safely conclude an inference about the population from the paper.

One might have a question about the specific group of children in the sample – the 7th and 8th graders. I am not able to study whether parental attitudes matter more for this group than others due to the limitation of the data. Certain characteristics of this group, such as rebellious behaviors during puberty, might have skewed the result.

However, I argue that this group is appropriate for the study of the topic. First, children at this age are developing better perceptions of other people's behaviors and attitudes. A sample of younger children might systematically produce more data points with inaccurate perceptions, and a sample of older children might systematically produce more data points with perfect perceptions. A sample of middle schoolers like the one in the paper provides a more heterogeneous children's perception variable so that its effect can be more salient and can be controlled for.

Second, children who have the pressure of taking high-stakes exams are ideal for the study. An important implication of the paper is that parents and schools should exert more effort to understand school performances to improve children's academic achievement. This improvement is the most relevant for parents and children who want academic improvement most urgently. In China, career achievements and social mobility are decided largely by academic achievements, and where children go to school is decisive for academic achievements (Jia and Li, 2017). Especially, middle schoolers and high schoolers face entrance exams every three years. While the college entrance exam (CEE) at the end of 12th grade is almost a life-or-death decision, the high school entrance exam at the end of 9th grade largely determines students' CEE outcomes because of their high school education. Therefore, studying the effect of parental attitudes for middle schoolers is more policy-relevant.

6 Conclusion

The paper is an attempt to focus on one specific parental-child interaction, parental attitudes toward school performances, and study how it affects academic capability by using survey data from China. There is a clear working definition of parental attitudes (the directly assessed strictness and the corresponding behaviors), and academic capability is measured consistently across years and regions. Although there is no experiment, I include several variables as controls to produce a less biased estimate of the effect of parental attitudes. These variables, including children-perceived parental attitudes, previous academic achievements, and school fixed effects, were previously largely omitted in papers studying the same topic although researchers have acknowledged their importance. The result from this paper indicates previous studies can hardly make a causal inference about parental attitudes and educational outcomes.

The paper shows evidence of the significance of parental attitudes toward school performances for educational outcomes. When I add instruments to account for endogeneity, a one-point increase in the first principal component of parental-reported attitudes would lead to a 0.0940-point increase and a 0.0982-point increase in subject test score and cognitive test score, respectively. The attenuation bias in the OLS model might be due to (1) the omitted variable of how rebellious teens are and (2) the measurement error of parental-reported attitudes. Moreover, the result suggests that with the controls in the model, children's perceived parental attitudes do not matter.

The paper can be considered as a robustness check to the conventional wisdom that "tiger parents" are good for children's academic development. It also addresses a bigger question central to the large literature on child development: how should parents interact with children to help children achieve more? Since parental attitudes toward school performances have a

significant positive effect on educational outcomes, attitudes toward other areas are very likely to matter for other aspects of child development. Using the same working definition and framework, researchers can further contribute to the understanding of the big question.

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Figure 1 Questions for Parents and Children

How strict are you about the child's homework and exams?

(How strict are your parents about your homework and exams?)

- Not at all
- A little
- Very

How strict are you about the child's school performance?

(How strict are your parents about the your school performance?)

- Not at all
- A little
- Very

Do you actively discuss what happens at school with the child?

(Do your parents actively discuss what happens at school with you?)

- Never
- Sometimes
- Very often

Do you actively discuss with the child about the relationship between the child and his/her teachers?

(Do your parents actively discuss with you about the relationship between you and your teachers?)

- Never
- Sometimes
- Very often

Notes: These are the questions that are used for constructing parental-reported attitudes and children's perceptions. The questions asked to parents are without parentheses, and the ones asked to children are in parentheses. Answer choices are the same for both parents and children.

Figure 1

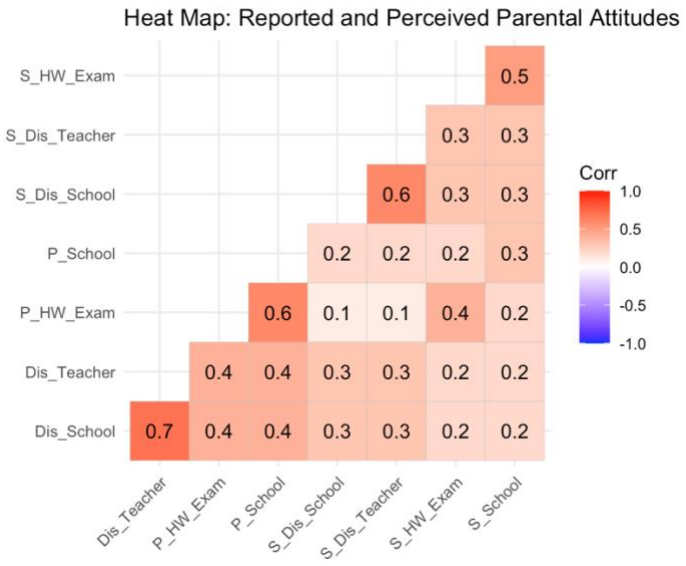
Figure 2 Aspects of the Cognitive Test

Language	Graphs and space	Algebra and logic
•phrase analogy •verbal reasoning	•graphical pattern analysis •origami •geometry application	•mathematical applications •arithmetics •application of numerical series •abstract pattern analysis •probability •inverse thinking

Notes: These are the 11 aspects that the cognitive test is designed to test. The 11 aspects are grouped under 3 larger categories that are considered to be the underlying academic skills by the Center.

Figure 2

Figure 3 Heat Map for Questions Related to Reported and Perceived Parental Attitudes



Notes: This heat map captures the correlations among the 4 questions asked to parents and the same 4 questions asked to children: child-perceived parental strictness about homework/exam (S_HW_Exam); child-perceived parental strictness about school (S_School); child-perceived parental activeness about discussion on teachers (S_Dis_Teacher); child-perceived parental activeness about discussion on school (S_Dis_School); parental-reported strictness about homework/exam (P_HW_Exam); parental-reported strictness about school (P_School); parental-reported activeness about discussion on teachers (Dis_Teacher); parental-reported activeness about discussion on school (Dis_School). Note that the diagonal is omitted from the map.

Figure 3

Table 1 Descriptive statistics

Statistic	Father's Edu	Mother's Edu	Boy	MLSF
N	9,449	9,449	9,449	9,449
Mean	4.075	3.794	0.512	0.104
St. Dev.	2.127	2.108	0.500	0.306
Min	1.000	1.000	0.000	0.000
Pctl(25)	3.000	3.000	0.000	0.000
Pctl(75)	6.000	6.000	1.000	0.000
Max	9.000	9.000	1.000	1.000

Notes: These descriptive statistics describe the CEPS dataset. Education levels for both fathers and mothers rank from 1 to 9 (None; Elementary school; Middle school; Secondary vocational school; Higher vocational school; High school; 2- or 3-year college; College; Master and above). The variables Boy and MLSF are indicators that take on the value 1 if the subject is a boy and if the subject's family receives minimum living security funds provided by the government, respectively.

Table 1

Table 2 Cronbach's Alpha Test for the Parental and Children's Variables

	α	Confidence Interval
Parents	0.78	[0.775, 0.789]
Children	0.72	[0.71, 0.728]

Notes: The table presents the results from the Cronbach's Alpha tests for the reported and perceived parental attitudes. The alphas, along with the confidence intervals, for the children's set of question and for the parents' set of question are above 0.70, which is the conventional threshold for a set to be regarded as internally consistent.

Table 2

Table 3 PCA: Explained Variation per Component

	1st	2nd	3rd	4th
Parents	0.6054	0.2208	0.0939	0.0798
Children	0.5433	0.2437	0.1249	0.0880

Notes: The table presents the results from the principal component analyses for the reported and perceived parental attitudes. The first principal components explain around 61% and 54% of the variation in the parental and children's sets of questions, respectively.

Table 3

Table 4 OLS Results for Subject Test Score

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	W/O Child's Perception			W/ Child's Perception		
Parent's Attitude	0.233***	0.183***	0.0663***	0.174***	0.133***	0.0531***
	(0.0166)	(0.0169)	(0.0113)	(0.0181)	(0.0182)	(0.0120)
Child's Perception				0.155***	0.138***	0.0409***
				(0.0192)	(0.0186)	(0.0124)
Subject prev			0.768***			0.766***
			(0.00664)			(0.00666)
Boy		-1.246***	-0.365***		-1.240***	-0.365***
		(0.0501)	(0.0333)		(0.0500)	(0.0333)
MLSF		-0.378***	-0.0665		-0.343***	-0.0581
		(0.0827)	(0.0560)		(0.0826)	(0.0560)
Father's Edu		0.0845***	0.0269**		0.0841***	0.0271**
		(0.0165)	(0.0110)		(0.0165)	(0.0110)
Mother's Edu		-0.0176	-0.0152		-0.0223	-0.0156
		(0.0167)	(0.0113)		(0.0167)	(0.0113)
Constant	0.0625**	0.463***	0.245	0.0625**	0.475***	0.228
	(0.0259)	(0.0663)	(0.215)	(0.0258)	(0.0661)	(0.215)
School FE	No	No	Yes	No	No	Yes
Observations	9,449	9,449	9,449	9,449	9,449	9,449
R-squared	0.020	0.086	0.629	0.027	0.092	0.629

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents the results from OLS regressions for the subject test score model. Columns (1) to (3) are without controlling for children's perceptions, and columns (4) to (6) control for children's perceptions. Columns (1) and (4) are without any control and school fixed effects. Columns (2) and (5) are with usual family background controls but without previous academic achievements and school fixed effects. Columns (3) and (6) are with all the controls and school fixed effects.

Table 5 OLS Results for Cognitive Test Score

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	W/O Child's Perception			W/ Child's Perception		
Parent's Attitude	0.0878***	0.0455***	0.0256***	0.0529***	0.0167**	0.0111*
	(0.00655)	(0.00669)	(0.00610)	(0.00711)	(0.00718)	(0.00648)
Child's Perception				0.0910***	0.0784***	0.0439***
				(0.00750)	(0.00733)	(0.00669)
Cognitive prev			0.283***			0.279***
			(0.0116)			(0.0116)
Boy		-0.0144	-0.0178		-0.0107	-0.0157
		(0.0199)	(0.0175)		(0.0197)	(0.0175)
MLSF		-0.324***	-0.128***		-0.304***	-0.118***
		(0.0327)	(0.0302)		(0.0326)	(0.0302)
Father's Edu		0.0631***	0.0278***		0.0629***	0.0279***
		(0.00653)	(0.00596)		(0.00650)	(0.00595)
Mother's Edu		0.0424***	0.00191		0.0397***	0.00148
		(0.00662)	(0.00612)		(0.00658)	(0.00611)
Constant	-1.13e-09	-0.377***	0.0785	-4.48e-10	-0.370***	0.0626
	(0.0102)	(0.0262)	(0.116)	(0.0101)	(0.0261)	(0.116)
School FE	No	No	Yes	No	No	Yes
Observations	9,449	9,449	9,449	9,449	9,449	9,449
R-squared	0.019	0.073	0.297	0.034	0.084	0.300

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents the results from OLS regressions for the cognitive test score model. Columns (1) to (3) are without controlling for children's perceptions, and columns (4) to (6) control for children's perceptions. Columns (1) and (4) are without any control and school fixed effects. Columns (2) and (5) are with usual family background controls but without previous academic achievements and school fixed effects. Columns (3) and (6) are with all the controls and school fixed effects.

Table 6 Comparisons between 2SLS and OLS

Variables	(1) Subject	(2) Subject-OLS	(3) Cog	(4) Cog-OLS
Parent's Attitude	0.0940**	0.0531***	0.0982***	0.0111*
	(0.0380)	(0.0120)	(0.0207)	(0.00648)
Child's Perception	0.0390	0.0409***	-0.0177	0.0439***
	(0.0548)	(0.0124)	(0.0300)	(0.00669)
Subject prev	0.764***	0.766***		
	(0.00739)	(0.00666)		
Cognitive prev			0.280***	0.279***
			(0.0121)	(0.0116)
Boy	-0.362***	-0.365***	-0.00858	-0.0157
	(0.0332)	(0.0333)	(0.0179)	(0.0175)
MLSF	-0.0597	-0.0581	-0.132***	-0.118***
	(0.0567)	(0.0560)	(0.0310)	(0.0302)
Father's Edu	0.0229**	0.0271**	0.0204***	0.0279***
	(0.0115)	(0.0110)	(0.00629)	(0.00595)
Mother's Edu	-0.0205*	-0.0156	-0.00634	0.00148
	(0.0120)	(0.0113)	(0.00654)	(0.00611)
Constant	0.270	0.228	0.157	0.0626
	(0.217)	(0.215)	(0.119)	(0.116)
School FE	Yes	Yes	Yes	Yes
Observations	9,449	9,449	9,449	9,449
R-squared	0.629	0.629	0.284	0.300

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table presents the results from 2SLS for both the subject test and cognitive test models and compare them to the results from OLS. Column (1) and (3) are the 2SLS results for the subject test and cognitive test models, respectively. Column (2) and (4) are the OLS results for the subject test and cognitive test models, respectively. All 4 columns are with all the controls and school fixed effects.