

# *Family Fertility Cost Estimation Based on CFPS Data*

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**Abstract:** The "demographic dividend" has brought abundant labor resources and low labor costs to our country. However, the official data released by the National Bureau of Statistics in 2021 shows that China's total fertility rate is 1.3. With the obvious trend, this endowment advantage will no longer exist. It is of great significance in contemporary China to calculate the cost of family fertility that leads to low fertility willingness, and to formulate policies to increase the fertility rate. Therefore, the paper builds a model to calculate the cost of family fertility in China through the equivalence scale theory, and calculates that the equivalence scale level of the family fertility cost in China is 1.41, which is a relatively high level in the world. On this basis, the paper analyzes the reasons for the high cost of fertility, and summarizes the shortcomings of the paper's research, therefore putting forward suggestions for future research.

**Keywords:** family fertility cost, equivalence scale theory, fertility rate

## 1. Introduction

Since the reform and opening up, China's rapid economic growth for decades has created a "miracle" in the world. Many economists believe that the "demographic dividend" has played an important role in the growth, bringing abundant labor resources and low labor costs to China. However, according to official data released by the National Bureau of Statistics in 2022, the national population at the end of 2021 is 1.4126 billion, an increase of only 480,000 compared with the data at the end of 2020, and the natural population growth rate is only 0.34‰, hitting an all-time low in nearly 60 years. According to the trend of the cliff-like decline in population growth, 2022 is likely to become the turning point of negative population growth.

Since 2015, in view of the current situation of China's population structure, in order to maintain the advantages of China's human resources endowment, the fertility policy has been adjusted in a timely and accurate manner. Starting from the "one-child" policy, the "two-child" and "three-child" policies have been gradually implemented to solve the problem of declining fertility and make population growth compatible with economic and social development. However, due to the long continuation of the "one-child" policy and the late opening of the "two-child" policy, the family fertility welfare policy introduced by our country is not perfect, and there are problems such as small coverage areas and fewer subsidy forms, which lead to the high cost of family fertility and fail to achieve the expected effect when it was formulated.

Based on the above problems, the paper intends to measure the cost of family fertility with less previous research by using the equivalence scale method, and further explore why the cost of family fertility in China is at this level.

## 2. Literature Review

### 2.1. Foreign Research Trends

The research of foreign scholars mainly focuses on the definition and measurement of family fertility costs. Apps & Rees use the term "total consumption" to define expenditure on children, which includes the various goods consumed during the childcare process, self-produced items to meet the needs of childcare, and the time expenditure that parents have to pay for childcare [1]. Bradbury put forward the term "total cost", made a distinction between the cost of children and the price of children, the consumption of children and the value of children, and believed that the resources paid for raising children, that are, the time and economic costs spent on children, are the cost of raising children [2]. The new family economy emphasizes that the cost of reproduction mainly includes direct costs, such as the costs of food, clothing, housing, transportation, education, medical care, etc., as well as opportunity costs due to women's inability to work and raise children [3]. In the specific calculation of childbearing costs, foreign researchers usually divide the cost of raising children into direct costs and indirect costs. Three main methods are used to measure indirect costs: one is to measure the size of the parenting responsibility between husband and wife, and the other is to measure the difference in time spent on childbirth by husband and wife, and the other is the change in the total household income before and after childbirth, that is, the loss of income to women due to childbearing [1,4,5].

### 2.2. Domestic Research Trends

Research in China mainly focuses on the composition and the calculation method of family fertility cost.

In the calculation of family fertility costs, the "new family economics" of the neoclassical economy is currently dominant in academia. This theory believes that a family's parenting cost mainly includes two parts: the first is the direct economic cost, which is also a factor that directly affects the quality of family parenting; the second is the indirect time and opportunity cost, this presupposes that women's work and raising children are incompatible, which means that childbirth increases opportunity costs [6,7]. For example, Ma believes that in addition to direct economic costs, childbirth costs also including indirect costs at the family level (the time cost of parents in the process of parenting, the impact of parenting on the total family income, etc.) and the indirect costs that may exist at the social level [8]. At present, there are few empirical studies on the basic status of family fertility costs in China, and some empirical studies focus on discussing fertility costs from the perspective of population control. Ma based on the 2014 CFPS data, estimated that the direct economic expenditure spent by minor children was 191,000 yuan, of which the economic expenditure of the urban population was 273,200 yuan, while that of the rural population was only 143,400 yuan, for families that are not very wealthy, although the absolute value of childcare costs has dropped, the proportion of parental income is higher [8]. In addition, a small number of domestic studies have also paid attention to the indirect cost of raising children in families. Zhu, Liang and Zhang have calculated and analyzed the opportunity cost and time cost of childbirth [9,10].

### 3. Methodology

#### 3.1. Model Building

The calculation methods of family fertility cost are mainly divided into direct calculation method and equivalence scale method. The direct calculation method, as the name implies, is to directly calculate the expenses of the family to have children and add up the various items. However, it is inaccurate to use expenditure data to measure family fertility costs, because consumption expenditure does not include the loss of welfare level, such as opportunity cost and time cost [11]. According to the viewpoint put forward by Van Praag et al., the data based on subjective feelings will be more accurate than the data of demand function, when using the equivalence scaling method, we can measure the cost of family fertility through changes in welfare levels from the perspective of subjective feelings [12]. Unlike the absolute cost calculated by the direct calculation method, the equivalence scale method measures the relative level, which is more credible than the previous one.

To sum up, the calculation method adopted in this paper when measuring the family fertility cost is the equivalence scale method, the welfare level is represented by income satisfaction, and it is assumed that each family has the same consumption preferences. Referring to the setting of Schwarze, the paper constructed the panel model of marginal utility of income as follows [13]:

$$S_{it}^* = \beta_0 + \beta_1 \ln Y_{it}^e + \beta_2 year + \beta_3 price + \beta_4 employ + \varepsilon_{it}, \quad i=1,2,\dots,N; \quad t=1,2,\dots,T \quad (1)$$

In model (1),  $S_{it}^*$  represents the latent variable of income satisfaction of the  $i$ th decision-making unit in period  $t$ ;  $Y_{it}^e$  represents the expected income of the  $i$ th decision-making unit in period  $t$ , which is measured by  $Y_{it}^e = Y_{it}/h_{it}^e$ , and  $Y_{it}$  in the formula represents the  $i$ th actual income of the decision-making unit in period  $t$ ,  $h_{it}^e$  represents the equivalent scale, where  $h_{it}$  represents the scale of the decision-making unit,  $e$  represents the scale elasticity of the equivalent scale, which can be expressed as  $e = a - bk$ , and the value range of  $e$  is  $[0,1]$ ,  $k$  represents the number of children;  $year$  is a dummy variable year;  $price$  represents a price-related factor;  $employ$  represents whether it is in a working state.

#### 3.2. Variable Selection

This paper constructs panel model indicators based on the 2014-2018 data of the China Household Tracking Survey (CFPS). Since latent variables cannot be directly observed, income satisfaction is selected as the explained variable, and after removing missing values and outliers, the data of children aged 20 and below are screened out. Because the data of the explained variables are discrete and have different degrees, the paper chooses the panel logistic model to process the data.

In the explanatory variables,  $Y_{it}$  represents the actual income,  $h_{it}$  represents the size of the decision-making unit,  $k$  represents the number of children,  $year$  is the dummy variable year,  $price$  represents the price factor, which is represented by the annual inflation rate;  $employ$  represents whether to quit the labor market. Among them,  $i=1,2,\dots,N$ , represents the decision-making unit, that is, the family;  $t=1,2,\dots,T$ , represents the year.

### 4. Results

Because the value of the dependent variable of the model is 1-5, this paper chooses the Multilevel ordinal panel logistic regression model as the analysis model. The estimation results of the panel logistic model obtained by using STATA 15.1 are shown in Table 1 below.

Table 1: Estimation results of panel logistic model.

Variable	qg401
lnY	0.109*** (3.97)
lnh	-0.118** (-2.11)
klnh	0.026* (1.68)
price	13.114*** (27.37)
employ	-0.014** (-2.33)
year01	0.622*** (14.61)
o.year02	-
a	1.08
b	0.24
sample size	11563
Equation Significance Wald Test	820.93 (0.00)
Likelihood Ratio Test	848.43 (0.00)

Note:

- (1) \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% significance levels, respectively.
- (2) The values in parentheses corresponding to the regression coefficients are standard errors.
- (3) The parentheses of various tests are the corresponding z values.

#### 4.1. Results Test

The effective sample size of the research data used to calculate the fertility cost is 11563, indicating that the research has a certain representativeness and credibility. The reliability and validity of the empirical analysis results are still unclear when only one model is used, and further robustness tests are needed to verify them. The paper adopts the equation significance Wald test and likelihood ratio test. The results are shown in table 1 above. It can be considered that the constructed model is robust, and the follow-up result analysis can be carried out on this basis.

#### 4.2. Research Results

According to the calculation results of the equivalence scale model, the expression of scale elasticity  $e$  is  $1.08-0.24k$ , and the equivalent scale is  $\frac{h_i^e}{h_0^e}$ , where  $h_0$  represents the scale of the reference unit, and  $h_i$  represents the scale of the decision-making unit. Therefore, when the reference family is set as a couple without children, then when the family has a child aged 0-20, the equivalent scale is 1.41, which means that in the case of having one child, the family's income needs to be increased to The original 141% can guarantee the maintenance of the original welfare level. When the reference family is set as a family with a child aged 0-20, when the number of children in the family becomes two, the equivalent scale becomes 1.19, that is to say, the more children in the family, the more children are born. The cost of childbearing will be less, because the material basis and experience base of the previous childbearing will reduce the cost of new childbearing. Although the cost of childbirth will drop significantly after the number of newborns increases, the childbearing cost of allowing a family

to make a decision from no child to one child is the basis for all subsequent decisions. If this cost is too high, the family's childbearing behavior will be impossible. Obviously, the cost of having children still brings a large burden to the family. In order to understand the level of the cost of childbirth in China, this paper compares the equivalence scale levels of other countries under the same circumstances. In developed countries such as Japan, the family fertility equivalent scale calculated by scholars is 1.39, while in developing countries such as Turkey, the family equivalence scale calculated is 1.27 [14,15]. From the above data, it can be concluded that China's equivalent scale is at a relatively high level in both developed and developing countries, that is to say, the cost of family fertility in China is still relatively high, which is likely to become one of the important influencing factors of China's fertility willingness.

## **5. Discussion**

### **5.1. Analysis of the Results**

By calculating the relative level of fertility costs, it can be concluded that China's fertility costs are at a relatively high level in the world. In order to further explain the reason for the high cost of family fertility, the paper starts with a specific analysis of the composition of family fertility costs.

First, the direct economic cost of family fertility has risen. On the one hand, with the rapid development of society and economy, the imbalance between supply and demand of population and resources has led to the rise in housing, education and medical prices, which also directly led to the rapid rise in fertility costs. As an expensive commodity, housing plays a role that cannot be underestimated in the increase of fertility costs; the rise in education costs is an important reason for the rise in fertility costs. At the same time, education costs are related to intergenerational mobility, and low intergenerational mobility means that people will have an increase in the age at which they are born and the number of births will decrease, which will lead to increased household spending on education; in addition, the increase in income and medical needs will also bring about an increase in medical costs. On the other hand, the development of society has improved the living standards of each family to a certain extent, and it is an inevitable trend to invest more costs in childcare. The loss of profit from the increase will continue for a long time.

Second, the indirect time and opportunity costs of family fertility costs are rising to vary degrees. First, with the improvement of population quality, the education level of both parents, especially mothers, has been greatly improved, and women's work participation has also been improved. In this case, the indirect cost of childbearing behavior will be greater; second, the improvement of the overall quality of the population also makes parents pay more attention to the education of their children, which requires parents to spend more time and energy, which also leads to a substantial increase in indirect costs. Under this circumstance, the increase in the cost of childbearing for the population of childbearing age has become an irreversible trend.

### **5.2. Implications and Limitations of the Study**

The results of the study have certain practical implications for this research field. From a practical point of view, this paper has a clearer understanding of my country's fertility status by measuring the cost of family fertility in China, which can provide a useful reference for improving my country's population structure, narrowing the actual income gap between families, and promoting long-term stable economic development, therefore provide research support for the formulation of the national fertility policy.

However, there are still many deficiencies in the research of this paper. First of all, due to the limitation of the sample size of the micro household survey data, the measurement results in this paper may still have a little deviation from the actual value. Therefore, when the survey data is more

reasonable, the measuring results will be closer to the true value. Secondly, most Chinese families continue the traditional family model of three or even four generations living in the same family. There are more than two adults in the family, and there may be three or more. The equivalence scale measurement model used in this paper uses monogamous families as a reference in the application research, and only considers the impact of children on household consumption expenditures. If the factors of the elderly can also be considered, it will be more in line with China's national conditions. Finally, due to the previously implemented family planning policy, the fertility situation in my country may be different from other countries. The specific trend, effect and improvement of the fertility welfare policy after the implementation of the family planning policy is also worthy of further research.

## 6. Conclusions

Since 2015, with the successful implementation of the "two-child" and "three-child" policies, researchers have found that the fertility rate has not increased as expected, but has gradually increased after a small increase. At present, China's total fertility rate has reached 1.3, which is far below the 2.1 that maintains a stable intergenerational population. According to this trend of continued decline in the fertility rate, 2022 is likely to become a turning point of negative population growth. In this reality, this paper calculates the relative value of family fertility costs in order to have a more correct understanding of the current fertility costs in our country.

This paper builds a model based on the equivalence scale theory to measure the cost of family fertility. According to the calculation results of the model, the equivalence scale level of Chinese families is 1.41, indicating that when a child is added to the family, both husband and wife must increase their income to 141% of the original level in order to maintain the original welfare level of the family. It can be seen from this that the relative fertility cost of Chinese families has reached a high level, which has a negative impact on the welfare level of the family.

There are still shortcomings in this paper in terms of sample size and specific analysis based on national conditions. Not only the lack of effective sample size may lead to biased analysis results, but also China's specific "four generations living together" family situation and the inelasticity of fertility costs are not considered. Therefore, the impact of the family planning policy that still exists in Chinese society may make the results deviate even more from reality. These factors can be taken into consideration in future research to make the research more complete and convincing.

Although the research of this paper is not perfect, it still provides some references and suggestions for relevant institutions to formulate fertility policies by measuring the cost of fertility in China.

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