

A Study on the Impact of Family Education Ability on Family Education Investment Expenditure in the Context of "Double Reduction"

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Abstract: On July 24, 2021, the "Opinions on Further Reducing the Burden of Homework and Off-Campus Training for Students in Compulsory Education" was introduced. During the implementation of the "double reduction" policy, the extracurricular training market is being comprehensively regulated, schools have started to implement various after-school education activities, parents' education concepts have started to change, the family atmosphere has become harmonious, and the burden of parents and children has been reduced. Therefore, by studying the impact of family education capacity (non-economic component) on the change of family education expenditure in the context of "double reduction", we can effectively test the effectiveness of policy implementation and gain insight into the meaning of family education.

Keywords: Double reduction, education expenditure, Questionnaire, cumulative ratio model, Multiple regression

1. Introduction

Since 1995, the country has proposed to implement the strategy of developing the country through science and education, and the strong investment in education expenditure has forged a solid material foundation for the development of education. However, with the diversification of education demand and the rapid development of the education market, the interaction between education investment and economic growth has led to increasingly serious disparities in education standards and threatened the equity of the education system [1]. Therefore, the introduction of the "Double Reduction Policy" in 2021 focuses on building educational equity, forcing the adjustment of the relationship between school education, out-of-school education and family education, paying attention to the lack of family education in today's society, and rebuilding a new pattern of the education system.

Under the "double reduction policy", due to the irreducible internal system of family education in each family, the difference in family education ability will inevitably produce different response mechanisms to the policy, and the concern for increasing non-financial investment in family education itself is worth further investigation [2]. By exploring the response mechanism of the "double reduction policy" formed by the differences in the internal structure and philosophy of families, we can uncover the investment patterns and influencing factors of family education in the context of educational inequality, grasp the inner mechanism of family education investment, and then deeply explore the "double reduction policy". The effect of the implementation of the "double reduction policy" can be further explored. From the perspective of both internal energy investment and external economic investment in family education, it will be very important to guide families to educate their children correctly, seek a healthy development path for education in China, and effectively use the limited educational resources in China.

2. Establishment of a family education capacity assessment system

2.1. Questionnaire design and sample description

The analysis in this paper focuses on households with primary and secondary school students in the household, so households with only children younger than 7 years old (below elementary school) and college students in the household were excluded. In order to use the sample of children from families

with many children as much as possible, we tried to obtain a sample of families with many children with a high probability by consulting the number of children in the family in advance during the interview.

2.2. Evaluation indicators

In order to be as accurate as possible in judging the ability of home educators to educate their children at home, we surveyed the respondents (who completed the questionnaire) on various aspects: the special situation of family members, the working status of the main educator, the child's school district, the child's current grade ranking in the class, the extent to which the child's current academic performance meets expectations, the extent to which the child is worried about the child's future, the communication with the child, the educator's The extent to which the educator believes that the school education meets the child's educational needs at this stage, the main way to acquire knowledge about family education, the tendency to acquire educational knowledge, the main problems in educating the child, whether the child can be soothed and reasonably guided in case of emotional problems, whether the child can be helped in case of academic problems, whether the educator understands the child's personality traits, hobbies and behavioral habits, and whether the educator can control the child's emotions when the child's grades fall back. The subjective educational ability of the educator is judged by his or her ability to control emotions when the child's performance falls behind, which in turn reflects the amount of effort put into education.

3. Model building and solving

3.1. Establishment and testing of family education competency model

3.1.1. Sequential logistic regression modeling

Logistic regression is a logistic odds model, one of the discrete choice method models, which belongs to the category of multivariate analysis, and is a common method for statistical empirical analysis in sociology, quantitative psychology, and forthcoming economics. The ordinal logit model is an extension of the dichotomous logit model, mainly by processing information that reflects the results of the ordered classification of variables [3].

(1) Assignment

(2) Build 4 cumulative Logit functions and estimate them simultaneously

$$\log it(P_{y \leq 1}) = \ln\left(\frac{P_1}{1 - P_1}\right) = \ln\left(\frac{P_1}{P_2 + P_3 + P_4 + P_5}\right) = \alpha_1 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n \quad (1)$$

$$\log it(P_{y \leq 2}) = \ln\left(\frac{P_1 + P_2}{1 - (P_1 + P_2)}\right) = \ln\left(\frac{P_1 + P_2}{P_3 + P_4 + P_5}\right) = \alpha_2 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n \quad (2)$$

$$\log it(P_{y \leq 3}) = \ln\left(\frac{P_1 + P_2 + P_3}{1 - (P_1 + P_2 + P_3)}\right) = \ln\left(\frac{P_1 + P_2 + P_3}{P_4 + P_5}\right) = \alpha_3 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n \quad (3)$$

$$\log it(P_{y \leq 4}) = \ln\left(\frac{P_1 + P_2 + P_3 + P_4}{1 - (P_1 + P_2 + P_3 + P_4)}\right) = \ln\left(\frac{P_1 + P_2 + P_3 + P_4}{P_5}\right) = \alpha_4 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n \quad (4)$$

Where n is the number of factors affecting educational ability, P_1, P_2, P_3, P_4, P_5 the probability that the educator assesses excellent, good, average, bad and very poor home education ability of the child and $P_1 + P_2 + P_3 + P_4 + P_5 = 1$, The four formulas are explained as: the log occurrence ratio of excellent to good, average, bad and very poor, the log occurrence ratio of excellent and good to average, bad and very poor, the log occurrence ratio of excellent, good and average to bad and very poor, the log occurrence ratio of excellent, good, average and bad to very poor.

3.1.2. Model testing

Using the econometric software Stata 14, the most significant variables affecting educational competence were screened by stepwise regression. The analysis showed that the most significant variables on educational ability Y were the duration of parent-child education sessions, the gender of the primary educator, age, and the degree of knowledge of the child's personality traits and preferred

behavioral habits, and the following are the results of the analysis and tests[4].

(1) Test of regression equation

The p-values of z-test are less than 0.1, indicating that the four variables screened do have an effect on the dependent variable

(2) Heteroscedasticity test: Prob>0.0000, heteroscedasticity test passed

The parameter estimates, standard deviations and significance tests for Model 1 are shown in Table 1.

Table 1: Parameter estimation, standard deviation and significance test of model I

Variables	Parameter estimation	Standard deviation	Significance level
time	0.1145	0.0551	0.038*
gender	0.5108	0.2847	0.073*
age	0.0367	0.0207	0.076*
habit	1.1743	0.2032	0.000***
Ln(Income)	0.1944	0.1608	0.227
Prob>chi2	0.0000		

3.1.3. Parameter estimation

(1) The formula for the estimated value of Logit odds is as follows.

$$A = 0.1145 * \text{time} + 0.5108 \text{gender} + 0.0367 \text{age} + 1.1743 \text{habit} + 0.1944 \text{LnIncome} \quad (5)$$

The predicted probability is as follows.

$$P(Y=1) = P(Y+u \leq \text{cut1}) = P(Y+u \leq 3.481)$$

$$P(Y=2) = P(\text{cut1} \leq Y+u \leq \text{cut2}) = P(3.481 < Y+u \leq 3.900)$$

$$P(Y=3) = P(\text{cut2} \leq Y+u \leq \text{cut3}) = P(6.900 < Y+u \leq 9.829)$$

$$P(Y=4) = P(\text{cut3} \leq Y+u \leq \text{cut4}) = P(9.829 < Y+u \leq 11.383)$$

$$P(Y=5) = P(\text{cut4} < Y+u) = P(11.383 < Y+u)$$

(2) Explanation of Odds Ratio (Odds Ratio).

Constantly, the ratio of the probability of acquiring excellent educational ability and the probability of acquiring other degrees of ability is 1.666 times higher when the primary educator is a male than when the primary educator is a female, and so on, each time the probability of acquiring a higher degree of educational ability is 1.666 times higher for male educators than for female educators than in the ratio of acquiring a lower degree of educational ability.

Faced with income, the model can be interpreted in such a way that each time the total annual household income increases by 1%, the probability of acquiring a higher level of educational ability increases by a factor of 1.214 compared to the rate of acquiring a lower level of educational ability

$(\sum_{i=1}^j P_i / 1 - \sum_{i=1}^j P_i (j \leq n) | 1 \leq n \leq 5)$, however, in the actual analysis the p-value of the z-test is $0.227 > 0.1$ and we consider that the effect of this variable on educational ability is not significant.

3.2. Development and testing of the household education expenditure model

3.2.1. Modeling of household education expenditures

The 15 qualitative and quantitative indicators in the questionnaire were regressed and analyzed using the stepwise regression method. "the extent to which the child meets expectations (EXPECTATION)," "weekly opportunities to relax (CHANCE)," "the ability to control emotions (CONTROL)" and "total annual household income entering (INCOME)" into the education expenditure change model. Given that there are increases and decreases in expenditure changes; and large values of household income, we processed both separately by taking logarithms, and the results of Stata 14 analysis are shown in Table 2.

Table 2: Parameter estimation, standard deviation and significance test of model II

Variables	Parameter estimation	Standard deviation	Significance level
SITUATION	0.642	0.3403	0.061*
TIME	0.398	0.1260	0.002**
EXPECTATION	1.086	0.4364	0.014*
CHANCE	-0.162	0.0669	0.016*
CONTROL	-1.091	0.4484	0.016*
lnINCOME	0.27	0.4021	0.501
Constant term	-7.549	5.0427	0.136
F(6, 199)	5.10		

The model is.

$\ln\text{CHANGE} = 0.642\text{SITUATION} + 0.398\text{TIME} + 1.086\text{EXPECTATION} - 0.162\text{CHANCE} - 1.091\text{CONTROL} + 0.271\ln\text{INCOME} - 7.549$.

3.2.2. Model validation

(1) Significance test[5]

As can be seen in the table, variable significance test: all variables except income can pass the t-test, that is, the variables pass the significance test.

(2) Collinearity test: VIF test

Variable multicollinearity test is shown in Table 3.

Table 3: Variable multicollinearity test

Variables	VIF	1/VIF
SITUATION	1.27	0.7873
TIME	1.27	0.7888
EXPECTATION	1.14	0.8799
CHANCE	1.04	0.9615
CONTROL	1.04	0.9646
lnINCOME	1.03	0.9682
Average VIF	1.13	

Vif are less than 10, and the model passes the multiple covariance test.

(3) Heteroskedasticity test

The standard robust error was used in the regression, that is, $\text{Prob} > F = 0.0001$, and the model passed the heteroskedasticity test.

3.2.3. Analysis of results

Communication (SITUATION) is positively related to the logarithm of expenditure change ($\ln\text{CHANGE}$), with a significance of 0.061, indicating that more communication with children increases education expenditure change, with each degree of increase in communication increasing expenditure change by 0.642%; time spent with children in school (TIME) is positively related to the logarithm of expenditure change, indicating that more time spent with children also increases expenditure change, an increase of one hour of time spent with children's study per day will increase the expenditure change by 0.398%; there is also a positive relationship between EXPECTATION and logarithm of income ($\ln\text{INCOME}$), indicating that the higher the expectation of children, the higher the expenditure change will be. In contrast, the significance level of the logarithm of income ($0.501 > 0.1$) is poor and does not explain the change in expenditures well. The opportunity for educators to relax themselves (CHANCE) and the extent to which they control their emotions when their children have problems (CONTROL), on the other hand, are negatively related to the change in expenditures, suggesting that the more time spent relaxing and the less able to control their emotions, the lower the change in expenditures may be. For each additional hour of relaxation per week, the change in education spending decreases by 0.162%.

Model results analysis framework diagram is shown in Figure 1.

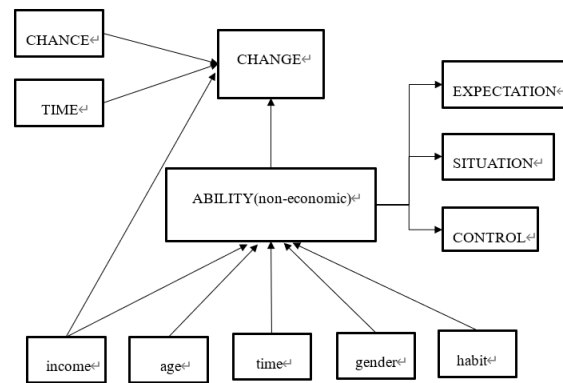


Figure 1: Model results analysis framework diagram

Model 1: The four factors of primary educator's gender, primary educator's age, primary educator's time devoted to parenting education programs, and knowledge of children's personality, interests, and habits (habit) had a positive effect on the improvement of family education ability, while the effect of total annual household income (income) on family education ability was not significant. The effect of income on family education ability was not significant.

Model 2: Parents who have higher opportunities to communicate with their children (TIME), spend more time with them (TIME), and have higher expectations (EXPECTATION) tend to invest more under the "double reduction policy" reform, while parents' opportunities to relax (CHANCE) and emotional control (CONTROL) are associated with changes in spending. CONTROL) are negatively associated with changes in spending.

4. Conclusion

Family education expenditure has been a long-standing concern of scholars, and the differences in family structure and the resulting inequalities have attracted much discussion in recent years. This paper analyzes the factors influencing family education ability based on the data collected from the questionnaires of families with children in compulsory education, and analyzes the impact of the "double reduction policy" on family education expenditure under the difference of family education ability, using questionnaires and regression models. In the context of changes in our social environment, we can understand the characteristics of family education flexibility and the trend of specialization.

First of all, the results of Model 1 basically reveal the main factors influencing the ability of family education. The gender of the primary educator, the age of the primary educator, the amount of time the primary educator invested in parenting education programs, and the degree of knowledge of the child's personality, interests, and habits were the four areas that were most effective in improving family education ability, while the effect of total annual household income on family education ability was not significant. When the primary educator is the father, the probability of obtaining an excellent evaluation of educational ability is greater than the probability of excellent evaluation when the primary educator is the mother. It has been proved by domestic and international research that fathers play an indispensable role in the development of children (Zhao, 2011). However, in real life, the involvement of fathers in family education is not optimistic due to factors such as social development, traditional culture, division of functions, and fathers themselves, which implies that more involvement of fathers in family education will improve the overall family education capacity to a certain extent.

Second, the analysis results of Model 1 indicate that there is a significant advantage in the improvement of family education ability in families where the primary educator is older, devotes more time to parenting education programs, and has a better understanding of the child. Based on this result, we can speculate that the difference in family education ability decreases as family educators' educational experience and time investment increase. Therefore, with the opportunity of the "double reduction policy", family educators should return more energy to family education itself, spend more time with their children, and understand them more deeply. In addition, although the total annual family income may appear to be an indirect factor influencing family education ability, in fact, the logistic regression model found that this factor has no significant effect on family education ability, so it can be assumed that the difference in family income is not a decisive factor in family education ability.

Finally, the results of Model 2 show that family education ability significantly affects the change of family education expenditure under the "double reduction policy". In families with higher ratings of family education ability - the more parents communicate with their children, the more opportunities to be with them, and the higher expectations - parents tend to invest more under the "double reduction policy" reform, while the opportunities for parents to relax and the degree of emotional control are negatively associated with the change in spending is negatively correlated with the change in parental relaxation and emotional control. From the results of this paper, it is clear that the change of family education investment expenditure under the "double reduction policy" is influenced by family education anxiety to a certain extent. Rollo-May's anxiety theory classifies family educational anxiety into normal anxiety and excessive anxiety. Therefore, we can predict that families with higher ratings of family educational competence are more inclined to transform educational anxiety brought about by the "double reduction policy" through extracurricular educational inputs, while in families where parents have more opportunities to relax and can better control their emotions, the "double reduction policy" in families where parents have more opportunities to relax and have better control over their emotions, the "double reduction policy" has implemented measures such as in-school after-school services, digital resources for classroom teaching, and reform of the extracurricular education system, which have reduced the burden on both children and parents, and therefore, the education expenditure of these families has been reduced to some extent.

It can be seen that, compared with school education and social education, family education has its own unique characteristics: it is tailored to the needs of the children and has a strong flexibility and specificity. As the "double reduction" calls for family education to return to the nurturing of people, into the scientific teaching of talent, the road of home-school cooperation. The "double reduction" will create a new pattern for the healthy growth of primary and secondary school students, with school education as the mainstay and family education and social education as the left and right arms of the education system. We should not only pay attention to the adjustment of the proportion of extracurricular education, but also pay attention to the lack of family education in today's society, the absence of the problem.

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