

# The Class Distribution of Extracurricular Education and the Academic Achievement and Non-cognitive Ability of Middle School students—Analysis Based on CEPS Data

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**Abstract:** Based on the data of CEPS 2013-2014 and 2014-2015, this paper uses multilevel mixed-effects logistic regression to verify that there are stratum differences in the distribution of family education and economic capital in the choice of extracurricular education. And the effect on interest-oriented class is more than that of cram school. Moreover, family capital enhances the accessibility of extracurricular education through the supply of school education resources. The influences of cram schools on the academic performance of middle school students are heterogeneous and can be divided into two mechanisms: “accelerator” and “safety net”; while interest-oriented classes play a more significant role in self-efficacy and social interaction in terms of non-cognitive ability. The widespread existence of extracurricular education has intensified the stratification of the educational model.

## 1. Introduction

Extracurricular education refers to the planned and organized educational activities for students to acquire knowledge, improve their ability and learn special skills beyond the school curriculum plan and subject standards. Extracurricular education includes extracurricular tutoring for the purpose of improving learning achievement, also known as shadow education, and interest classes based on hobbies to develop skills and emotions. The term "shadow education" was originally proposed by Stevenson and Bray <sup>[1]</sup> emphasized its definition with "academic nature". Extracurricular education has been popular all over the world for a long time. At present, cultural capital, as a symbol, is an important way of improving social status, so it also presents the generalization of investment in extra-curricular education. With the popularization of extra-curricular education, the increasing diversification of its types and the inevitable investment demand will also lead to the unequal access of students to resources in this area. Different from "cognitive ability" which includes reading and writing ability, basic mathematical ability, production knowledge and technology, "non-cognitive ability" refers to individual character, attitude and enthusiasm.

Extra-curricular education means more investment in education, which is affected by economic capital. Many foreign literatures and Chinese researchers have confirmed that the positive impact of family economic and social status on the participation of supplementary education. <sup>[2][3][4][5][6][7][8]</sup> Many researches have explained the influence of cultural capital on extracurricular education. Compared with the material resources, the advantage of cultural capital means higher quality ability cultivation. Bourdieu also used to explain the stratification of cultural capital and the instrumental significance of striving for higher educational achievements. <sup>[9][10]</sup> At present, cognitive ability has been widely concerned, but non-cognitive ability has been relatively less involved in the previous literature. As the current education system in China emphasizes more on the shaping of cognitive ability, the output and assistance of family cultural capital to non-cognitive ability are relatively hidden. However, some literatures suggest that students' participation in extracurricular education can improve their non-cognitive ability. <sup>[11]</sup>

What kind of influence does remedial class and interest class have on the development of different dimensions of students. Based on this, this paper uses the two-year data of China's education tracking survey to test the class distribution of extracurricular education, as well as its academic performance and non-cognitive ability of middle school students.

## 2. Data, Variables and Methods

### 2.1 Data Source

The data used in this study comes from China Education tracking survey (CEPs), which is designed and implemented by the survey and data center of Renmin University of China. There are 112 schools and 10279 students.

### 2.2 Variables and Description

Whether to participate in the tutorial class and interest class are two dummy variables. This study standardized the mid-term results. The average value of each academic year is taken as an indicator of comprehensive performance. Through the principal component factor analysis, this paper obtains "social interaction" and "self-expression" from the indicators of students' behavior development in the questionnaire. The higher the scores of "social interaction", "self-expression" and "self-efficacy", the better the corresponding abilities of students.

As occupation is an important basis for social stratification, this paper divides it into three types of Occupation: farmer, blue collar and white collar according to the specific work types of parents. The highest education levels of parents are junior high school or below, senior high school / vocational high school / secondary school, junior college or above. Take the self-assessment of the respondents as the operational indicator of the family economic level. After that, the component factor analysis of parents' education, occupation and family economy is carried out, and the factors is names as family socio-economic status.

"Relationship with parents", "the degree of communication with parents" and "school atmosphere" are variables that may affect students' behavior and emotional perception. According to the ranking of the schools in the questionnaire, the school level is divided into "poor", "general", "top middle" and "best", with a code of 1-4.

### 2.3 Model

In this paper, the mixed-effects logistic regression is used, that is, the random intercept stratified model with dummy variable as dependent variable, to investigate the class distribution differences of extracurricular education. The first level is the individual level, and the second level is the school level.

Zero model:

$$\text{First Level: } \ln\left(\frac{P_{ij}}{1-P_{ij}}\right) = \beta_0 + \gamma_{ij}, \gamma_{ij} \sim N(0, \sigma_\gamma^2) \quad (1)$$

$$\text{Second Level: } \beta_0 = \gamma_{00} + \mu_j, \mu_j \sim N(0, \sigma_\mu^2) \quad (2)$$

In this model,  $P_{ij}$  represents the probability that the student  $i$  of the  $j$  school chooses to receive extra-curricular education,  $\beta_{0j}$  represents the overall mean of the logarithm ratio of the  $j$  school probability,  $r_{ij}$  is the residual of the individual level,  $\gamma_{00}$  represents the overall average of all schools,  $\mu_{0j}$  represents the random error term of the second level. By calculating the intra group correlation coefficient ICC, we can know the inter group correlation, that is, the proportion of the variation of dependent variable can be explained by the difference of school level.

Stratified model of random intercept:

$$\text{First Level: } \ln\left(\frac{P_{ij}}{1-P_{ij}}\right) = \beta_0 + \beta_{1j}X_{ij} + \beta_{2j}X_{ij} + \gamma_{ij} \quad (3)$$

$$\text{Second Level: } \beta_0 = \gamma_{00} + \gamma_{01}X_j + \mu_j \quad (4)$$

In this model,  $\beta_{1j}X_{ij}$  represents the effect of individual family capital on dependent variables,  $\beta_{2j}X_{ij}$  represents the effect of other control variables on dependent variables. The model assumes that the first level of  $\beta_0$  is random rather than fixed. At the same time, independent variables representing school attributes are added to the second level.

### 3. Empirical Research

#### 3.1 Class Distribution Differences of Students' Extracurricular Education Choices

In the case of no independent variable, the random intercept of different school grades is included in the mixed effect logit regression, and a zero model is established. According to the estimation results(  $ICC = \text{Var}(\mu_j) / [\text{Var}(\mu_j) + \frac{\pi^2}{3}] \approx 0.147$  and  $0.089$ ), 14.7% and 8.9% of the differences in the choice of extra-curricular classes, which are caused by the differences between schools. After that, the random intercept values of different school grades are estimated. It shows that the rise of school grades brings positive random effects on the selection of extra-curricular education. In China, the primary and secondary school entrance system is closely related to the school district system, resulting in the uneven distribution of educational resources. Some parents invest in school district housing to transform their social resources into their children's prior advantages in education.

Table1 The estimation of the hierarchical model of extracurricular education selection

|   | Tutorial class |       |          | Interest class |       |          |
|---|----------------|-------|----------|----------------|-------|----------|
| Fixed effect  | $\beta$        | SE.   | Ratio    | $\beta$        | SE.   | Ratio    |
| Intercept   | -3.634***      | 0.306 | 0.035*** | -1.690***      | 0.132 | 0.185*** |
| Achievement in last year  | 0.021***       | 0.003 | 1.021*** |                |       |          |
| Gender (male)   | -0.122*        | 0.052 | 0.885*   | -0.490***      | 0.054 | 0.613*** |
| Residence(non-agricultural)   | 0.491***       | 0.059 | 1.634*** | 0.209***       | 0.065 | 1.232*** |
| Only child  | -0.188***      | 0.054 | 0.829*** | -0.032         | 0.059 | 0.969    |
| Education level of mother (reference group: junior high school and below) |                |       |          |                |       |          |
| senior high school  | 0.323***       | 0.071 | 1.381*** | 0.338***       | 0.077 | 1.402*** |
| Junior college or above   | 0.459***       | 0.104 | 1.582*** | 0.530***       | 0.107 | 1.699*** |
| Education level of father (reference group: junior high school and below) |                |       |          |                |       |          |
| Senior high school  | 0.255***       | 0.068 | 1.290*** | 0.170*         | 0.074 | 1.185*   |
| Junior college or above   | 0.412***       | 0.102 | 1.510*** | 0.311**        | 0.106 | 1.365**  |
| Occupation type of father (reference group: farmer)                       |                |       |          |                |       |          |
| Blue Collar   | 0.316***       | 0.088 | 1.372*** | 0.164          | 0.094 | 1.178    |
| White Collar  | 0.316**        | 0.106 | 1.372**  | 0.347**        | 0.111 | 1.415**  |
| Occupation type of mother (reference group: farmer)                       |                |       |          |                |       |          |
| Blue Collar   | 0.157*         | 0.070 | 1.170*   | 0.007          | 0.076 | 1.007    |
| White Collar  | 0.420***       | 0.087 | 1.522*** | 0.254**        | 0.092 | 1.289**  |
| Family economic grade (reference group: poor)                             |                |       |          |                |       |          |
| Middling  | 0.698***       | 0.089 | 2.010*** | 0.117          | 0.088 | 1.124    |
| Affluent  | 0.973***       | 0.114 | 2.646*** | 0.509***       | 0.113 | 1.664*** |
| Random effect   | Estimate       | SE.   | $X^2$    | Estimate       | SE.   | $X^2$    |
| $\mu_j$   | 0.303***       | 0.118 | 37.95    | 0.144***       | 0.062 | 13.05    |
| N of obs.   | 7917           |       |          | 7917           |       |          |
| N of groups   | 4              |       |          | 4              |       |          |
| Log likelihood  | -4574.6725     |       |          | -4120.5959     |       |          |

In the model in Table 1, the individual level variables are added. First of all, as to the choice of tutoring class, the increase of parents' education level, or the upgrading of family economic level, will lead to the increase of students' chances of receiving supplementary education. Compared with the students whose mother's education level is junior high school or below, those whose mother's highest education level is high school, junior college or above have an increase of 38.1% and 58.2% respectively, while for the father, the increase of 29.0% and 51.0% respectively. In terms of father's occupation type, blue-collar workers and white-collar workers have the same increase rate compared with agricultural practitioners; in terms of mothers, blue collar workers and white-collar workers have 17.0% and 52.2% respectively. From the perspective of family economic level, the children of medium-sized families are 2.01 times more likely to choose extra-curricular tutoring than those of poor families, and the children of rich families are 2.646 times more likely to choose extra-curricular tutoring. Generally speaking, family economic capital and cultural capital will strengthen parents' investment in supporting education for their children, especially those who meet the standards of vocational middle class and education middle class.

Moreover, the choice of extracurricular interest class. Mothers with secondary school / vocational high school / high school education, junior college education or above are 1.402 and 1.699 times of those with junior high school education or below, while fathers are 1.185 and 1.365 times. In terms of occupation, compared with agricultural production personnel, blue collar parents have no chance to change their choice of middle school students' interest classes, while those whose parents are white-collar students will increase their chances of attending interest classes by 41.5% and 28.9%. On the family economic level, children from rich families are 1.644 times more likely to participate in the interest class than those from the reference group. Compared with the extra-curricular classes, the distribution of interest classes in the social class is more obvious.

### **3.2 The Impacted of Students' Participation in Extracurricular Education on Their Academic Achievements**

In this paper, by calculating the difference of scores between the two academic years, the subjects are divided into four categories: four subgroups: the significant decline, the slight decline, the slight rise and the obvious rise. It can be seen from the estimation results that, for the students with "significant decline" and "significant rise", attending the tutoring class has a positive effect on their scores, while for the students with "slight decrease" and "slight rise", it has no significant effect. It shows that the influence of extra-curricular education on students is heterogeneous.

In the sub sample regression model of "significant decline" and "significant rise" after the learning difficulty is added into the model, the estimation coefficient of "tutoring class" has decreased, which shows that shadow education is in line with students' acceptance of formal education in school.

Models 1, 3 and 4 in Table 2 show that parents' expectation of higher grades has a positive impact, but this trend is not significant in model 2. The frequency of parental guidance has no significant effect in any model. In terms of "frequency of parents' checking homework", there may be a problem of reverse causality in the model. Family socio-economic status also has a direct impact on academic performance. This effect is significant in models 2, 3 and 4.

Table 2 OLS estimation of the influence of extra-curricular tutoring on learning achievement

|   | Significant decline |       | Slight decline |       | Slight rise |       | Significant rise |       |
|---|---------------------|-------|----------------|-------|-------------|-------|------------------|-------|
|   | $\beta$             | SE.   | $\beta$        | SE.   | $\beta$     | SE.   | $\beta$          | SE.   |
| Tutoring class  | 0.653**             | 0.234 | 0.014          | 0.071 | -0.012      | 0.053 | 0.392**          | 0.143 |
| Cognitive   | 1.785***            | 0.131 | 0.173***       | 0.053 | 0.098*      | 0.042 | 1.233***         | 0.107 |
| Achievement in last year  | 0.742***            | 0.017 | 0.977***       | 0.006 | 0.977***    | 0.005 | 0.642***         | 0.011 |
| Learning difficulty(reference group: hard)                      |                     |       |                |       |             |       |                  |       |
| Common  | 1.607***            | 0.240 | 0.181          | 0.110 | 0.035       | 0.099 | 1.189***         | 0.237 |
| Not hard  | 2.072***            | 0.309 | 0.234          | 0.122 | 0.172       | 0.108 | 1.629***         | 0.264 |
| Parents' expectation of academic performance                    |                     |       |                |       |             |       |                  |       |
| Middle  | 0.285               | 0.347 | -0.320*        | 0.151 | 0.092       | 0.116 | 0.634*           | 0.267 |
| Above average   | 1.437***            | 0.316 | -0.226         | 0.136 | 0.250*      | 0.104 | 1.270***         | 0.258 |
| Top five  | 2.108***            | 0.363 | -0.210         | 0.147 | 0.224*      | 0.112 | 1.588***         | 0.303 |
| Frequency of parental guidance (reference group: none)          |                     |       |                |       |             |       |                  |       |
| 1-2days   | 0.168               | 0.284 | -0.023         | 0.092 | 0.100       | 0.070 | 0.234            | 0.192 |
| 3-4days   | -0.392              | 0.411 | -0.108         | 0.125 | 0.088       | 0.092 | 0.082            | 0.239 |
| everyday  | -0.544              | 0.428 | 0.123          | 0.131 | 0.004       | 0.098 | -0.362           | 0.260 |
| Frequency of parents' checking homework (reference group: none) |                     |       |                |       |             |       |                  |       |
| 1-2days   | -0.367              | 0.271 | 0.145          | 0.092 | -0.059      | 0.072 | -0.358           | 0.198 |
| 3-4days   | -0.112              | 0.364 | 0.215          | 0.113 | -0.222*     | 0.087 | -0.849***        | 0.234 |
| everyday  | -0.519              | 0.367 | 0.239*         | 0.109 | -0.277***   | 0.084 | -0.297           | 0.223 |
| Socioeconomic status  | 0.240               | 0.127 | 0.081*         | 0.038 | 0.081**     | 0.027 | 0.241***         | 0.072 |
| Ethnic group (Han)  | 0.997***            | 0.267 | 0.219          | 0.120 | 0.215       | 0.110 | 0.722*           | 0.343 |
| _Cons   | 8.685***            | 2.326 | 0.578          | 0.858 | 4.768***    | 0.715 | 29.929***        | 1.817 |
| N   | 1852                |       | 1950           |       | 1978        |       | 1896             |       |
| R-squared   | 0.7641              |       | 0.9645         |       | 0.9774      |       | 0.8571           |       |

The model in Table 3 verifies the effect of extracurricular education on the non-cognitive ability of middle school students. In each model, there is no significant effect of attending tutoring class, which means that although the participation of cram school is helpful to the optimization of academic performance, it is not conducive to the development of non-cognitive ability. However, the proportion of supplementary classes is significantly higher than that of interest classes, which reflects that people pay more attention to scores than to supplement the demand of quality education after class.

Participating in the interest class will increase the scores of self-efficacy and social interaction by 0.280 and 0.110 respectively. Interest class can not only exercise the social communication ability of middle school students, but also provide different training of ability beyond exam-oriented education, so as to promote self-efficacy. But in terms of self-expression, interest class has no effect.

The results of the four models also show that: the better the relationship with parents and the better the school atmosphere, the higher the students' self-efficacy, social interaction and self-expression will be; the deeper the communication with parents, the better the self-efficacy and social interaction ability will be. Good communication between generations can also play a guiding role in children's social interaction. Good school atmosphere can enhance role interaction.

Table 3 OLS estimation of the influence of extracurricular education on non-cognitive ability

|  | Self-efficiency |       | Social interaction |       | Self-expression |       |
|--|-----------------|-------|--------------------|-------|-----------------|-------|
|  | $\beta$         | SE.   | $\beta$            | SE.   | $\beta$         | SE.   |
| Tutoring class                           | 0.020           | 0.066 | 0.016              | 0.023 | 0.017           | 0.025 |
| Interest class                           | 0.280***        | 0.071 | 0.110***           | 0.025 | 0.005           | 0.027 |
| Academic achievement                     | 0.019***        | 0.004 | 0.003              | 0.001 | -0.006***       | 0.002 |
| Cognitive ability                        | 0.178***        | 0.045 | 0.042**            | 0.016 | -0.065***       | 0.017 |
| Age                                      | -0.011          | 0.046 | 0.053***           | 0.016 | -0.042*         | 0.018 |
| The relationship with parents            | 0.088*          | 0.037 | 0.050***           | 0.013 | 0.091***        | 0.014 |
| The degree of communication with parents | 0.075***        | 0.008 | 0.032***           | 0.003 | 0.005           | 0.003 |
| School atmosphere                        | 0.157***        | 0.007 | 0.070***           | 0.002 | 0.039***        | 0.003 |
| Socioeconomic status                     | -0.036          | 0.034 | 0.013              | 0.012 | 0.024           | 0.013 |
| Constant                                 | 5.220***        | 0.784 | -3.821***          | 0.274 | -0.734*         | 0.303 |
| Number of obs                            | 7384            |       | 7215               |       | 7215            |       |
| R-squared                                | 0.1376          |       | 0.1970             |       | 0.0563          |       |

#### 4. Conclusion

This paper analyzes the differences in the class distribution of secondary school students' extra-curricular education by combining the two levels of family and school. The results show that the education level, occupation type and family economic level of parents affect the participation of students' remedial classes and interest classes, especially the output of economic capital and cultural capital of middle-class families, which has more prominent effect on the selection of extracurricular education, and deepens the influence of antecedent factors on the acquisition of educational resources. Moreover, the parents' investment in the school district makes further use of the current uneven distribution of educational resources in China.

In terms of the influence of extra-curricular remedial classes on students' academic performance, there are different functions among students at different levels. This explains that the tutoring class is not absolutely applicable in terms of improving performance. The differences in knowledge resource acquisition among different social classes do not completely translate into the differences in students' academic achievements.

By testing the relationship between extra-curricular education and non-cognitive ability, it is concluded that although the tutoring class is of no help to the development of non-cognitive ability, the participation of the interest class can bring about the improvement of social interaction and self-efficacy. In the choice of interest class, white-collar parents tend to be more obvious. That is to say, families with higher status will pay more attention to the cultivation of non-cognitive ability of middle school students. This is the stratification of another education model.

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