

Study on the Problem of Low Fertility in Contemporary Society based on the Results of the Seventh Population Census

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Abstract

General Secretary Xi Jinping proposed: "Actively respond to the aging of the population, and build a policy system and social environment for the elderly, filial piety and respect for the elderly." The low birthrate and aging caused by low fertility rate have become common problems faced by countries around the world. In November 2020, the results of the seventh national population census were released. Based on the results of the seventh population census and the data released by the leading group of the seventh population census, this project aims at the low fertility rate reflected in the data, relies on the hot big data technology in the current era to analyze the reasons, combines online data literature review and offline questionnaire survey, investigates its formation process, and the possible subsequent impact.

Keywords

The Seventh Population Census; Low Fertility; Women's Will; Regression Analysis.

1. Introduction

At 10 a.m. on May 11, 2021, the Information Office of the State Council held a press conference to introduce the main data results of the seventh national census. The data show that the total fertility rate of women of childbearing age in China in 2020 is 1.3, which is already at a low level. This is mainly due to the continuous decline in the number of women of childbearing age and the gradual weakening of the "two-child" effect. From the perspective of 2020, the new crown pneumonia epidemic has increased the uncertainty of life and worries about hospital delivery, and further reduced residents' willingness to have children. Low fertility has become a common problem faced by most developed countries and will become a real problem faced by China. Therefore, we need to study the problem of low fertility in contemporary society.

2. Analysis of the Current Situation and Causes of the Problem of Low Fertility in Contemporary Society

2.1. Current Situation of Fertility in the Country

Data show that in 2020, China's new birth population will be about 12 million. That's down 18 percent from 2019 and 33 percent from 2016, when the second child was liberalized, making it the lowest year for new births and birth rates so far. The total fertility rate estimated by the basic data is 1.3, which is higher than the 1.22 in the fifth national population census in 2000 and 1.18 in the sixth national population census in 2010, but it is below 1.5 without exception, which is a very low fertility rate. Therefore, it is not difficult for us to draw a qualitative conclusion: in the 21st century, China has already appeared the phenomenon of "ultra-low fertility."

Table 1. Number of births in China in 1999to2018ten thousand people

Particular year	Number of births		Particular year	Number of births
1999	1909		2009	1615
2000	1771		2010	1592
2001	1702		2011	1604
2002	1647		2012	1635
2003	1599		2013	1640
2004	1593		2014	1687
2005	1617		2015	1655
2006	1584		2016	1786
2007	1594		2017	1723
2008	1608		2018	1523

Data source: Statistical Bulletin of National Economic and Social Development of the People's Republic of China,1999-2018.

2.2. Causal Analysis

In Western economics, there are already relatively mature theories about fertility. The microeconomic theory of fertility holds that children are also a commodity for parents, and when used, they also seek to maximize utility like other commodities. The willingness to have children is inversely proportional to the cost of raising children, and the price of the child commodity is determined by the net cost or net price of having children, which can be measured by the sum of the direct and opportunity costs of the parents to have children minus the balance of the expected income of the children for the parents. The following will be analyzed from the three factors that affect direct costs, opportunity costs, and expected revenues.

From the perspective of factors affecting direct costs, on the one hand, millions of college students graduate every year, reaching 8.2 million in 2018, and in the face of an increasingly competitive employment environment, people have to make more intellectual investment for their children to have better job opportunities in the future, resulting in an increase in the direct cost of raising children; On the other hand, in the current economic environment, parents also have to bear the pressure of some children to buy a car and a house, and the large number of children will have to bear more costs of parenting, affecting the willingness to have children.

From the perspective of factors affecting opportunity cost, under the popularization of the idea of gender equality, women have more employment opportunities due to the improvement of their education level, and the opportunity cost of raising children is higher, due to the conflict between childcare and work, the risk of women interrupting work increases, on the one hand, their costs and behaviors in the family affect the outcome of childbirth, on the other hand, their costs and behaviors in the labor market also affect the development and realization of labor production potential, and ultimately affect economic development and their status in the family. This affects fertility changes. At the same time, parents and family members will also lose more work or leisure time in order to raise more children.

In addition, there are various economic factors that directly or indirectly contribute to the decline in fertility. First, since the reform and opening up for forty years, people's living standards have been improving day by day, children are rich in nutrition, medical and health conditions are superior, and child mortality is low, which was 9.05 ‰ in 2017, compared with 10.20 ‰ in 2016, the risk of raising children is reduced, and the demand for children will also decrease; Second, with the development of society and urbanization, the mobility of labor has increased, and people have reduced trouble and children in order to adapt to this mobility; Third, although China's social security system has been established, but there are still

imperfections, people's willingness to have children is not enough, the preference for children is not enough, social security expenditure still needs to be improved.

Table 2. China's population change from 1990 to 2018 ten thousand people

Particular year	Total population	Annual population increase	Particular year	Total population	Annual population increase	Particular year	Total population	Annual population increase
1990	114333	1629	2000	126743	957	2010	134091	641
1991	115823	1490	2001	127627	884	2011	134735	644
1992	117171	1348	2002	128453	826	2012	135404	669
1993	118517	1346	2003	129227	774	2013	136072	668
1994	119850	1333	2004	129988	761	2014	136782	710
1995	121121	1271	2005	130756	768	2015	137462	680
1996	122389	1268	2006	131448	692	2016	138271	809
1997	123626	1237	2007	132129	681	2017	139008	737
1998	124761	1135	2008	132802	673	2018	139538	530
1999	125786	1025	2009	133450	648			

Data source: 1. China Statistical Yearbook 2018, compiled by the National Bureau of Statistics, China Statistics Press, 2018.

2. 2018 National Economic and Social Development Statistics Bulletin of the People's Republic of China

3. Empirical Analysis of Factors Influencing Fertility Level

3.1. Establishment of Multiple Linear Regression Models

Combining the factors affecting the fertility level, five indicators of per capita GDP, the proportion of GDP in the primary industry, the proportion of illiterate females in the population aged 15 and above, the number of urban and rural residents participating in social pension insurance at the end of the year, and the urbanization rate of 31 provinces (cities, autonomous regions, and municipalities directly under the central government) in 2015 were selected for the regression analysis of fertility rate. Here, the birth rate is selected as an indicator of fertility level.

The population birth rate was set as the dependent variable and the five influencing factors as the independent variables, and a multiple linear regression model was established.

$$Y = C + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + e \quad (1)$$

Y Indicates the population birth rate(‰)

x_1 Indicates per capita GDP (ten thousand yuan)

x_2 Indicates the proportion of GDP in the primary industry(%)

x_3 Indicates that illiterate women account for the proportion of the population aged 15 and over(%)

x_4 Indicates the number of people participating in the social endowment insurance for urban and rural residents at the end of the year (10,000 people)

x_5 Indicates the urbanization rate(%)

C is a constant term, $b_1 \sim b_5$ is the dependent variable. Regression coefficient of Y for the independent variable $X_1 \sim X_5$, e is the residual.

It can be seen by a scatterplot matrix (Figure 1) of five independent and dependent variables, Y is linearly correlated with x_1, x_2, x_3, x_5 , and has poor linear correlation with x_4 .

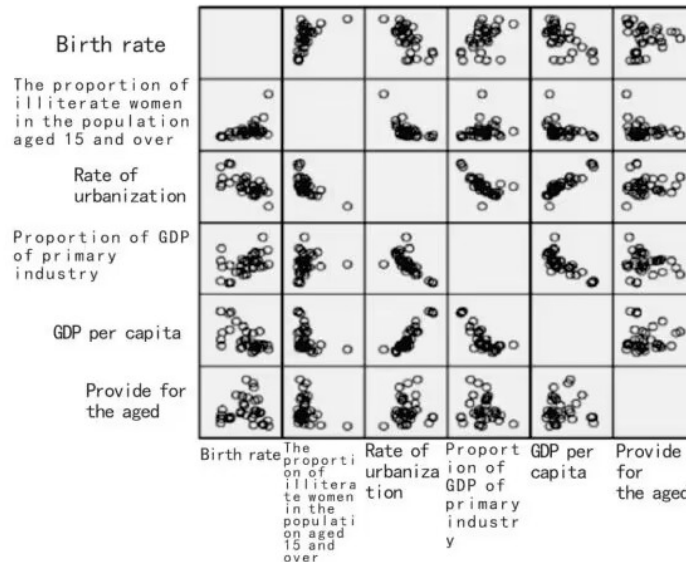


Figure 1. Scatter plot matrix

The P value of the partial F statistic is less than 0.05, and the introduced variable is statistically significant for stepwise regression discovery, and the model only retains the urbanization rate. Obviously, the proportion of GDP per capita, the proportion of GDP in the primary industry, and the proportion of illiterate women in the population aged 15 and over that should be statistically significant are excluded in the stepwise regression, and there is a suspicion of multicollinearity between the independent variables of the model. The multicollinearity test shows that the eigen root of the first principal component is 1.976, indicating a strong linear correlation between the independent variables. In order to eliminate the problem of model multicollinearity, this paper extracts the principal components from the combination of three variables: urbanization rate, per capita GDP and proportion of GDP of the primary industry, and regresses the principal components with the proportion of female illiterate population aged 15 and above, and the number of people participating in urban and rural residents' social pension insurance at the end of the year.

3.2. Principal Component Regression Model

3.2.1. Factor Analysis

The factors of three variables: per capita GDP, proportion of GDP of primary industry and urbanization rate were analyzed. As can be seen from Table 3, the KMO statistic is 0.676, close to 0.7, and the effect of factor analysis is better. Bartlett's sphericity test shows that the hypothesis of the independence of each variable is not valid, so the practicability test of factor analysis passes. As can be seen from Table 4, a common factor F is extracted from the results of factor analysis, and the variance contribution rate reaches 86.496%, which is sufficient to describe economic factors. According to the factor score coefficient matrix (see Table 5), the common factor is expressed as a linear form of the three indicators. The factor score function is:

$$F = 0.373ZX_1 - 0.339ZX_2 + 0.362ZX_5 \quad (2)$$

Among them, ZX₁, ZX₂ and ZX₅ are standardized per capita GDP, the proportion of primary industry GDP and urbanization rate, respectively.

Table 3. KMO and Bartlett's test

Kaiser-Meal-Olkin measurement of sampling adequacy	Bartlett's Sphericity Test		
	Approximate chi square	df	sig.
0.676	77.854	3	0.00

Table 4. Total variance of interpretation

Compostition	Initial characteristic value			Extract Square Sum Load		
	Total	Variance%	Accumulate%	Total	Variance%	Accumulate%
1	2.595	86.496	86.496	2.595	86.496	86.496
2	0.332	11.065	97.561			
3	0.073	2.439	100			
Extraction method: principal component analysis						

Table 5. Component score coefficient matrix

	Composition 1
Per capital GDP	0.373
Proportion of GDP of primary industry	-0.339
Rate of urbanization	0.362
Extraction method: principal component analysis, composition score	

3.2.2. Regression Analysis

The least squares regression analysis of the dependent variable Y is performed on F, X₃ and X₄ to obtain a new model:

$$Y = 9.137 - 1.359F + 0.143X_3 \quad (3)$$

3.2.3. Analysis of Test Results

Table 6. Partial regression coefficient and t-test

Independent variable	Denormalization coefficient		t	Sig.
	B	Standard error		
C	9.137	0.985	9.274	0.000
X ₃	0.143	0.056	2.546	0.017
F	-1.359	0.440	-3.090	0.005
X ₄	0.000	0.000	1.090	0.285

The coefficient of determination R^2 of the model is 0.708, indicating that the model fits well, and most of the uncertainty of the dependent variable can be explained by the regression equation. The p-value of the F test of the regression model is $0.000 < 0.01$, indicating that the overall linear relationship between the dependent variable and the two independent variables is significant, and the model is statistically significant. Through the t test, we can clearly see that the P values of the non-standardized coefficients of the constants C and F and X_3 are less than 0.05, and the linear effect on the dependent variable is significant through the t test. X_4 fails the t-test and is removed from the model (Table 6).

According to the relationship of $X = ZX\sqrt{D_X} + \bar{X}$ reduction to the original variable, the final regression model obtained is:

$$Y = 11.55 - 0.22X_1 + 0.09X_2 + 0.143X_3 - 0.04X_5 \quad (4)$$

4. Thinking about the Results of Regression Analysis

Although the family planning policy restricts people's reproductive behavior at the institutional level, it effectively controls excessive population growth in the early stage of implementation, stabilizing the total fertility rate of women at about 1.6. However, from the perspective of the decline of fertility rates in developed countries and regional differences in national fertility levels, economic factors are the main and decisive factors affecting women's fertility levels. In areas with a high level of economic development, a relatively rapid urbanization process, active development of secondary and tertiary industries, and widespread compulsory education, the birth rate is low, and vice versa, the birth rate is often higher. The model results show that for every 10,000 yuan increase in per capita GDP, the birth rate decreases by 0.22 thousand points; for every 1% increase in the GDP ratio of the primary industry, the birth rate increases by 0.09 thousand points; for every 1% increase in the proportion of female illiterate population in the population aged 15 and above, the birth rate increases by 0.143 thousand points; and for every 1% increase in urbanization rate, the birth rate decreases by 0.04 thousand points. In fact, with the rapid social changes, the new way of life brought about by urbanization, the improvement of women's education level, and the change of fertility concept have long replaced the "executive order" and become the main decisive factors for "suppressing" the level of fertility. Especially in recent years, with the popularization of the Internet and the invasion of modern urban lifestyles, the people's willingness to have children has hovered at a low level, and the fertility rate of women has dropped sharply, and the economic and social factors that maintain low fertility levels have become more solidified.

5. Countermeasures and Suggestions

In order to encourage the smooth implementation of the two-child policy, here are a few comments for reference:

First of all, at the economic level, the establishment of a social compensation mechanism for the cost of "childbirth" and "childbirth" to reduce the heavy economic burden brought by the rapid rise in childcare costs to families, so that the implementation of the comprehensive two-child policy cannot be "lip service", from the perspective of residents' fertility level is lower than the willingness to give birth and lower than the replacement level, the transformation of future fertility policy from "suppression" to "encouragement" is very necessary and urgent.

Second, the state, society, and enterprises should regard the protection of women's rights and interests as an act that "flows moral blood". At the social level, blindly considering cost and economic benefits seems to improve the competitiveness of enterprises in a single cost in the short term, and in the long run, the blow to the sustainable development of enterprises and

social prosperity will be devastating.; At the cultural level, radically changing the social norm of the one-child family is the "normal family" model, and advocating that at least two children in a family is the path to sustainable human development.

Third, for the future pension system arrangement, cannot blindly promise, the low fertility rate that began to appear in the early 90s of the 20th century and continues to decline will undoubtedly shake or even destroy the foundation of the social security system in the future. Between raising government debt, lowering social security, and inflation, China chooses at least one of them. If today's young people are still immersed in the paradise of hedonism and consumerism, and do not bear the obligation of human reproduction, then the pension is definitely not a problem that can be solved by relying on the government and society. In this way, the continued turn of the birth policy is the meaning of the question.

6. Conclusion

Both families and nations should understand that future generations of mankind are the most precious resource. Population migration is a positive-sum game in the era of population growth, and it has evolved into a negative-sum game in the era of population reduction. Although China will maintain a relatively large population size in the future, the low birthrate and aging are irreversible, China cannot improve the population structure through foreign immigration like other countries, and large cities will become the hardest hit areas of the "low fertility trap" like other developed countries, and the impact of less than aging will be alleviated to a certain extent through population migration within the country. It's just that the attempts of governments around the world to encourage fertility and regulate the rational distribution of the population have generally failed. The experience of the Russian Far East and Japan's Hokkaido region shows that lower fertility and accelerated negative population growth promote each other, forming a vicious circle, and then falling into a "negative population growth trap". And our efforts are precisely to avoid that.

Acknowledgments

This work is an innovation and entrepreneurship project for college students in Anhui Province, project number: S202110378352.

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