

**Chinese Concerted Cultivation:
The Determinants of Parenting and Its Effects on Children's Cognitive Development from
a Multigenerational Perspective**

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Abstract

This study uses 2010 to 2014 Chinese Family Panel Study data (N = 1137) to examine the class difference of Chinese parenting based on the concerted cultivation theory. Chinese concerted cultivation is operationalized as four dimensions: organized leisure time, family environment, supervisory parental involvement, and assistive parental involvement. The analyses are threefold. First, a Confirmatory Factor Analysis (CFA) indicates that concerted cultivation is a valid construct for Chinese parenting. Second, controlling for family income, parental and grandparental education positively contributes to the use of concerted cultivation, indicating that cultural capital exerts a stronger effect on parenting than monetary capital. Third, employing Marginal Structural Model (MSM), the analysis shows that the experience of organized leisure time, good family environment, and supervisory parental involvement improves children's cognitive abilities, while assistive parental involvement has no significant effects. The results support the cross-cultural validity of concerted cultivation theory and enrich the knowledge of Chinese parenting.

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INTRODUCTION

In sociology, various theories and empirical research have considered the family a pivotal context in which parents with advantaged backgrounds transmit their advantages to their children, and researchers have accumulated abundant evidence regarding the transmission function of family (Sewell, Haller, and Portes 1969; Dimaggio and Mohr 1985; Coleman 1988; Portes 1998; McLanahan and Percheski 2008; Bourdieu et al. 2014; Castro et al. 2015). Drawing insights from the preexisting findings, Lareau (2011) proposed the concerted cultivation theory in which working-class and middle-class parents adopt a different set of parenting practices derived from their cultural capital, which helps middle-class parents pass on their social advantages to the next generation. Most of the quantitative application of Lareau's model has replicated the qualitative findings from Lareau, confirming the benefits of concerted cultivation (Bodovski and Farkas 2008; Redford Johnson and Honnold 2009; Cheadle and Amato 2011; Martin 2012; Carolan and Wasserman 2015).

However, the quantitative studies based on the concerted cultivation theory are not entirely satisfactory. Despite the relatively small body research, the literature exhibits limitations in terms of perspectives. On the other hand, the scope of research is limited. Sociological studies on parenting, including those based on the concerted cultivation theory, tend to focus on the United States and western European societies. The study of parenting in non-Western societies is desired for the consolidation of the comparative knowledge of parenting and for understanding the cross-cultural validity of the concerted cultivation theory. In addition, most of the research on parenting and concerted cultivation focuses on the two-generational process. In recent years, however, the rapid growth of the knowledge of the multigenerational process, which refers to the correlation of social status between more than two generations (Mare 2014; Solon 2015; Song

and Campbell 2017; Anderson, Sheppard, and Monden 2018), indicates the importance of extending the perspectives on parenting studies. Because grandparents may be a source of cultural capital and play a role in determining parenting, it is theoretically meaningful to introduce a multigenerational perspective to the concerted cultivation theory.

Motivated by the limitations of the current literature, this study will conduct an analysis of Chinese parenting based on the concerted cultivation theory. As a country that has recently experienced economic reform accompanied by the rapid growth of social inequality and the middle-class population (Li 2008; Li and Zhang 2008; Xie and Zhou 2014), China provides a unique case for testing whether the concerted cultivation theory holds in a transitional, non-Western society. With four sets of the China Family Panel Study (CFPS) data (Xie and Hu 2014), this study will ask whether (1) concerted cultivation is a valid pattern behind Chinese parenting, (2) Chinese concerted cultivation is determined by the cultural capital of parents and grandparents, and (3) Chinese concerted cultivation benefits children's development. By investigating these three questions, this study contributes to research on the sociology of parenting and the knowledge of the mechanism of the intergenerational and multigenerational process.

THEORETICAL IMPORTANCE OF FAMILY PARENTING IN THE TRANSMISSION PROCESS

Among all institutions involved in the transmission process, the family has been a particularly important one. Scholars use investment vocabulary to illustrate the transmission process, theorizing that in families, parents invest in their children given the market opportunities and constraints. Neo-classical economic perspectives are inclined to depict the investment in terms of monetary resources, arguing that the magnitude of investment made by parents largely

determines the life outcome of the offspring (Becker and Tomas 1979). Sociologists recognized the importance of the magnitude of investment (Blau and Duncan 1976), but they were aware that the association between the magnitude of investment and the life outcomes of the offspring is not as immediate as it appears. Sociologists have identified a set of nonmonetary resources that serve to transmit advantages across generations to explain the specific mechanism of such investments. One such important resource is cultural capital, the set of symbolic interactions and behaviors that include lifestyles, cultural tastes, and social attitudes that reward the individuals independently of labor market skills or monetary resources (DiMaggio and Mohr 1985; Bourdieu et al. 2014; Lareau and Weininger 2003). This conceptualization differentiates cultural capital from human capital that directly contributes to the market benefits in the form of salaries and wages. Instead, bearers transmit their cultural capital to their children, who benefit from the social institutions that recognize their cultural capital. Another important critical resource maintains that the intergenerational transmission is social capital. Coleman (1988) theorized on three forms of capital that constitute the family background of children: financial capital, human capital, and social capital. Whereas financial capital and human capital refer to the bearers' occupation, credentials and income, social capital illustrates "the relationship between parents and children" that serves as the principal channel allowing the transmission of the other two forms of capital. Portes (1998) placed a similar emphasis on the mediating role of within-family interactions.

Despite their contributions, these scholars did not sufficiently theorize the interaction between the forms of nonmonetary capital, leaving some important questions unanswered. Primarily, what are the within-family interactions that matter for the transmission? What determined the form and content of the within-family interactions? It is on such theoretical

backgrounds that Lareau (2011) made a groundbreaking contribution to the “how” of the transmission process by systematically portraying the importance of parenting, which is the predominant form of within-family interactions between bearers and children. The concerted cultivation theory posits that parenting has a mediating role between the parental cultural capital, which is noted by the high level of parental education, and children’s development, including cognitive growth and socialization (Lareau 2011).

Pointedly, Lareau argued that the class differences in parenting could be attributed to the differential cultural capital. On the one hand, working-class parents view the development of their children as a spontaneous process and regard the intellectual development of their children as primarily the responsibility of the schools. They thus use the parenting style of *accomplishment of natural growth*, where they are less likely to be actively involved in the children’s school education and organization of leisure time and are inclined to use directive languages to communicate with the children. In contrast, Lareau observed that middle-class parents are aware that children’s intellectual development needs their intervention, and thus, they apply the parenting style of *concerted cultivation*. In a concerted manner, middle-class parents organize the leisure time of their children, actively engage in the schooling of the children, and talk with the children using interactive language. The differential parenting styles, as argued by Lareau (2011), derives from the class inequality of the cultural capital. Middle-class parents’ knowledge of education and labor market institutions leads them to use concerted parenting to prepare their children for the social institutions that recognize and reward a middle-class culture. With qualitative evidence, Lareau (2011) concluded that concerted cultivation improves cognitive and social skills, thereby transmitting class advantages to the next generation.

Lareau's concerted cultivation theory introduced a way to study parenting from a cultural capital perspective and in an integrative manner, offering insights to qualitative and quantitative studies of parenting. However, while some quantitative works based on the concerted cultivation theory have yielded substantial findings, the current quantitative works, as will be reviewed, are not entirely satisfactory. Specifically, the dominant quantitative studies of the concerted cultivation theory are centered on the United States and the intergenerational process, which leaves limitations in the sociological study of parenting.

QUANTITATIVE ASSESSMENT OF PARENTING FROM THE INTERGENERATIONAL PERSPECTIVE

The quantitative research on parenting has well documented the significant effect of particular parenting practices on children's developments. For example, Wisconsin model and the later research using the same idea (Sewell, Haller, and Portes 1969; Entwisle and Alexander 1996; Dumais 2002; Davis-Kean 2005) revealed that the parental expectation results in higher self-expectation of children and meanwhile exerts direct effects on educational attainments of children. Family backgrounds are also found to be positively associated with the parental involvement with children school works, parents' school involvements, and parent's community bonds, which provides extra benefits to children's cognitive developments and social status attainments (Epstein 1987; Fehrman, Keith and Reimers 1987; Stevenson and Baker 1987; Astone and McLanahan 1991; Muller 1993; Horvat, Weininger and Lareau 2003).

The publication of the concerted cultivation theory (Lareau 2003) provoked a line of quantitative research measuring the effect of concerted cultivation with large samples. The mainstream way of operationalizing concerted cultivation was first developed by Bodovski and Farkas (2008), which argued that four dimensions of parenting practices should be included to

represent concerted cultivation: (1) organized leisure time, which refers to the degree to which children's leisure time is arranged by parents; (2) parental school involvement, which refers to the degree to which parents build a relationship with the school instructors and officials; (3) language patterns, which refers to the degree to which parents frequently communicate with children and use reasoning language to negotiate with children; and (4) parental responsibility, which refers to the degree to which parents teach, play with, and read stories for children. Parental expectation, the factor that has been subject to a strong focus since the Wisconsin model was proposed, was regarded not as a parenting practice but a psychological factor that confounds the effect of parenting.

Following such framework but with variations (to be reviewed later), Bodovski and Farkas's (2008) and later works produced three-fold findings. First, concerted cultivation is a valid and latent pattern behind the dimensions of parenting practices (Cheadle and Amato 2011; Carolan and Wasserman 2015). Second, concerted cultivation practices exerted significantly positive effects on children's cognitive development and academic performance. The results are replicated regardless of whether concerted cultivation is represented as various variables of parenting practices (Redford Johnson and Honnold 2009; Martin 2012) or as a single variable constructed based on composition (Bodovski and Farkas 2008) or an Exploratory Factor Analysis (EFA) (Cheadle and Amato 2011). While one study based on an EFA reported insignificant effects (Carolan and Wasserman 2015), it can be concluded that concerted cultivation, as argued by Lareau, does convey benefits to children's development. Third, Bodovski and Farkas (2008), Martin (2012) and Carolan and Wasserman (2015) found that parental education significantly predicts a higher level of concerted cultivation, conforming to Lareau's point that cultural capital determines parenting.

However, despite the limited body of literature, the existing literature shows two limitations in perspectives. First, studies on concerted cultivation and studies on parenting as a whole tend to focus the intergenerational process between parents and children. However, as noted by Mare (2014), Solon (2015) and Song and Campbell (2017), academia has been witnessing a resurgence of the mobility research that was driven by the findings from research on the multigenerational process that refers to “the associations in socioeconomic status across three or more generations.” Different from early works that conclude insignificance (Behrman and Taubman 1987; Warren and Hauser 1997), a substantial number of recent studies have identified significantly positive associations between the socioeconomic status of grandparents and grandchildren’s cognitive development and social status (Fomby, Krueger and Wagner 2014; Zeng and Xie 2014; Ferrie, Massey and Rothbaum 2016; Song 2016; Song and Mare 2017). With such a trend of findings, the study of parenting could also benefit from offering more consideration to the effects of more generations. The concerted cultivation theory provided a theoretical motivation for such considerations: given that grandparents are also sources of cultural capital in the family, similar to parents, it will be theoretically important to consider the grandparents in the analysis of parenting.

Second, the studies on parenting put most of the emphasis on the United States and western European societies, and all of the studies using the concerted cultivation theory that are reviewed above were exclusively rooted in the United States. Such bias leads to the concern about whether the existing theory of parenting, including the concerted cultivation theory, is cross-culturally valid. It is still questionable as to whether the phenomenon of parenting found in Western societies could be observed in a different context. To consolidate and enrich the sociological knowledge of parenting, these two limitations are worth investigating.

MULTIGENERATIONAL PERSPECTIVE IN THE CHINESE CONTEXT

Chinese society will be a strategic context to understand concerted cultivation comparatively and to study the multigenerational process of parenting. Chinese society is witnessing growing class inequality, which serves as a foundation for the class-based parenting. After the market reform in 1978, the Gini coefficient, a widely accepted indicator of income inequality, has risen from approximately 0.3 in the 1960s to approximately 0.6 in 2015 in China (Xie and Zhou 2011), and the middle-class population, defined according to a set of social status indicators, has grown from approximately 0.8% to 25.8% from 1995 to 2008 (Li and Zhang 2008). Some research has revealed the emergence of the class difference of parenting under the expanding social inequality. For example, Liu and Xie (2015) discovered that family SES is positively related to a higher level of parental involvement that improved children's cognitive test scores. Zhang and Xie (2015) determined that Chinese family income and parental education are positively related to the children's involvement in private tutoring, which significantly improved the verbal and academic performance of low-achieving urban Chinese high school students (Zhang 2013).

Moreover, Chinese society is especially valuable for research on grandparental effects. As noted by Chen, Liu, and Mair (2011) and Zeng and Xie (2012), grandparents live more often with their grandchildren in Chinese society compared to Western societies, and such multigenerational coresidence is not primarily caused by economic difficulties of parents, which is often the case in the United States (Gerstel 2011). This feature of Chinese society implies that

multigenerational coresident families have more variation in SES, which facilitates research on grandparental effects. Second, Chinese grandparents, regardless of whether they living with their grandchildren, are strongly involved with childrearing. Chen et al.'s research (2011) reported that 40 to 45% of coresidential families among all the Chinese households included children 0-6 years old and found that coresident grandparents provide approximately 20 hours childrearing per week, which is as much as the mother provides. Such strong involvement leads to a reasonable expectation that parenting should be affected by the grandparents. In fact, Goh and Kuczynski's (2010; 2014) and Xiao (2014)'s qualitative studies observed that Chinese grandparents tend to treat their grandchildren in a more lenient manner, which made parenting less directive and strict.

In sum, the features of Chinese societies provide a promising context for extending concerted cultivation into a non-Western context and extending the study of parenting to a multigenerational perspective. A study on Chinese society would make significant contributions to the comparative knowledge of parenting. On the other hand, quantitative studies of parenting in China are still limited in terms of sizes. More studies on parenting in a Chinese context will also substantially enrich our knowledge of how Chinese families affect their children and how Chinese social inequality is promoted and reproduced. A quantitative study of concerted cultivation in the Chinese context is thus desirable and necessary.

PRESENT STUDY

To address the limitations, this study will quantitatively analyze concerted cultivation in the context of China. This study will draw upon the operationalization of concerted cultivation from Bodovski and Farkas (2008), but three revisions will be made due to the limitation of the dataset to be used. First, parental responsibilities will not be included because the inclusion of this

dimension is inconsistent across studies, and it is unclear whether parental responsibility constituted a parenting practice or a psychological factor affecting concerted cultivation.

Second, Lareau (2011) has put particular emphasis on parental involvement, especially involvement with children's schoolwork, but most of the papers using the concerted cultivation theory, except for Redford Johnson and Honnold (2009), did not capture this aspect. The education and sociological literature, however, repeatedly observed that parental involvement is determined by the family background and significantly improved children's cognitive development and life outcomes (Fehrmann, Keith, and Reimers 1987; Stevenson and Baker 1987; Horvat, Weininger, and Lareau 2003; Fan and Chen 2001; Jeynes 2007; Hill and Tyson 2009; Castro et al. 2015). Given such evidence, this study will include parental involvement with children's schoolwork as two dimensions: supervisory parental involvement, which refers to parents checking their children's schoolwork, restricting the children's leisure time, and asking the children to focus on studies; and assistive parental involvement, which refers to parents helping with the children's schoolwork. Such differentiation would reflect the convention of operationalizing parental involvement in the education literature (Hill and Tyson 2009; Castro et al. 2014) and help us to understand the strong preferences toward supervisory education in Asian cultures (Chao 1994; Zhou and Kim 2006; Park, Byun and Kim 2010).

Third, due to the lack of variables, this study could not include a variable of school involvement and a parent-child communication variable that strictly represents the definition given by Lareau (2011). To compensate for this, this study will use the variable of family environment that was introduced by Liu and Xie (2015) to represent parent-child communication. Due to these revisions, this study will operationalize concerted cultivation with four dimensions: (1) organized leisure time, (2) family environment, (3) assistive parental

involvement, and (4) supervisory parental involvement. Since the slight variation of the operationalization of concerted cultivation did not affect the validity of the construct and the overall conclusion in the existing studies (Cheadle and Amato 2011; Martin 2012), this study believes that the omission of school involvement will not significantly affect the current research.

Finally, following Redford Johnson and Honnold (2009), Cheadle and Amato (2011) and Martin (2012), this study will not use a composite variable to represent concerted cultivation as was done by Bodovski and Farkas (2008) and Carolan and Wasserman (2015), but concerted cultivation will be operationalized in the model as separate variables. This method of operationalization will not diminish the explanatory power of concerted cultivation theory but help to reveal the heterogeneous effects of concerted cultivation.

To understand Chinese parenting, this study will testify to whether the critical arguments made by Lareau (2011) are valid in Chinese families. As reviewed earlier, the first argument in Lareau's (2011) theory is that concerted cultivation is a style or a pattern behind a set of parenting practices.

Hypothesis 1: Concerted cultivation is a valid construct for Chinese parenting.

Second, it is vital to investigate whether the level of concerted cultivation is, as Lareau expected, determined by cultural capital. If Lareau's argument is valid, then we would expect that controlling for income that reflects the human capital result of education and parental and grandparental education should still exert significant effects of concerted cultivation parenting. To be more specific, this study expects that all four dimensions that constitute concerted cultivation are positively affected by the family cultural capital.

Hypothesis 2: The education of Chinese parents and grandparents positively affects all dimensions of concerted cultivation, net of the effect of family finance.

Third, the theory argued that concerted cultivation improves children's development (Lareau 2011), and this study will make the same hypothesis. Similar to existing studies (Bodovski and Farkas's 2008; Redford Johnson and Honnold 2009; Liu and Xie 2015), this study will focus on children's cognitive abilities, which are significant indicators of children's education and status attainment in the future (Mayer 1997; Heckman, Stixrud, and Urzua 2006; Heckman and Mosso 2014). As long as some dimensions of Chinese concerted cultivation positively affect children's cognitive abilities and none of the dimensions exert negative effects, it can be concluded that Chinese concerted cultivation affects children's cognitive abilities positively and may substantially improve children's life outcomes in the future.

Hypothesis 3: At least one dimension of Chinese concerted cultivation significantly improves children's cognitive abilities, and none of the dimensions exerts negative influences.

DATA, MEASURES, AND METHODS

Data

This study drew from longitudinal data from the China Family Panel Study (CFPS, see Xie and Hu 2014; Xie and Lu 2015). The CFPS is a nationally representative longitudinal study of the Chinese population in 25 out of 34 provinces. The baseline wave was conducted in 2010, which includes 33,360 adults and 8990 children from 14,780 families. The detailed adult, child, and family questionnaire provided abundant information regarding family backgrounds, parenting and children's cognitive development, which made it possible to conduct a representative and longitudinal study of Chinese parenting. In particular, this study used the first

four waves: 2010, 2011, 2012, 2014. The 2011 and 2014 waves provided information on the children's cognitive abilities (the outcome variable), and the 2010 and 2012 waves provided information on the children' family backgrounds and parenting information (the independent variable). As such, this study ensured a time lag between the outcome variables and the independent variables, controlling the bias due to reverse causality.

This study used children as the unit of analysis (Liu and Xie 2015) and applied some restrictions to the sample. First, this paper restricted the sample to children with nonmissing family structure information, parental education information, and grandparental information. This restriction excluded children for whom a valid questionnaire for at least one parent or precise information regarding the survival or coresidence of grandparents do not exist. Second, this study excluded children who withdrew during any of the four waves. Third, due to the CFPS design, only respondents older than 10 years of age (included) in a particular wave have cognitive ability information in that particular wave. This study excluded children without the cognitive ability information. Consequently, these restrictions yielded a sample of 1,137 cases.

Measures

Children's cognitive abilities. The children's cognitive abilities were operationalized as the CFPS cognitive test scores (Liu and Xie 2015). The tests yield a standardized *word test score*, which ranges from 0 to 34, and a standardized *math test score*, which ranges from 0 to 24. These two tests are issued to children between 10 to 15 (included) and adults (defined as older than 15) in the 2010, 2011 and 2014 waves (Xie 2012). This study used the test scores in the 2011 and 2014 waves to represent the cognitive abilities of the children.

Concerted cultivation parenting practices. This study used a four-dimensional operationalization of concerted cultivation. The first dimension, organized leisure time, was operationalized as a dummy variable, indicating whether the children participated in any extracurricular activities such as after-school education, sports programs, or art programs. The second dimension, family environment, was operationalized as the composite of the two 5-scale variables in CFPS, which was supposed to reflect the degree to which parents show interest in the children's education and the degree to which the parents initiate communication with the children (Liu and Xie 2015). While imperfect, this variable could reflect Lareau's (2011) concept of better parent-child communication. The third dimension, assistive parental involvement, was operationalized as whether any of the family members had ever tutored the children in their studies (Park et al. 2010). The fourth dimension, supervisory involvement, was operationalized as a composite of six 5-scale (1-5) variables in CPFS and ranges from 6 to 30, which was introduced by Liu and Xie (2015). This variable was supposed to reflect the degree to which parents check the children's schoolwork or require their children to reduce entertainment and focus on schoolwork. The missing values of the supervisory parental involvement variable were imputed based on multiple imputations with the information on parental education, grandparental education, and family income per capita. Because continuous variables with many scales could not effectively fulfill the requirement of inverse-probability-treatment-weighting (IPTW), the method to be used in this study (Rosenbaum and Rubin 1983; Hong 2015; Austin and Stuart 2015), this study created the binary supervisory parental involvement variable and family environment variable. Given that these two variables are constituted by 5-scale variables, this paper used 3/5 as the cutoff point (for example, a 5-scale variable is coded as 1 if the value is larger than 3 and as 0 if the value is lower than or equal to 3). As the composite of two 5-scale

variables, the family environment variable was recoded as 1 if larger than 6 and as 0 if lower than or equal to 6. Similarly, the supervisory parental involvement variable was recoded as 1 if it is larger than 18 and as 0 if lower than or equal to 18.

Parental and grandparental cultural capital. Parental education was operationalized as the time invariant average years of education of the parents (Martin 2012; Liu and Xie 2015). If the information of one parent was missing, the information of the other parent would be used (Liu and Xie 2015). The information of the grandparents was not as accessible as the parental education information. Most cases do not have the information of all four grandparents because of either the nonresponse or the survey design that did not gather the information of the deceased grandparent. To compensate for the restriction, this study used a three-categorical variable to operationalize grandparental education: (1) no coresident grandparents, which includes the cases that do not have coresident grandparents or living grandparents; (2) less-educated coresident grandparents, which indicates that the children do not have a coresident grandparent with more than a high school education; and (3) highly educated coresident grandparent, which indicates that the children have at least one grandparent whose finished level of education is higher than or equal to high school. Such operationalization could capture the grandparental effect and account for the lack of education data of the deceased grandparents because the existing studies (Zeng and Xie's 2014) reported that categorical operationalization of the highest level of education of the grandparents yields same results as the years of education of grandparents and that the multigenerational coresidence mediates the grandparental effects. With the three-categorical variable of grandparental information stated above, we can analyze if, *compared to non-coresident grandparents, a highly educated coresident grandparent increases the likelihood of*

concerted cultivation. The effect, if observed, would indicate the existence of the effects of grandparental cultural capital on parenting.

Parental expectation. As with Bodovski and Farks (2008) and Carolan and Wasserman (2015), this study regarded parental expectation as a psychological factor exogenous to concerted cultivation. While parental expectation is conventionally defined as expected educational attainment or occupational status of children (Sewell, Haller and Portes 1969), the respective information has a substantial loss in CPFS. Thus, as with Liu and Xie (2015), this study operationalized parental expectation as parents' expectation of the grades their children would earn in the next final or mid-term exam, which is a continuous variable in a 100 scale. This variable has minimal missing values, and the mean parental expectation was used to impute the missing values (Liu and Xie 2015). As this variable is only available at the 2010 baseline wave, it would be a time invariant variable. In the statistical analysis, the variable underwent a log-transformation due to its skewness.

Parental cognitive ability. This study used the CPFS math and verbal cognitive test scores of parents to represent the cognitive abilities of parents. If the information of one parent is missing, the information of the other parent will be used. The cognitive test scores were stratified against the parents' education level and then standardized to deal with their strong correlations with parental education (Liu and Xie 2015). As parental cognitive abilities exert significant effects on both children's cognitive abilities and parenting, the two variables are potential confounders that need to be controlled (Parcel, Dufur, and Zito 2014; Liu and Xie 2015).

Family Characteristics. One of the essential characteristics of a family is its financial condition. Family financial information was operationalized as the time varying per capita income of the household in Chinese currency (RMB) in 2010 and 2012. The log-transformation

of the income was used, and the missing values of the variable were imputed based on multiple imputations using the information on parental education, hukou (which refers to the household registration status that strongly determines the educational resources and social welfare to which children have access. For more details, see Wu and Treiman 2004), and province (Liu and Xie 2015). Because income was often regarded as reflecting the human capital result of education (Becker and Tomas 1979; Lareau and Weininger 2003), controlling family income would help capture the cultural capital aspect of parental and grandparental education more accurately. This paper also included three variables to represent the family structure: (1) two-parent family: a dummy variable indicating whether the household has both parents (Cheadle and Amato 2011; Carolan and Wasserman 2015), (2) the number of children in the household (Liu and Xie 2015; Zhang and Xie 2015; Zhang and Xie 2018), and (3) household size. Family structure is a potential confounding factor because family structure determines parenting practices (McLanahan and Percheski 2008; Carolan and Wasserman 2015) and exerts direct effects on the children's development (Fomby and Sennott 2013; Mitchell et al. 2015). This study operationalized the family structure as time varying factors, but the two-parent family variable is time invariant because the information is not available in the CFPS across waves.

Children's demographics. This study included four variables to represent the children's demographics: (1) age, which refers to the age of the children in the baseline wave; (2) gender, which was defined as male or female; (3) hukou, which was defined as rural or urban; and (4) geographical region. This study categorized provinces into west, middle and east, which can efficiently characterize the effects of unequal regional development in the relatively small sample (Zhang and Xie 2014). While controlling for provinces as a set of dummy variables may be more accurate (Xie and Hannum 1996; Liu and Xie 2015), the relatively large number of

provincial categories ($n = 25$) led to some categories with less than 10 cases and made it less preferable to control for provinces.

METHOD

Different methods will be used to test the three hypotheses stated earlier. To test Hypothesis 1, in which concerted cultivation is a valid construct in China, this study will use the Confirmatory Factor Analysis (CFA; see Bollen 1989). CFA will reveal whether there is a latent variable of concerted cultivation shared by the parenting practice variables (Cheadle and Amato 2011; Carolan and Wasserman 2015).

To test Hypothesis 2, where parental and grandparental cultural capital contributes to concerted cultivation, this study uses lagged regression, regressing the wave 2012 parenting practices on the wave 2010 covariates. The time lag will help to reduce the danger of reverse causality, offering more robust estimations. Based on the scale of the parenting practice variable, the ordinal logistic model (ologit), binary logistic model (logit) and Ordinary Least Square (OLS) will be used.

[FIGURE 1 ABOUT HERE]

To test Hypothesis 3, in which the Chinese concerted cultivation affects children's cognitive abilities, this study will use the Marginal Structure Model (MSM). This study will estimate the effect of each concerted cultivation variable on the two forms of cognitive abilities, and thus, 8 MSMs will be implemented. Based on the propensity scores, MSM will reweight the data to remove the confounding causal pathways without invoking the collider effect, offering an unbiased estimation of the time varying effects of concerted cultivation parenting and revealing

the long-term cumulative effect of concerted cultivation (Figure 1, see Appendix A for more detail).

RESULTS

Summary Statistics

[TABLE 1 ABOUT HERE]

The summary statistics of the analytical sample as well as the summary statistics of the CFPS population were presented in Table 1. The CFPS population is selected based on the 2010 and 2011 CFPS data, and the cases with missing values are not dropped. As we can see, the bias of the selected sample is minimal, except that the difference in income per capita is relatively large. Although the selected sample that will be analyzed in this study has a much smaller sample size, it should still retain the national representativeness of the CFPS data.

Confirmatory Factor Analysis

[FIGURE 2 ABOUT HERE]

The CFA results of the Chinese concerted cultivation are presented in Figure 2. Asymptomatically distribution-free method was used in order to estimate the latent factor without assuming normality (Muthén and Kaplan 1985). The lower value of RMSEA and high value of CFI indicate good fitness. CD has a similar interpretation to R-squared, and high CD indicates good fitness. The top pictures indicate that the pattern is shared by two waves of data, and the bottom picture in Figure 2 considered the covariance pattern of the wave 2012 and 2014 latent concerted cultivation variables, which should be correlated because they reflect the same construct. As we can see, the significant path coefficients, the significant covariance pattern, and

the goodness-of-fit indices give us confidence that the operationalization of Chinese concerted cultivation captured the richness of Lareau's theory.

Results of the Lagged Regression Models

[TABLE 2 ABOUT HERE]

Table 2 presents the results of the lagged regressions regarding the determinants of the dimensions of concerted cultivation. Three models are given for each dimension. The first model (Model 1, 4, 7 and 10) only includes parental education and regional effects. The second model (Model 2, 5, 8 and 11) controls for other covariates including family income. The third model (Model 3, 6, 9 and 12) includes grandparental education, revealing the effect of grandparental cultural capital.

First, we can observe a significantly positive effect of parental education on concerted cultivation. Higher parental education predicts a higher level of all dimensions of concerted cultivation, and this association remained significant after family income per capita is controlled. Since family income per capita is supposed to control the human capital results of education (Becker and Tomas 1979; Lareau and Wasserman 2003; Liu and Xie 2015), the significant net effect of education can be regarded as reflecting the cultural capital aspects of education denoted by Lareau (2011). In contrast, three of the four dimensions are not significantly affected by income. Only organized leisure time is significantly improved by higher family income, which corresponds to the prior research (Zhang 2015). Overall, the contrast between education and income effects imply that cultural capital, instead of material capital, plays a more significant role in determining parenting, showing support for Lareau's emphasis on cultural capital rather than monetary capital. The findings also show the cross-cultural validity of Lareau's framework.

The positive effect of income on organized leisure time can reflect that organized leisure time is a relatively unique dimension of parenting because it often costs much more (e.g., the participating extracurricular activities) than the other dimensions, and such a monetary effect should not be understood as reflecting the general pattern of parenting.

Another notable finding is the positive effect of grandparental cultural capital on concerted cultivation. As we can see in Model 3, the coresident highly educated grandparent increases the likelihood that the grandchildren will experience organized leisure time. The inclusion of grandparental education does not affect other coefficients, indicating that the grandparental effect is largely independent of the other factors. However, such an effect of the grandparental cultural capital was not observed for the other dimensions. One possible explanation is that, whereas the other dimensions are the patterns emerging implicitly from everyday family interactions, organized leisure time or extracurricular activity participation tends to be an explicit family decision in that it involves the decision of allocating family time and financial resources. In such an explicit decision-making process, grandparents may have a say and thus affect the decision. The other dimensions, however, may be dominated by parent-child interactions in which, as illustrated by Xiao (2014), grandparents only have marginal roles. Overall, we can conclude that grandparental cultural capital only exerts a partial effect on concerted cultivation by affecting organized leisure time.

Conversely, we can see that the concerted cultivation theory can by no means explain everything about parenting practices. Family structure also affects parenting. For example, a two-parent household predicts better family environment and stronger assistive parental involvement, corresponding to studies in the United States (Bodovsiki and Farkas 2008; Cheadle and Amato 2011). This advantage may reflect that in two-parent families, the bearers have more

mental and physical resources to provide more care to children (Astone and McLanahan 1991; McLanahan and Sandefur 1994; McLanahan and Percheski 2008; Martin 2012).

In terms of other parental characteristics, parental expectation is found to affect supervisory parental involvement, reflecting the idea that parental expectation serves as a psychological, rather than behavioral, pathway through which parents affect children's self-expectation (Sewell, Haller and Portes 1969; Entwisle and Alexander 1996; Dumais 2002; Davis-Kean 2005). The relationship between parental expectation and supervisory parental involvement in a Chinese context reflects the Chinese belief of childrearing in which supervisory control is a necessary condition for children's success (Chao 1994; Frewen et al. 2014). Parental cognitive abilities also show varying effects on concerted cultivation.

Children's demographic characteristics show varying effects. A city hukou improved extracurricular activity participation and family environment, which may be explained by the abundant educational and material resources in the urban area (Wu and Treiman 2004). Higher age, on the other hand, indicates less parental involvement. This may reflect that as children grow up, the increasing difficulty of children's education limits parents' capability of checking their children's schoolwork. Alternatively, this effect can also be explained by the stronger personal independence of the older children. The results of gender are complicated. Female children are less likely to receive assistive parental involvement and experience a good family environment but are more likely to experience organized leisure time. The positive association between being female and organized leisure was also observed by Zhang (2018) in another nationally representative data of China (China Education Panel Survey). It is perplexing to observe such a positive association because China is entrenched with biases against female

children (Gupta 2003). The mechanism for such association may call for qualitative investigations.

Finally, the effects of children's cognitive ability are worth noting. Children's word cognitive ability positively affects family environment but is negatively related to assistive parental involvement. First, these effects show that parenting is not solely determined by family backgrounds but also actively responds to children's development. Second, compared to the math cognitive ability, verbal ability is used more often in everyday life, which may explain why the advantaged word cognitive ability improves the family environment. The negative association between the word cognitive ability and assistive parental involvement, though somewhat surprising, has been recorded by the meta-analysis literature (Hill and Tyson's 2009). While there has been no consensus about the explanation of this correlation (Hill and Tyson 2009; Castrol et al. 2015), this study proposes a possible explanation that Chinese assistive parental involvement is compensatory behavior. Chinese bearers tend to help children with schoolwork only when they found that the children are underperforming, and thus, children with better word cognitive abilities are less likely to experience parental assistance. However, this interpretation demands evidence from more detailed studies.

In sum, by analyzing the determinants of parenting in a Chinese context, this study finds that Hypothesis 2 is partially supported. In particular, parental cultural capital, but not family finance, exerted consistent and significant effects on all dimensions of the Chinese concerted cultivation, which underscores the cultural capital aspect of parenting. Additionally, grandparental cultural capital only positively influences organized leisure, indicating a modest effect of grandparents on concerted cultivation. However, the effects of other factors on the Chinese concerted cultivation are complex and viable across the dimensions. As noted by Lareau

(2011), cultural capital is not the sole determinant of parenting practices. The mechanisms for producing parenting practices are complex and should be investigated from diverse theoretical perspectives.

Effects of Chinese Concerted Cultivation on Children's Cognitive Abilities

[TABLE 3 ABOUT HERE]

Table 3 presents the MSM estimation of the effects of the dimensions of Chinese concerted cultivation on cognitive abilities. The outcome variables and the parenting practices variables are lagged. For each dimension, its effects on word and math cognitive abilities are measured, and three estimations are presented: (1) Unadjusted Model, which refers to the unweighted regression estimation with only the parenting practice variables of two time points as predictors; (2) RA Model, which refers to the “regression adjustment” that regresses the outcome variables on both concerted cultivation practice variables and covariates; (3) MSM, which refers to the marginal structural model estimation that only uses the parenting practice variables as predictors but adjusts the regression with IPTW weights given by Formula 3 (See Appendix A). DRE refers to the doubly robust estimators that control the covariates not balanced by MSM (Austin and Stuart 2015). The unadjusted model offers a baseline estimation for which the confounding effect of the covariates is not controlled. The RA model, while controlling all the covariates, only estimates the controlled direct effect (Pearl 2001) of a time-1 parenting practice net of the other parenting practice, which is characterized by the direct arrow from A_0 to Y_1 , and it suffers the danger of collider effect (Cole et al. 2009). The MSM, on the other hand, offers a better estimation of the total effect of a time-1 concerted cultivation dimensions net of the effect of the other time-1 dimension and avoids collider effect (Vanderweele 2009).

As stated in Hypothesis 3, if concerted cultivation benefits children, we may expect to see that at least one dimension of concerted cultivation exerts positive effects on children's cognitive abilities and that none of the dimensions shows adverse effects. The hypothesis is confirmed (see Table 3). Specifically, a better family environment and more supervisory parental involvement significantly improve children's word and math cognitive abilities, and organized leisure time substantially benefits children's word cognitive ability. Given the longitudinal design of this study, we may more confidently conclude the causal effect of concerted cultivation rather than just the correlation. This finding has two additional implications. First, the finding supports the cross-cultural validity of the concerted cultivation theory in the Chinese context. Second, together with the findings that parental cultural capital increases the tendency toward concerted cultivation, the significant effect of concerted cultivation on children's cognitive abilities indicates that parenting may play a mediating role in transmitting parental advantages to children in the Chinese context. Even more so, the positive effect of grandparental education on organized leisure time suggests that parenting also serves as a mechanism for multigenerational transmission, although only partially.

However, the analyses observe no accumulative effect of concerted cultivation. A pattern shared by the parenting practices, except for the assistive parental involvement, is the significance of the time 1 parenting practices instead of those from time 2. For family environment and organized leisure time, both the RA model and MSM estimations indicate that after the covariates are controlled, only the coefficients of the time 1 treatment variable are significant. Similarly, for supervisory parental involvement, the unadjusted model and MSM indicate the sole significance of the time 1 parenting practice. In the potential outcome framework (Rubins 1974; Hong 2015), the coefficient of the time 1 treatment variable, or

parenting practice variable, can be expressed as $E(Y_1(A_0 = 1) - Y_1(A_0 = 0))$, which signifies the effect of the time 1 parenting practice on cognitive abilities. On the other hand, the coefficient of the time 2 treatment variable can be expressed as $E(Y_1(A_1 = 1) - Y_1(A_1 = 0) | A_0)$, denoting the effect of time 2 parenting practices on cognitive abilities conditional on time 1 parenting practices. The significance of only time 1 coefficients thus has two implications. First, for children who experience more concerted cultivation at time 1, the continuing experience of concerted cultivation at time 2 does not further improve their cognitive abilities. Similarly, for children who experience less concerted cultivation at time 1, experiencing more concerted cultivation at time 2 will not compensate for their disadvantages either. Briefly, the effect of time 1 concerted cultivation dominates the time 2 effect. The reason for such domination effect is unclear. It may reflect the advantages of early intervention (Campbell and Ramey 1995; Campbell et al. 2002), or it may be because the time interval in this study (4 years) is too short for the observation of the cumulative effect.

Despite the shared pattern, we should also note the heterogeneous effects of the dimensions of concerted cultivation. On the one hand, MSM estimations show that better family environment and higher supervisory parental involvement improves both types of cognitive abilities. As such, we may believe that the Chinese preference for disciplinary education (Chao 1994) may explain their prominent educational achievement. The finding that the RA model denotes insignificant effects of concerted cultivation may reflect that the effect of supervisory parental involvement is not primarily transmitted by the controlled direct effect but is channeled through various indirect paths (Pearl 2001; Vanderweele 2009).

On the other hand, organized leisure time only significantly improves children's word cognitive abilities, which is reflected in both RA estimations and MSM estimations. Such

different effects are not exceptional: Zhang and Xie (2015) found that private tutoring improved the language academic test scores but not math academic test scores of Chinese children. However, the mechanism for the differential effect of extracurricular activity participation still needs further explanation. Moreover, assistive parental involvement conveys no significant effects. This, however, should not be interpreted as reflecting the inefficiency of concerted parenting. It only tells us that not all concerted cultivation parenting practices will exert the same effects on a particular developmental outcome. It is possible that assistive parental involvement improved the children in other aspects.

In sum, the analyses of the effect of the dimensions of Chinese concerted cultivation produced three results. First, concerted cultivation would improve children's cognitive developments. This finding corresponds to Lareau's theory (2003), offering further support for the cross-cultural validity of the concerted cultivation theory. The finding also indicates a potential mediating role of parenting in the intergenerational and multigenerational process. Second, such positive effects are heterogeneous across the dimensions in terms of both effect sizes and significance. Third, earlier concerted cultivation parenting practice seems to have stronger effects.

DISCUSSION AND CONCLUSIONS

Sociological theories and empirical studies have well-documented the importance of parenting in social stratification and the transmission process. Lareau's concerted cultivation theory made a particularly critical contribution to the sociological perspective of parenting by linking the parental cultural capital to parenting, revealing the relationship between class backgrounds and multidimensional parenting practices. However, the sociological literature on parenting has not yet sufficiently utilized insights from the concerted cultivation theory. In

addition to the limited body of research, the quantitative literature primarily focused on Western societies and the intergenerational process. With the China Family Panel Study data, this study analyzed Chinese parenting in a concerted cultivation framework and introduced a multigenerational perspective to the research question.

This study confirms Lareau's theory of concerted cultivation in the context of China. First, the results show that concerted cultivation is a valid construct for various Chinese parenting practices. Next, using longitudinal data, this study confirms that parental education significantly influences all dimensions of Chinese concerted cultivation, while the effect of income is much weaker and only affects children's extracurricular activity participation. Because family income represents the human capital part of education, this finding implies that parental cultural capital, rather than human capital, plays a more significant role in determining concerted cultivation. Finally, with the help of the marginal structural model, this study concludes that the Chinese concerted cultivation overall positively improved children's cognitive development, although the effects are heterogeneous across the dimensions of the Chinese concerted cultivation. From a multigenerational perspective, this study also denotes a mediocre effect of grandparental cultural capital on extracurricular activity participation, which transmits advantages from grandparents to grandchildren. These findings altogether indicate that Chinese concerted cultivation plays a mediating role in the intergenerational and multigenerational transmission process of China, contributing to knowledge of the mechanism of the multigenerational persistence.

As shown in this study, in China and the United States, parenting is similarly determined by cultural capital and similarly benefits children's development. If the conclusion of this study is reliable, it would be worth conducting a genuinely comparative study of parenting. In particular, it would be meaningful to ask what shaped the cross-cultural similarity of parenting and how the

universality of the stratification system and the uniqueness of cultures competing with each other shaped parenting in different countries and areas. Despite the findings, this study also observed that the determinants of parenting vary from one parenting practice to another, which leads to the question of how a specific parenting practice is uniquely determined.

However, this study has several limitations. First, the operationalization of concerted cultivation in this study is far from ideal. The measures are limited by data availability. An operationalization that more accurately reflects concerted cultivation would be vital for a more in-depth and comprehensive understanding of parenting. Second, as a compromise for the limitation of data, the categorical operationalization of the grandparental cultural capital leads to the loss of the information. A more detailed and less compromised measurement of grandparental cultural capital would be preferred in further studies. Third, cognitive development is by no means the only outcome that should be affected by concerted cultivation. Outcomes of parenting, similar to parenting itself, are diverse and multidimensional. It would be valuable to study the effects of parenting on other important outcomes. Finally, while the selected sample in this study did not significantly deviate from the total China Family Panel Study sample in terms of statistical characteristics, the relatively small sample size ($N = 1,137$) is still a concern. The limited sample size may make the standard error unstable and restrict the replicability of the findings. A larger sample size would be preferred for further studies.

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Table 1. Summary Statistics

		Time 1		Time 2		CFPS Population	
		(mean)	(SD)	(mean)	(SD)	(mean)	(SD)
		2011		2014		2011	
Children's Cognitive Abilities							
Word Cognitive Ability		21.2	7.34	25.34	6.81	20.83	8.05
Math Cognitive Ability		9.84	4.27	13.27	5.44	9.85	4.73
		2010		2012		2010	
Concerted Cultivation							
Organized Leisure Time	0 = never	0.15	0.36	0.16	0.37	0.14	0.35
Family Environment		4.99	1.19	5.15	1.44	4.87	1.31
—Binary	0 = worse environment	0.41	0.49	0.55	0.5	0.38	0.47
Supervisory Parental Involvement		13.35	4.33	12.72	4.1	13.40	4.76
—Binary	0 = less involvement	0.24	0.43	0.19	0.39	0.2	0.4
Assistive Parental Involvement	0 = never	0.58	0.49	0.37	0.48	0.43	0.49
Cultural Capital							
Parental Education	Years	7.04	3.71	—	—	7.35	3.95
Grandparental Education	less-educated co-resident grandparent	0.31	0.46	—	—	0.31	0.46
	highly-educated co-resident grandparent	0.03	0.17	—	—	0.04	0.19
	non-co-resident grandparent	0.66	0.48	—	—	0.65	0.48
Children's Demographics							
Age		10.97	1.38	—	—	7.63	4.58
Hukou	urban = 1	0.21	0.41	0.21	0.41	0.21	0.40
Gender	male = 1	0.5	0.5	—	—	0.53	0.5
Family Backgrounds							
Family Income Per Capita	RMB	6945.16	8377.94	7979.03	8972.5	7391.34	11004.4
Two-parent household	0 = single-parent	0.97	0.18	—	—	0.97	0.17
Number of Children		2	0.95	2.11	1.02	1.88	0.9
Family Size		4.65	1.44	4.6	1.42	5.13	1.82

Other Parental Factors							
Parental Expectation		91.46	8.68	—	—	90.9	9.84
Parental Cognitive Ability	Word	0.11	0.81	—	—	0.12	0.81
	Math	0.06	0.78	—	—	0.06	0.81
Region	West	0.33	0.47	—	—	0.34	0.46
	Middle	0.26	0.44	—	—	0.28	0.35
	East	0.41	0.49	—	—	0.38	0.49
Sample Size		1137					

Table 2. Lagged Regression Results Regarding the Determinants of Parenting

	Organized Leisure Time			Family Environment			Assistive Parental Involvement			Supervisory Parental Involvement		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
<i>Cultural Capital (Education)</i>												
Parental	0.238*** (0.027)	0.083* (0.035)	0.075* (0.035)	0.103*** (0.016)	0.093*** (0.021)	0.093*** (0.021)	0.143*** (0.019)	0.156*** (0.025)	0.155*** (0.025)	0.203*** (0.034)	0.157*** (0.042)	0.161*** (0.042)
Grandparental (Highly-educated = 0)												
Less-educated			-0.891* (0.445)			0.195 (0.348)			-0.403 (0.407)			0.101 (0.725)
Not coresident			-0.994* (0.478)			0.032 (0.366)			-0.226 (0.428)			0.625 (0.761)
<i>Other Parental Factors</i>												
Verbal Test Score		0.288* (0.131)	0.294* (0.131)		0.371*** (0.084)	0.369*** (0.084)		0.023 (0.096)	0.027 (0.096)		0.159 (0.169)	0.163 (0.169)
Math Test Score		-0.142 (0.135)	-0.164 (0.132)		0.008 (0.085)	0.01 (0.085)		0.215* (0.097)	0.212* (0.098)		-0.096 (0.172)	-0.094 (0.172)
Parental Expectation		0.148† (0.082)	0.146† (0.082)		-0.01 (0.048)	-0.01 (0.049)		0.045 (0.057)	0.046 (0.057)		0.227* (0.1)	0.227* (0.1)
<i>Family Characteristics</i>												
Per-capita Income		0.384** (0.115)	0.377** (0.115)		0.104 (0.068)	0.108 (0.068)		0.025 (0.079)	0.018 (0.079)		0.117 (0.14)	0.114 (0.14)
Number of Children		-0.38* (0.168)	-0.307 (0.191)		0.209* (0.085)	0.251* (0.099)		-0.021 (0.103)	-0.062 (0.12)		-0.162 (0.173)	-0.326 (0.205)
Family Size		-0.021 (0.077)	-0.086 (0.12)		-0.032 (0.051)	-0.074 (0.072)		-0.02 (0.06)	0.021 (0.085)		-0.002 (0.106)	0.157 (0.15)
Two-parent (single = 0)		0.556 (0.552)	0.631 (0.578)		0.743* (0.318)	0.806* (0.326)		0.932* (0.426)	0.874* (0.435)		1.281† (0.664)	1.07 (0.679)

Children's demographics

Male	-0.468*	-0.457*		0.243*	0.243*		0.455**	0.458**		-0.157	-0.162
	(0.183)	(0.184)		(0.118)	(0.118)		(0.136)	(0.137)		(0.24)	(0.24)
Hukou (rural = 0)	0.974***	0.954***		0.387*	0.397*		0.29	0.278		0.376	0.378
	(0.225)	(0.227)		(0.171)	(0.172)		(0.189)	(0.19)		(0.342)	(0.344)
Age	-0.19*	-0.184*		0.022	0.019		-0.376***	-0.374***		-0.372***	-0.368***
	(0.08)	(0.08)		(0.05)	(0.05)		(0.059)	(0.059)		(0.101)	(0.101)

Children's Cognitive Test Scores

Verbal	0.012	0.01		0.033**	0.033**		-0.032*	-0.032*		0.025	0.026
	(0.019)	(0.019)		(0.011)	(0.011)		(0.013)	(0.013)		(0.023)	(0.023)
Math	0.017	0.021		-0.03	-0.03		0.012	0.013		-0.056	-0.059
	(0.028)	(0.028)		(0.019)	(0.019)		(0.022)	(0.022)		(0.038)	(0.038)

Region(West = 0)

East	0.916***	0.533*	0.602***	0.072	-0.128	-0.122	-0.387*	-0.448**	-0.45**	0.22	0.067	0.03
	(0.238)	(0.258)	(0.263)	(0.138)	(0.145)	(0.146)	(0.154)	(0.17)	(0.171)	(0.29)	(0.297)	(0.299)
Middle	0.669**	0.537†	0.578	-0.462**	-0.638***	-0.623***	-0.467**	-0.467*	-0.487**	-0.973**	-1.008**	-1.066**
	(0.261)	(0.278)	(0.284)	(0.154)	(0.158)	(0.159)	(0.172)	(0.184)	(0.186)	(0.32)	(0.321)	(0.324)
Intercept	-4.191***	-4.662***	-3.64*	—	—	—	-1.299***	1.857†	2.128†	12.461***	14.482***	13.851***
	(0.304)	(1.454)	(1.549)	—	—	—	(0.157)	(0.987)	(1.086)	(0.277)	(1.729)	(1.908)
N	1137	1137	1137	1137	1137	1137	1137	1137	1137	1137	1137	1137
Model	Logit	Logit	Logit	Ologit	Ologit	Ologit	Logit	Logit	Logit	OLS	OLS	OLS

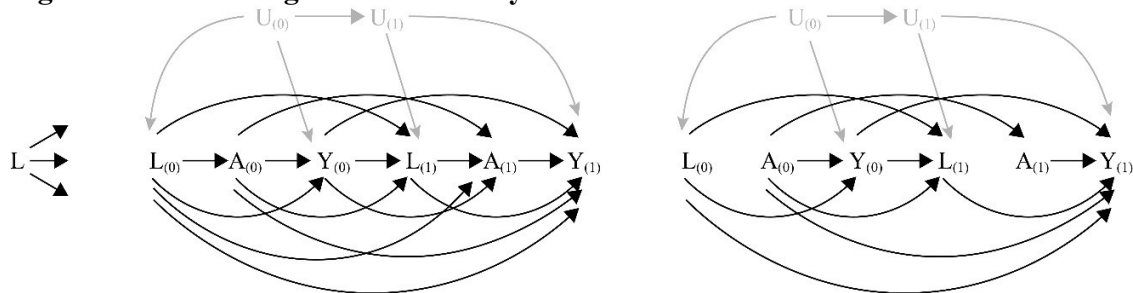
Note: Standard error in the parenthesis. † p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 3. Regression and MSM Estimations of the Effects of Concerted Cultivation

	Word Cognitive Ability			Math Cognitive Ability		
	Unadjusted	RA	MSM	Unadjusted	RA	MSM
<i>Family Environment</i>						
Time 1	2.097*** (0.408)	0.913* (0.374)	1.505*** (0.418)	2.046*** (0.324)	0.861** (0.291)	1.364*** (0.351)
Time 2	1.217** (0.402)	0.339 (0.368)	0.44 (0.423)	0.762* (0.32)	0.25 (0.283)	0.212 (0.348)
Intercept	23.82*** (0.327)	11.741*** (2.949)	24.579*** (0.368)	12.021*** (0.26)	2.777 (2.311)	12.594*** (0.299)
DRE	—	—	NA	—	—	NA
<i>Organized Leisure Time</i>						
Time 1	2.292*** (0.591)	1.178* (0.553)	1.529* (0.728)	1.905*** (0.473)	0.58 (0.429)	0.975 (0.639)
Time 2	2.048*** (0.574)	0.651 (0.537)	0.693 (0.607)	1.448** (0.459)	0.108 (0.417)	0.045 (0.524)
Intercept	24.657*** (0.224)	10.231** (3.003)	22.26*** (2.072)	12.744*** (0.179)	-0.398 (0.314)	9.98*** (1.838)
DRE	—	—	Yes	—	—	Yes
<i>Assistive Parental Involvement</i>						
Time 1	0.738† (0.427)	0.399 (0.405)	0.38 (0.486)	0.67† (0.341)	0.252 (0.315)	0.244 (0.382)
Time 2	-0.343 (0.437)	0.428 (0.404)	-0.207 (0.455)	-0.644† (0.349)	-0.398 (0.314)	-0.732† (0.404)
Intercept	25.039*** (0.324)	10.231** (3.003)	22.652*** (0.819)	13.12*** (0.259)	-0.398 (0.314)	9.171*** (0.745)
DRE	—	—	Yes	—	—	Yes
<i>Supervisory Parental Involvement</i>						
Time 1	1.152* (0.479)	0.125 (0.434)	1.086* (0.467)	0.997** (0.382)	0.26 (0.338)	1.134** (0.424)
Time 2	0.621 (0.521)	0.398 (0.464)	0.716 (0.52)	0.351 (0.416)	0.324 (0.361)	0.351 (0.46)
Intercept	24.95*** (0.245)	10.697*** (2.917)	25.046*** (0.254)	12.968*** (0.195)	1.606 (2.292)	13.014*** (0.203)
DRE	—	—	NA	—	—	NA

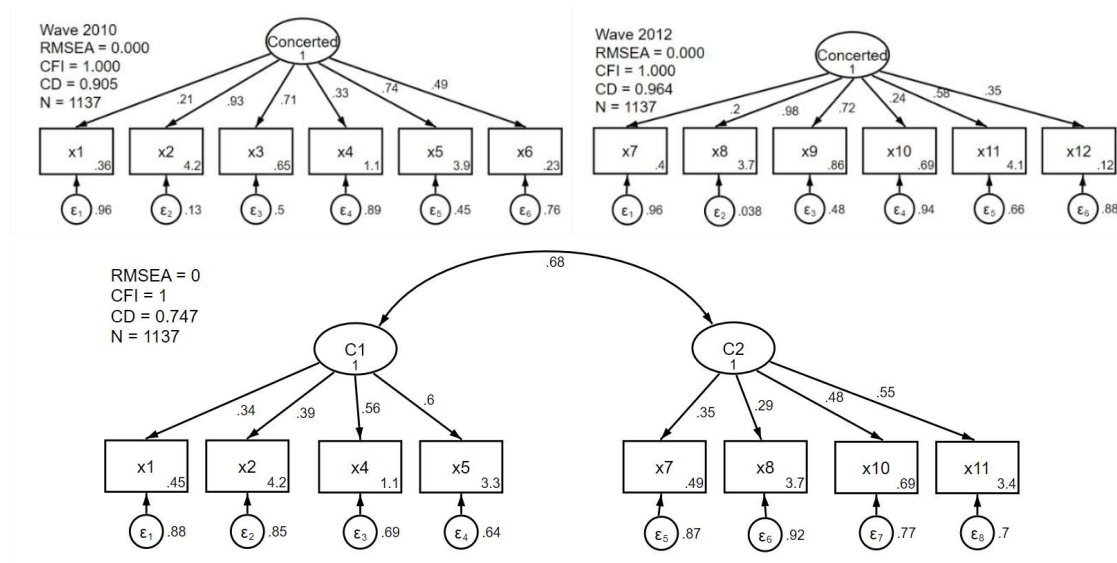
Standard error in the parenthesis. † p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001
The interaction term of Time 1 and Time 2 does not significantly improve the model.
DRE: Doubly Robust Estimator. NA: all covariates have been balanced.

Figure 1. Causal Diagram of the Analysis



The directed acyclic graph (DAG) representing the causal relationship between parenting practices, cognitive abilities, and covariates. The arrows indicate a causal relation, and the direction of arrows indicate the direction of causality. L = time-invariant covariates, which influence all the other variables. $A_{(t)}$ = treatment variables/parenting practice variables. $L_{(t)}$ = time-varying covariates. $Y_{(t)}$ = time-varying outcome variables/cognitive ability variables. $U_{(t)}$ = unobserved confounders. t equals 0 if the variables are from the prior time point (2010, 2011 or prior timepoint) and 1 if the variables are from the later timepoint (2012 or 2014). The left DAG indicates the causal relationship before MSM weighting, and the right DAG representing the causal relationship after the sample is weighted by MSM. Compared to the top DAG, following paths are eliminated by MSM: $L_0 \rightarrow A_0$, $L_0 \rightarrow A_1$, $L_0 \rightarrow A_2$, $L_1 \rightarrow A_2$, $Y_0 \rightarrow A_1$, and $L \rightarrow$ the other variables.

Figure 2. Confirmatory Factor Analysis of the Concerted Cultivation



Note: RMSEA = Root mean squared error of approximation; CFI = Comparative fit index; CD = Coefficient of determination. The standardized path coefficients are reported. All path coefficients are significant at <0.001 level. x1 to x6 refer to parenting practices variables in 2010, and x7 to x12 refer to parenting practice variables in 2012. x1, x7 = organized leisure time; x2, x8 = family environment; x3, x9 = binary family environment; x4, x10 = assistive parental involvement; x5, x11 = supervisory parental involvement; x6, x12 = binary supervisory parental involvement. C1 = the 2010 latent concerted cultivation variable. C2 = the 2010 latent concerted cultivation variable. x3, x9, x6 and x12 are not included in the covariance analysis (the bottom picture) because the model does not converge.

APPENDIX A. DISCUSSION OF THE MSM METHOD USED IN THE PAPER

As a propensity score-based method (Robins, Hernán, and Brumback 2000; Robins and Hernán 2009), MSM makes sequential ignorability assumption that the direct causal path between unobserved confounders and the time-varying treatment variables (parenting practices variables) are absent (See Figure 1). In other words, all the confounders of the effect of parenting practices on cognitive abilities have been reflected by the observed variables included in the Model. In a formula from, the sequential ignorability made in this study can be illustrated as formula (1) and (2).

$$Y_0(0), Y_0(1) \perp A_0 | L_0, L \quad (1)$$

$$Y_1(0), Y_1(1) \perp A_1 | A_0, L_0, L_1, L, Y_0 \quad (2)$$

Based on the sequential ignorability assumption, MSM utilizes IPTW to weight sample against the treatment variables (Robins et al. 2000; Robins and Hernán 2009). IPTW will make the covariates equally distributed in the treatment and control groups (the children receiving concerted cultivation and the children not receiving concerted cultivation) and created a sample that resemble an experiment scenario where the only difference between the groups is whether the treatment is offered (Hong 2015; Austin and Stuart 2015). As such, MSM relies on a simple OLS regression with the treatment variable as the only predictor, which avoids assuming an outcome equation and becomes less subject to the danger of model misspecification or extrapolation than the multiple regression model (Hong 2015).

In addition to the benefits of the typical advantages of IPTW methods, MSM allows for unbiased estimation of the effects of time-varying treatments, which allows us to observe the long-term effect or accumulative effect of the Chinese concerted cultivation.. Specifically, with a

proper weighting method, MSM could rule out the backdoor paths while keeping all the direct and indirect effect of the time 1 treatments (A_0 , see Figure 1), which allows the measurement of the total effects of both A_0 and A_1 in one model (Pearl 2001; VanderWeele 2009). Second, the ordinary regression methods that control Y_0 or L_1 will result in collider effects a fake direct correlation between the unobserved factors and the time 1 treatments (A_0), which is called collider effect (Cole et al. 2009), which violates the sequential ignorability assumption and bias the causal estimation. MSM could avoid this bias by avoiding conditioning on Y_0 or L_1 .

One last point to note is that instead of measuring the total effects, this study in fact measures *total net effects*. To be specific, one issue of the causal analysis of the parenting effects is that the time order of the four parenting variables is unknown, which means that it is impossible to differentiate the causal relationship among the parenting practices in a particular wave. Such ambiguity of the time order implies the danger of biased estimation of causal effects. To solve this concern, when one parenting practice variable is evaluated, the other three parenting practices variables will be controlled as covariates by MSM. A trade-off of this method is that the estimated effect is no longer the total effect of parenting but the total effect of one parenting practice net of the effects of the other three parenting practices, which can be called as *total net effects*.

$$\text{Weight} = \text{IPTW}_0 \times \text{IPTW}_1 = \frac{P(A_{0i}=j)}{P(A_{0i}=j|L_0, L_1, A_{-0i})} \times \frac{P(A_{1i}=k|A_{0i}=j)}{P(A_{1i}=k|A_0, L_0, L_1, Y_0, L, A_{-1i})} \quad (3)$$

Note: $j = 0, 1$; $k = 0, 1$. A_{0i} and A_{1i} denote the particular parenting practice variable to be used in a MSM, and A_{-0i} and A_{-1i} refer to the other three parenting practice variables that will be controlled as covariates in that model.

Given all the considerations in this section, this study will use Formula 3 to calculate the stabilized IPTW and use MSM to estimate the causal effects. The OLS regression model will be

used to estimate the causal effects based on the sample weighted by IPTW. The balance of the covariates between the treatment groups and control groups will be measured by the standardized difference. While there is no complete consensus regarding the best threshold value of standardized difference that can prove balance, a preferred criterion is that a standardized difference less than 0.25 could indicate the balance of a covariate (Austin 2009; Stuart, Lee and Leacy 2013; Garrido et al. 2014). However, the balance of all covariates is typically a property of the large sample size, and in small or moderate size samples it is common to find variables not balanced by IPTW (Austin 2009; Stuart, Lee and Leacy 2013). Austin and Stuart (2015) advised that this problem can be solved by adding the imbalanced covariates to the weighted regression model as doubly robust estimators. In consideration of such advice, this study will use 0.25 standardized difference to test the balance of the covariates and include the imbalanced variables, if any, into the MLE models as doubly robust estimators.