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**Abstract**

We build up a three-period overlapping generation model to explore the effectiveness of fertility policy and the corresponding factors affecting the fertility choices in China. The results show that there is a significant U-shaped relationship between female income and the two-child fertility choice, and a significant positive relationship between male income and the two-child fertility choice, and the relationship between the price of other child care services and the two-child fertility choice is negatively correlated. The analysis of the effectiveness of the current universal two-child policy suggests that there exists a threshold of the fertility policy estimated to be between 1 and 2. Therefore, even if the two-child policy is further relaxed to a three child policy, it will exert little influence on fertility choice. Thus other forms of fertility policy should be combined to improve fertility rate.

**Keywords:** two-child policy, male and female income, threshold of the fertility policy

# 1 Introduction

On January 1, 2016, China further relaxed its family planning policy and adopted the universal two-child policy to actively address the country's aging trend. Up to now, the universal two-child policy has been implemented for more than one year. National Bureau of Statistics census data shows that the birth rate in 2016 is higher than 2003 for the first time, reaching 12.95%. This result reflects the positive impact of changes in China's population policy on fertility. However, according to the reports[1], in spite of the universal two-child policy implemented in 2016, the second child fertility rate of many provinces did not meet expectations. Further, the birth rates of some of the provinces even declined, i.e., the 2016 statistical bulletin released from Hunan Provincial Bureau of Statistics pointed out that the new population in Hunan in 2016 is less than it in 2015. In consideration of China's growing aging issue, how to effectively improve the fertility rate is imminent. Motivated by the above phenomenon, this paper aims to focus on the following research questions: why the effect of the two-child policy is not significant, let alone the policy relaxed the more than thirty years one-child policy in China? Now that the policy outcome is not satisfactory, what policy should the government enact to enhance the birth rate? Should the policy be adjusted to a three-child policy, or even be fully liberalized, similar to the original policy direction? Or are there any other policy considerations that can actively improve the birth rate, apart from focusing on relaxing the restrictions on the number of children?

Many pieces of research introduce the concept of "fertility choice" to conduct the related research of the problem of fertility. For example, Berker (1960) establishes the theoretical basis of the family decision-making problem to explore the factors of fertility choice. Galor & Weil (1996) build up a theoretical model finding that the greater the relative wage gap between men and women, the lower the fertility rate. When it comes to specific situation in China, pieces of researches have tried to explore the factors of the fertility choice in China, but most of which are empirical analysis from survey data. Therefore some important underlying factors have not been found and confirmed yet. Here we build a three-period overlapping generation model to characterize the utility maximization decision made by a representative family from the perspective of fertility choice. Since most women in China are faced with the dual pressures of raising children and working to make money, and since that the preference of young men and women is changing nowadays, our model takes the following factors into consideration, such as men and women's wages, the changing lifestyle of men and women of childbearing age and the current universal two-child policy. Based on our theoretical model, the empirical analysis will be conducted using the data from China Labor Force Dynamic Survey (CLDS) to explore and verify the factors that affect the two-child fertility choice of

[1] $http://epaper.21jingji.com/html/2017-02/24/content_56760.html$

women of childbearing age in China. The empirical result shows that there is a significant U-shaped relationship between female income and the two-child fertility choice, and male income is positively correlated the two-child fertility choice. The price of other child care services is negatively correlated with the two-child fertility choice. In addition, the analysis of the effectiveness of the current universal two-child policy suggests that there exists a threshold of the fertility policy, which is estimated to be between 1 and 2. Once the restricted child number is larger than the threshold, even if the two-child policy is further relaxed, it will exert little influence on fertility choice. This result can explain why the birth rate has not risen to meet expectations. Therefore, even if future fertility policy is liberalized to a three-child policy, the impact will not be substantial. Thus, other steps need to be taken to improve the birth rate, particularly child-raising costs cutting measures.

The remainder of the paper proceeds as follows: Section 2 reviews the existing literatures and points out the contributions of this study; Section 3 follows with the theoretical analysis; then, we give an empirical analysis using the CLDS data to study the factors influencing fertility choice in Section 4; Section 5 further explores the effectiveness of the current fertility policy and puts forward the corresponding policy recommendations; we conclude in the last part.

# 2 Literature Review

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Through the above research, we find that the vast majority of studies in China is descriptive statistics and empirical test using survey data of each province. Some of them may lack of theoretical analysis of the core reasons of these phenomenon we mentioned above. In addition, there are few investigations on China's population policy from the perspective of the impact of absolute income on fertility. In this respect, Li (2016) analyzes the relationship between income and fertility from a macroscopic point of view and applies panel data vector autoregressive model to find that the effect of income on fertility has the characteristics of the U-shaped curve from a time series perspective. However, it does not take into account the theoretical basis of the family's internal economic decision-making behavior and the relationship between the income structure of men and women within the family. So, what are the micro-foundation and the internal mechanism of the linkages between fertility and the labor market? This paper modifies and expands the theoretical model of Galor & Weil (1996), starting from the economic decision-making behavior of the family and making it fitted with China's specific population policy to explore the factors affecting the fertility, so as to provide recommendations for China's fertility policy.

# 3 Theoretical Model

## 3.1 Model Setup

Here we build up a three-period overlapping generation model by taking the inherent mechanism of fertility choice into account. The economic system consists of representative families, and the model are divided into three stages. In the first stage $(t-1)$, people are children and consume a fixed quantity of time and necessities from their parents; in the second stage $(t)$, people in the first stage grow up, and supply labor to earn a wage and raise their own child. Notably, there is a restriction on the number of children parents can raise because of the special policy in China. If the number of the children exceeds the limit, there will be a penalty imposed on the family. At this stage, people do not consume for themselves. The utility comes from the number of children. The more a family prefer children, the more utility children can bring to the whole family; in the third stage $(t+1)$, people consume from the last period of savings, and from which to obtain utility.

We assume that the number of children at $t$ is $n_t$, and that the quantity of consumption at $t+1$ is $c_{t+1}$. Let $\beta$ be the degree of altruism. The model is represented by a representative family, and a family consists of a couple whose goal is to maximize the utility of a family. At time $t$ a family's utility function can be expressed as

$$U_t = \max_{n_t, c_{t+1}} \beta ln n_t + (1-\beta) ln c_{t+1}. \tag{1}$$

Households face certain constraints, which are the budget constraints and time constraints. Assume that the source of labor incomes from a representative family is divided into two parts, physical labor incomes, and mental labor incomes. It is generally considered that men are more qualified than women in physical labor and that the difference between men and women in mental work is not too much. Accordingly, the income of men is higher than that of women. For the sake of simplicity, suppose that the income of men is $w_t^m$, and women's income is $w_t^w$, and suppose $w_t^m > w_t^w$. Therefore, the marginal cost of child raising for a female is lower than that for a male, so women raise children. Besides women's commitment to raising children, there are many other supporting ways to raise children, such as hiring nurse, sending their children to pre-school, or getting help from the children's grandparents. Assume the unit cost other means for raising one child is $w_t^b$. Assume that if the number of children exceeds the maximum number of children restricted by the government $i$, a certain amount of penalty $p$ is required. If the number of children is less than $i$, then the same amount of government subsidies can be attained.

At the same time, the family also faces certain time constraints. Assume that the proportion of the time required for a woman to support a child of the person's lifetime is $z$ and the number of children is $n_t$. The total proportion for children raising is $zn_t$.

Assume that the upper bound of the proportion is $\bar{z}$. Assume that a family buys $b$ units other supporting ways to raise children for each child,such as child care services, nursing services, and then the expenditure for it is $bn_t w_t^b$. Then we can get when $b \to \infty$, $z \to 0$; when $b \to 0$, $z \to \bar{z}$. $z$ and $b$ has a negative relationship. The function $b = -ln(z/\bar{z})$ will depict such a relationship without loss any generality. Thus, a family's budget constraint at time $t$ can be expressed as

$$zn_t w_t^w - ln(z/\bar{z})n_t w_t^b + s_t + (n_t - i)p = w_t^w + w_t^m. \tag{2}$$

Savings $s_t$ at time $t$ can be transformed to consumption $c_{t+1}$ at time $t+1$. Thus we have

$$c_{t+1} = s_t(1 + r_t). \tag{3}$$

In addition, the total time proportion of a woman's life is assumed to be 1. Thus we have

$$0 \leq zn_t \leq 1. \tag{4}$$

The notations are summarized in Table 1.

[Insert Table 1]

## 3.2 Model Analysis

By solving the above equation, $z^*$ and the optimal $n_t^*$ can be obtained as

$$z^* = \frac{w_t^b}{w_t^w}, n_t^* = \frac{\beta(ip + w_t^b + w_t^m)}{p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z})}, \tag{5}$$

where $n_t^*$ can be interpreted as the willingness of fertility, the larger $n_t^*$ is , the more willingness will be. Since $0 \leq zn_t \leq 1$ , we have to discuss the range of values for the parameter to determine the optimal $n_t^*$. When

$$\frac{\beta(ip + w_t^b + w_t^m)}{p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z})} \geq \frac{1}{z^*}, \tag{6}$$

the optimal $n_t^*$ is the corner solution. When

$$\frac{\beta(ip + w_t^b + w_t^m)}{p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z})} \leq \frac{1}{z^*}, \tag{7}$$

the optimal $n_t^*$ is the inner solution.

## 3.3 Comparative Statics

In this part, we show the impacts of parameter changes on the optimal solution $n_t^*$.

First, we discuss the relationship between $n_t^*$ with female income and male income. Take the first order derivative of $n_t^*$ w.r.t. $w_t^w$, we have

$$\frac{\partial n_t^*}{\partial w_t^w} = -\frac{\beta(ipw_t^b + w_t^m w_t^b - pw_t^m + w_t^w w_t^b ln(w_t^b/w_t^w \bar{z}))}{w_t^w(p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z}))^2}. \tag{8}$$

When $w_t^w \to 0$, the first order condition is less than zero; when $w_t^w \to \infty$, the first order condition is greater than zero. Also,

$$\frac{\partial^2 n_t^*}{\partial w_t^{w2}} = \frac{\beta w_t^b(ip(p + 3w_t^b) + pw_t^m + 3w_t^m w_t^b - pw_t^w + w_t^b w_t^w - w_t^b(ip + w_t^m - w_t^w)ln(w_t^b/w_t^w \bar{z}))}{w_t^{w2}(p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z}))^3} > 0.^2 \tag{9}$$

Thus we can conclude that the relationship between $n_t^*$ and $w_t^w$ is a U-shaped relationship.

Take the first order derivative of $n_t^*$ w.r.t. $w_t^m$ ,we have

$$\frac{\partial n_t^*}{\partial w_t^m} = \frac{\beta}{p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z})} > 0. \tag{10}$$

According to (8), (9), (10) and Appendix A, we have

**Proposition 1** *In this model, the relationship between $n_t^*$ and female income is U-shaped.*

That is to say, before reaching a certain critical point, the higher the female income, the less the willingness of fertility. After reaching the critical point, the higher the female income, the more the willingness of fertility.

**Proposition 2** *The male income is positive correlated with $n_t^*$.*

Take the first order derivative of $n_t^*$ w.r.t. $\beta$,

$$\frac{\partial n_t^*}{\partial \beta} = \frac{ip + w_t^m + w_t^w}{p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z})} > 0. \tag{11}$$

According to (11), we have

**Proposition 3** *The relationship between $n_t^*$ and the degree of altruism is positive.*

Take the first order derivative of $n_t^*$ w.r.t. $p$,

$$\frac{\partial n_t^*}{\partial p} = -\frac{\beta(-iw_t^b + w_t^m + w_t^w + iw_t^b ln(w_t^b/w_t^w \bar{z})}{w_t^w(p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z}))^2} < 0.^3 \tag{12}$$

Take the first order derivative of $n_t^*$ w.r.t. $w_t^b$,

$$\frac{\partial n_t^*}{\partial w_t^b} = \frac{\beta(ip + w_t^m + w_t^w)ln(w_t^b/w_t^w \bar{z})}{(p + w_t^b - w_t^b ln(w_t^b/w_t^w \bar{z}))^2} < 0. \tag{13}$$

[2]Please find the proof in the Appendix A

[3]Please find the proof in the Appendix B

According to (12), (13) and Appendix 2, we have

**Proposition 4** *The relationship between the optimal number of children and the force of penalty, as well as the price of other supporting ways for raising children is negative.*

Table 2 summarizes the conclusions above.

[Insert Table 2]

# 4 Empirical Study

## 4.1 Data Resource and Sample Selection

The data source used in this paper is the China Labor-force Dynamics Survey (CLDS), which is a special survey of Chinese social science survey platform. It conducts a follow-up survey on the families and labor individuals of urban and rural areas in China. The study sample was the data collected from the family and individual questionnaires in the year 2014, which did not fully liberalize the two-child policy at the time of implementation. Since the specific information of the spouse can not be informed by the individual's questionnaires, we merged the family and individual questionnaires so that each of the female-related data is paired with the data of their spouse. When we get the specific information of women, we can get specific information about their spouse. Since some of the samples in the questionnaire had missing and extreme values, 1228 pairs of husband and wife were eventually obtained after deleting the samples with missing and extreme values.

## 4.2 Hypothesizes and Variables

According to the theoretical results and propositions 1 to 4, we propose the following hypotheses to be tested.

**Hypothesis 1** *After fully liberalizing the one-child policy to the universal two-child policy, keep the other factors unchanged, the relationship between the two-child fertility choice and the current amount of female income is U-shaped.*

**Hypothesis 2** *After fully liberalizing the one-child policy to the universal two-child policy, keep the other factors unchanged, the relationship between the two-child fertility choice and the current amount of male income is positive.*

**Hypothesis 3** *After fully liberalizing the one-child policy to the universal two-child policy, keep the other factors unchanged, the relationship between the two-child fertility choice and the family's ideal children number is positive.*

Family's ideal children number is related to the degree of altruism. If one values more to their children, the more likely they want to give birth to a baby. If there is no policy restriction on family planning, the higher the number of ideal children in a family, the more likely it is that the family has a higher degree of altruism. Since there is no data directly reveal the degree of altruism, thus we use the ideal children number which can be obtained from our database as the proxy variable for that preference.

**Hypothesis 4** *After fully liberalizing the one-child policy to the universal two-child policy, keep the other factors unchanged, the relationship between the two-child fertility choice and the price of child care service and other ways to raise a child is negative.*

Because we cannot attain the price of child care service for each family, we use the average wage of domestic service in each province in the year 2014 instead. Taking into account the different levels of economic development in different provinces, so we standardize the the average wage of domestic service by dividing the per capita income and using it as the price of domestic service.

Table 3 shows the variables and the related meanings.

[Insert Table 3]

## 4.3 Empirical Model

Before empirical research, we need to select the appropriate econometric method. Because the dependent variable is a binary variable, we use the Logit model. In addition, since the data is cross-sectional, so there may be heteroskedastic problems. Thus we use heteroskedasticity-consistent standard error estimators for empirical testing.

Further, we need to consider the endogenous problems that may exist in important variables.

First of all, we consider whether there is an endogenous problem in the two-child fertility choice and income. The first reason is that the higher the level of education of women, the higher the income of women, and the lower the possibility of giving birth to the second child. The second reason is that the higher the level of health of women, the higher the income of women, and the higher the possibility of giving birth to a second child. Therefore, we add to women's education level and health level as control variables in the model to control the possible endogenous problems.

Second, taking into account the female and male income and fertility decision-making may have a reverse causal relationship. That is, for the sake of childbearing and raising more children, parents will be encouraged to increase their efforts to make money. There is no variable in the database that directly reflects the efforts of making money. Because the number of professional and technical qualifications for the past three years in the data is positively related to the degree of efforts to make money, so we use this variable to

substitute parent's working efforts to raise more children for childbearing. By controlling this variable, we can measure the degree of voluntarily extra effort made by parents for raising more children, and thus solve this endogenous problem caused by this reverse causality.

At last, when we use ideal children number as a symbol of the preferences of parents, because of the Chinese family "patriarchal" ideas, ideal children number will be affected by the idea of this concept, and this concept also will affect the two children fertility decision. The reason is that if the first child is a daughter, the ideal children number and the possibility of giving birth to the second child will both rise. Thus using a family's ideal girl number as an instrumental variable for ideal children number can alleviate the endogenous problem causes by patriarchal thoughts. In addition, family planning policies and life ideas are different in rural and urban areas. During the family planning period, rural areas can give birth to two children without a fine. So when the universal two-child policy is implemented, there will be differences between rural and urban areas. Based on similar considerations, due to differences in regional cultural differences and economic development levels in eastern, central and western China, we add dummy variables such as rural and urban areas, eastern, central and western regions to the regression model.

In order to test Hypothesis 1, Hypothesis 2 and Hypothesis 3, we use Model 1 and Model 2, which is illustrated below as Equations (14) and (15).

**Model 1**

$$twochild = \alpha + \gamma_1 i\_w + \gamma_2 i\_m + \gamma_3 i\_w^2 + \sum \gamma_i controls + \varepsilon. \tag{14}$$

**Model 2**

$$twochild = \alpha + \gamma_1 i\_w + \gamma_2 i\_m + \gamma_3 i\_w^2 + \gamma_4 i\_girl + \sum \gamma_i controls + \varepsilon, \tag{15}$$

where *controls* are *Dcity*, *health*, *education*, *Dwest* and *Deast*. They are exactly the same with the models below.

In order to test whether the type of the residence will exert an influence on the marginal impact generated from income on the decision of the two-child fertility, we use Model 3, which is shown in Equation (16).

**Model 3**

$$twochild = \alpha + (\gamma_{11} + \gamma_{12} Dcity) i\_w + (\gamma_{21} + \gamma_{22} Dcity) i\_m + \gamma_3 i\_girl + \sum \gamma_i controls + \varepsilon. \tag{16}$$

In order to test whether there is a U-shaped relationship between male income and two-child fertility decision, we use Model 4, which is shown in Equation (17).

**Model 4**

$$twochild = \alpha + \gamma_1 i\_w + \gamma_2 i\_m + \gamma_3 i\_w^2 + \gamma_4 i\_girl + \gamma_5 i\_m^2 + \sum \gamma_i controls + \varepsilon. \quad (17)$$

For the sake of the reverse causal relationship between the female and male income and fertility decision-making we mentioned above, we add $certificate\_w$ and $certificate\_m$ to control variables in order to solve the problem. The regression model is the same with Equation (15) and we name it **Model 5**. In order to verify whether Hypothesis 4 is true or not, we use Model 6, which is illustrated below as Equation (18).

**Model 6.**

$$twochild = \alpha + \gamma_1 i\_w + \gamma_2 i\_m + \gamma_3 i\_w^2 + \gamma_4 i\_girl + \gamma_5 p\_other + \sum \gamma_i controls + \varepsilon. \quad (18)$$

**Model 7** and **Model 8** are for robustness test. The sample we used in Model 1 to Model 6 are women who work now. We enlarge our sample to include women who don't work in Model 7. The sample of Model 8 excludes the women who are not in the fertility age.

## 4.4 Data Description

The following is descriptive statistical results of the variables in the study sample applying the CLDS database. The proportion of women in the urban area accounts for 45.75%, basically the same as the rural proportion. According to the province where the family is located, the data are grouped into eastern, western and central regions, with the largest sample in the eastern region accounting for 48.29%. According to whether the women are in the stage of childbearing age, the sample is divided into two groups, one for women between 20 and 49 years of age, the other group of 50 and over 50 women.[4] According to the number of women working days per month, the sample is divided into two groups, one for women with zero working days and the other for women whose working days are greater than zero. The following is a descriptive statistic of the processed samples (as shown in Table 4).

[Insert Table 4]

Table 5 illustrates the basic information about the two-child fertility choice and other related variables. If the universal two-child policy was implemented, about 22.44% families want to have two children. Only from the numerical point of view, we can not make a clear judgment, thus we need to carry out empirical tests. Moreover, the average annual

[4]In theory, women of childbearing age generally refers to women in the 15 to 49 years of age. In practice, women's marriage age is 20 years old. In this paper, the youngest female in the sample is 21 years old, so this paper uses the age of 20 to 49 years for the women's childbearing age as a basis for grouping.

income of men is higher than that of women, which is in line with the basic assumptions of this paper.

[Insert Table 5]

### 4.5 Empirical Results

The results of the Logit regressions are shown in Table 6.

[Insert Table 6]

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## 5 Further Analysis and Policy Considerations

Recall that when the optimal solution of the model is the internal solution, the corresponding situation is the fertility choice made by the female who is still involved in the work. While this section discusses the relevant conclusions and policy analysis when the model takes the corner solution. From the above model analysis, we find that when a certain threshold $i^*$is reached, even if the restricted value of the childbearing policy $i$ increases, it does not lead to the increase in $n_t^*$. when

$$\frac{\beta(ip + w_t^b + w_t^m)}{p + w_t^b - w_t^b ln(w_t^b / w_t^w \bar{z})} \leq \frac{1}{z^*}, \tag{19}$$

$n_t^*$ is the inner solution. Then we have Proposition 5:

**Proposition 5** *When the threshold of fertility policy $i^*$ is met $i - 1 \leq i_t^* \leq i$, it means that the fertility will be positively promoted when the fertility policy released from $i - 1$ to $i$. However, when the fertility policy released from $i$ to $i + 1$ , since the fertility policy has been reached to the threshold, then the policy will not have a significant impact on fertility.*

In this model, the implication of reaching the corner solution is that the female members of a family have used all their time for raising children. That is to say that she will not be involved in work. The corresponding value of the threshold of fertility policy $i^*$ is the number of children chosen by the women who have already given up their work for bearing and raising children. By examining the number of ideal children in women who are not working at the age of childbearing from the CLDS database, the approximate values can be derived. We find that the average number of ideal children is 1.94 (as shown in Table 7).

[Insert Table 7]

The mean value illustrates the basic information of the women's ideal children number. Although the specific situation to each family is different, the average is still a good

measure of policy standards. Based on these analyses, we can say that there exists a threshold of the fertility policy, which is estimated to be between 1 and 2. Once the restricted child number is larger than the threshold, even if the two-child policy is further relaxed, it will exert little influence on fertility choice. This result can explain why the birth rate has not risen to meet expectations in China. Therefore, even if future fertility policy is liberalized to a three-child policy, the impact will not be substantial. Thus, other steps should be taken to improve the birth rate.

Based on the theoretical analysis and empirical test, this paper argues that the relevant policy suggestions can be put forward from the following aspects.

First of all, according to the above analysis about the relationship between fertility choice and family income, as well as the cost of raising children, we should shift the policy focus to reducing the cost of childbearing and raising children as soon as possible, such as the grant of maternity allowance, which is the policy measures adopted by many developed countries. Another way is to reduce the cost of socialized childcare services, such as the reduction of kindergarten admission costs, or nanny related costs, in order to exert a positive impact on fertility.

In addition, there is a positive relationship between male income and two-child fertility choice, and a U-shaped relationship between female income and two-child fertility choice. Taking into account the current wage gap between men and women in China, further widening the wage difference between men and women may lead to more other social issues. Thus we do not recommend policy orientation to further increase male wage income or to widen the difference between men and women's wages. At the same time, it also means that if we simply rely on the increase in family income subsidy policy, the effect may be unsatisfactory. However, we should also reduce the opportunity cost of women, especially the time cost of the relevant policies.

Finally, through the above analysis, we see that fertility will have a clear negative correlation with "altruistic" behaviors. Therefore, we need to understand young couple's ideas and attitudes towards life. "Altruistic" behaviors reflect the trade-offs between raising children and spending for their own, and nowadays, more and more young people, with the development of the times, are increasingly changing towards the concept of life and family, and the current consumption and timely music for them are more and more tempting, which is a cause for the low fertility. Therefore the need to strengthen advocacy of positive fertility culture, fundamentally affect their ideas, is very necessary. Correspondingly, to achieve this goal, there is still a long way to go.

# 6 Conclusion

This paper establishes an overlapping generation model for the economic decision-making behavior of micro-families. The main factors influencing fertility decisions are obtained

from the theoretical point of view, and it is demonstrated that the income structure within a family, preferences of altruism, child care service prices, and policy penalties have an impact on fertility choice. Then, through the empirical study with CLDS database, the relevant conclusions in the theoretical model are verified: the income structure of a family affects fertility choice, and there is a significant U-shaped correlation between female income and the two-child fertility choice, and the relationship between male income and the two-child fertility choice is positively correlated. There are also some other factors that exert explicit influence on fertility choices, such as the degree of altruism and the opportunity cost of raising children. Finally, in terms of policy analysis, the analysis of the effectiveness of the current universal two-child policy suggests that the threshold of fertility policy is between 1 and 2. So even if future fertility policy is liberalized to a three-child policy, the impact will not be substantial. Combining the relevant conclusions of this paper on fertility factors, related policies should start as soon as possible from other aspects, especially to reduce childbearing costs, in terms of female costs in order to influence fertility rates, such as reducing the cost of admission to kindergartens or nanny fees, birth special subsidies, extending the number of hours taught by the school.

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# Appendix A

Proof of Proposition 1:

$$\frac{\beta w_t^b(ip(p+3w_t^b)+pw_t^m+3w_t^m w_t^b-pw_t^w+w_t^b w_t^w-w_t^b(ip+w_t^m-w_t^w)ln(w_t^b/w_t^w\bar{z}))}{w_t^{w2}(p+w_t^b-w_t^b ln(w_t^b/w_t^w\bar{z}))^3}>0.$$

Because $0 \leq z \leq \bar{z} \leq 1$ and $z^* = \frac{w_t^b}{w_t^m}$, then we have $ln(w_t^b/w_t^w\bar{z}) < 0$. Because $w_t^w - w_t^w > 0$, thus the denominator and the nominator are both positive. ■

# Appendix B

Proof of Proposition 3:

$$-\frac{\beta(-iw_t^b+w_t^m+w_t^w+iw_t^b ln(w_t^b/w_t^w\bar{z})}{w_t^w(p+w_t^b-w_t^b ln(w_t^b/w_t^w\bar{z}))^2}<0.$$

That is to prove $w_t^m + w_t^w + iw_t^b(ln(w_t^b/w_t^w\bar{z}) - 1) > 0$. Because $w_t^m > w_t^w >> w_t^b$ and $0 \leq \bar{z} \leq 1$, so we have $w_t^w > lnw_t^w\bar{z}$ and $w_t^m > iw_t^b$. Then $w_t^w + w_t^m > lnw_t^w\bar{z} + iw_t^b$. ■

# Appendix C (Tables)

Table 1: **Summary of notations**

| Symbol | Explanation |
|---|---|
| $w_t^w$ | female income at time $t$; |
| $w_t^m$ | male income at time $t$; |
| $w_t^b$ | per unit price of other raising method at time $t$; |
| $n_t$ | number of children at time $t$; |
| $z$ | the proportion of the time required for a women to support a child of her life; |
| $b$ | the total units of other rating ways used; |
| $\bar{z}$ | the upper bound of $z$; |
| $p$ | penalty for giving birth to more children than regulated; |
| $r_t$ | interest rate at time $t$; |
| $c_{t+1}$ | consumptions at time $t+1$; |
| $s_t$ | savings at time $t$; |
| $\beta$ | a parameter described the degree of altruism; |
| $i$ | the maximum number of children restricted by the government. |

Table 2: **Monotonicity**

| symbol | $\beta$ | $w_t^m$ | $w_t^w$ | $p$ | $w_t^m$ |
|---|---|---|---|---|---|
| $n_t^*$ | + | + | U-shaped | - | - |

Table 3: **Variables**

| Variable Type | Variable Symbol | Meanings(in the questionnaire) |
|---|---|---|
| Dependent variables | *twochild* | If the one-child policy was released to a two-child policy, whether or not want to have two child(1 represents yes, 0 represents no) |
| Independent variables | $i\_w$ | the total income earned by the female last year |
| | $i\_m$ | the total income earned by the male last year |
| | $i\_child$ | If you do not consider family planning, health and economic conditions, what is the ideal children number |
| | $i\_girl$ | If you do not consider family planning, health and economic conditions, what is the ideal girl number |
| | $i\_boy$ | If you do not consider family planning, health and economic conditions, what is the ideal boy number |
| | $p\_other$ | average wage of domestic service by province / average residence income by province |
| Control variables | *Dcity* | dummy variable of the residence of the woman(1 represents urban, 0 represents rural) |
| | *health* | the health level of the women |
| | *education* | the education level of the woman |
| | *Dwest* | dummy variable of the region of the woman(1 represents west, 0 represents other region) |
| | *Deast* | dummy variable of the region of the woman(1 represents east, 0 represents other region) |
| | $Certificate\_w$ | the number of professional and technical qualifications for the past three years of the woman |
| | $Certificate\_m$ | the number of professional and technical qualifications for the past three years of the man |

Table 4: **Descriptive statistics**

| Variable name | Specific Categorization | Proportion |
|---|---|---|
| residence | urban | 45.75% |
| | rural | 54.25% |
| Province | east | 48.29% |
| | mid | 22.09% |
| | west | 29.62% |
| age | 20-49 | 75.81% |
| | above 49 | 24.19% |
| work | don't work | 7.07% |
| | work | 92.73% |

Table 5: **Descriptive statistics 2**

| Variable name | Mean | Std. Deviation | Min | Max |
|---|---|---|---|---|
| $twochild$ | 0.2244 | 0.4173 | 0 | 1 |
| $i\_girl$ | 0.8922 | 0.4736 | 0 | 4 |
| $i\_w$ | 30202.62 | 33915.57 | 0 | 400000 |
| $i\_m$ | 42603.58 | 41166.43 | 0 | 600000 |
| $health$ [5] | 3.8799 | 0.8809 | 1 | 5 |
| $education$ [6] | 7.4619 | 2.7859 | 1 | 11 |
| $certificate\_w$ | 0.2603 | 0.6641 | 0 | 7 |
| $certificate\_m$ | 0.3723 | 0.8108 | 0 | 6 |

[5]The questionnaire on the topic of health level is "What do you think of your health?" The answer is divided into five grades, where the number 5 represents very healthy and the number 1 represents very unhealthy.

[6]The questionnaire on the topic of the education level is "What is your highest education?", the answer is divided 11 levels, where the number 1 represents the doctoral degree, the number 11 represents not going to school.

Table 6: **Empirical Results**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| *i_w* | -14.3e-6*** | -16.0e-6*** | -10.3e-6** | -16.3e-6*** | -17.0e-6*** | -15.7e-6*** | -17.4e-6*** | -17.0e-6*** |
| | (4.94e-6) | (5.14e-6) | (4.94e-6) | (5.56e-6) | (5.22e-6) | (5.18e-6) | (5.10e-6) | (5.17e-6) |
| *i_m* | 4.15e-6** | 4.09e-6** | 2.59e-6 | 4.64e-6 | -3.95e-6*** | -4.18e-6** | 3.86e-6** | 3.30e-6* |
| | (1.84e-6) | (1.90e-6) | (2.28e-6) | (3.70e-6) | (1.93e-6) | (1.90e-6) | (1.80e-6) | (1.85e-6) |
| *i_w_sq.* | 2.98e-11* | 3.20e-11* | | 3.29e-11* | 3.74e-11** | 3.18e-11* | 3.20e-11 | 3.82e-11** |
| | (1.80e-11) | (1.92e-11) | | (1.98e-11) | (1.84e-11) | (1.79e-11) | (2.06e-11) | (1.73e-11) |
| *i_girl* | | 1.122*** | 1.114*** | 1.122*** | 1.093*** | 1.076*** | 1.169*** | 1.070*** |
| | | (0.171) | (0.169) | (0.171) | (0.169) | 0.172 | 0.166 | 0.188 |
| $Dcity * i\_w$ | | | -8.46e-07 | | | | | -0.932*** |
| | | | (6.70e-06) | | | | | (0.227) |
| $Dcity * i\_m$ | | | 2.60e-06 | | | | | |
| | | | (3.64e-06) | | | | | |
| *i_m_sq.* | | | | -1.74e-12 | | | | |
| | | | | (8.11e-12) | | | | |
| *Dcity* | -0.988*** | -0.994*** | -1.088*** | -0.996*** | -1.049*** | -1.070*** | -1.014*** | -0.932*** |
| | (0.205) | (0.210) | (0.296) | (0.210) | (0.216) | (0.212) | (0.202) | (0.227) |
| *health* | -0.0346 | 0.0157 | 0.0169 | 0.0155 | 0.0321 | 0.0707 | 0.0291 | -0.0232 |
| | (0.0857) | (0.0878) | (0.0880) | (0.0878) | (0.0883) | (0.0874) | (0.0831) | (0.100) |
| *education* | -0.167*** | -0.181*** | -0.171*** | -0.181*** | -0.153*** | -0.145*** | -0.195*** | -0.167*** |
| | (0.0387) | (0.0400) | (0.0395) | (0.0401) | (0.0416) | (0.0413) | (0.0386) | (0.0425) |
| *Dwest* | 0.696*** | 0.661*** | 0.671*** | 0.661*** | 0.668*** | | 0.626*** | 0.582** |
| | (0.231) | (0.241) | (0.242) | (0.241) | (0.241) | | (0.223) | (0.257) |
| *Deast* | 0.837*** | 0.875*** | 0.871*** | 0.874*** | 0.860*** | | 0.876*** | 0.630*** |
| | (0.214) | (0.225) | (0.225) | (0.225) | (0.225) | | (0.206) | (0.241) |
| *certificate_w* | | | | | 0.182 | 0.185 | | |
| | | | | | (0.117) | (0.114) | | |
| *certificate_m* | | | | | 0.128 | 0.128 | | |
| | | | | | (0.0921) | (0.0921) | | |
| *p_other* | | | | | | -546* | | |
| | | | | | | (0.326) | | |
| intercept | 0.0861 | -1.027* | -1.150** | -1.037* | -1.325** | -0.146 | -0.896* | -0.644 |
| | (0.535) | (0.562) | (0.561) | (0.567) | (0.571) | (0.693) | (0.532) | (0.603) |
| sample size | 1141 | 1141 | 1141 | 1141 | 1135 | 1135 | 1228 | 865 |

Note:The coefficients with *** are significant at the 1% confidence level; with ** are significant at the 5% confidence level; with * are significant at the 10% confidence level.

Table 7: **Ideal children number**

| Ideal Children Number | 0 | 1 | 2 | 3 | 4 | mean |
|---|---|---|---|---|---|---|
| Percentage | 1.47% | 12.32% | 78.30% | 6.45% | 1.47% | 1.94 |