New fertility changes and characteristics from the sixth population census in China *

WANG Guang-zhou, FU Chong-hui

(Institute of Population and Labor Economics of Chinese Academy of Social Sciences, Beijing, China; School of humanities and management, Guangdong Medical College, Dongguang, Guangdong, China)

【Abstract】

The release of the sixth population census has provided us with the authoritative information needed to quantitatively analyze the characteristics and changes regarding fertility in China in 2010. The themes of this paper include the fertility levels, fertility pattern, and the influential factors of the changes in fertility. It is revealed that with the fertility levels decreasing, structural factors (e.g., age structure and marital status) are becoming the determinative ones at present and in the future. Although the age-specific marital fertility rate has resulted in an increase of general fertility rate by 9.61% from 2000 to 2010, the age structure and marital status are more and more important among factors which resulted in the changes in fertility level. In the aspect of fertility pattern, the interval between first marriage and first childbearing is enlarging, and the parity is becoming lower. The findings are important to develop an appropriate understanding of its demographics and to scientifically plan and adjust the population policy.

【Key Words】The sixth population census; Fertility level; Fertility pattern; Influential factors

China is in the process of an unprecedented social transformation, and the reproductive behavior of its population is undergoing profound changes. China has conducted three decades of family planning policy. In particular, the one-child policy with regard to fertility has been in full effect. Furthermore, urbanization, higher levels of education and other social factors among women, and demographic factors (e.g., the age and marital status of child-bearing women) have all affected the current and future fertility of the Chinese population. With regard to the long-term maintenance of a low birth rate, knowledge concerning the characteristics and changes of the current levels, patterns, and factors regarding fertility in China are important to develop an appropriate understanding of its demographics and to scientifically plan and adjust the population policy. The release of the sixth population census has provided us with the authoritative information needed to answer these questions. Based on this census, the current paper explores the characteristics and changes regarding fertility among the Chinese population and its influential factors using quantitative and qualitative analyses.

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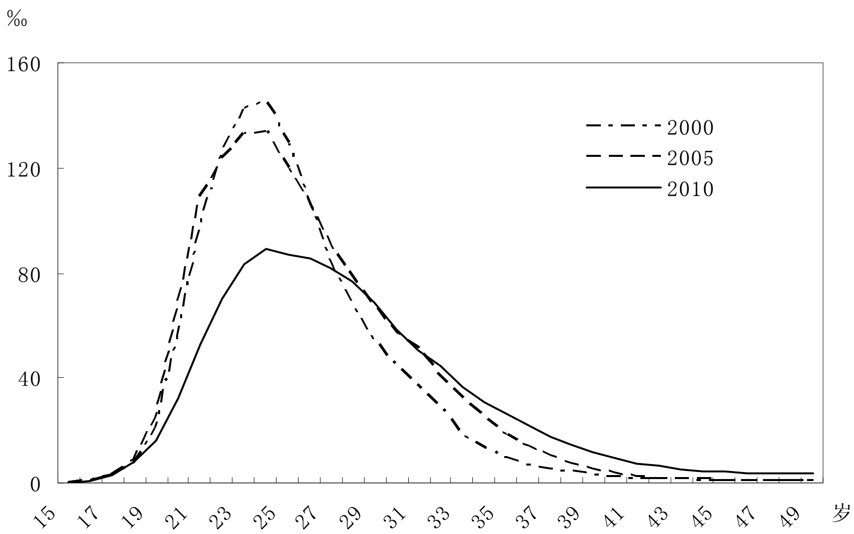
I. Fertility level analysis

(1) Crude birth rate and general fertility rate

The crude birth rate in 2010 was 9.36‰ in China, which was 0.14‰ lower compared with 2005. However, we cannot simply judge the extent of this decline only based on the crude birth rate because this statistic is also affected by the distribution of the population's age and sex structures as well as marital status. The general fertility rate excludes the effect of sex structure and some of the effect of age structure; therefore, it more precisely reflects the fertility level than the crude birth rate. These data show that the general fertility rate in 2010 was 33.31‰ in China, which was a decrease of 1.13‰ compared with 34.44‰ in 2005. Obviously, the denominator in the formula for the general fertility rate does not include males and non-childbearing-age women, thereby excluding the effect of the population not at risk. Thus, this statistic is less affected by the effect of age structure than the crude birth rate. As a result, the decline in the general fertility rate was larger than that of the crude birth rate.

(2) Age-specific fertility rate and parity-specific fertility rate

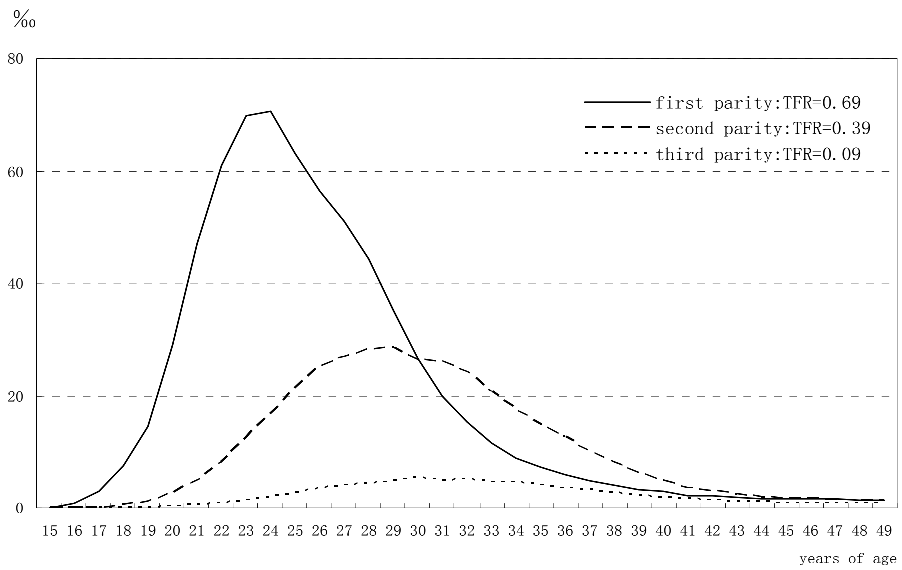


Data source: Calculated using the compiled population census data of 2000 and 2010 and the compiled data from the 1% population sampling survey in 2005.

Figure 1. A comparison of the age-specific fertility rates in China

Figure 1 shows that the peak of age-specific fertility was greatest in 2000, followed by 2005, and was lowest in 2010. The variance in age-specific fertility was the smallest and largest in 2000 and 2010, respectively. If the assumed cohorts are constructed according to the age-specific fertility rate in different years, childbearing-age women would completed their reproductive processes most quickly in 2000, and slowest in 2010. The differences in fertility patterns will ultimately affect the fertility level. Furthermore, because the number of children depends on the family planning policy, delayed childbirth denotes postponed childbearing, which leads to declines in the fertility levels for certain years[1-2].

The age-parity-specific fertility rate is the number of women of different childbearing ages who gave birth to their Nth child divided by the number of women within the respective age group. This indicator divided the age-specific fertility rate into different parity-specific fertility rates. Figure 2 shows that Chinese women typically had one child and that the age of these women corresponding to the maximum rate was approximately 24 years. However, more women older than 30 years gave birth to their second child than their first child. This result was due to two reasons. With the implementation of the "one-and-a half births" family planning policy, women who had a second child were generally approximately 30 years old. Moreover, we could not rule out the possibility that childbirth without permission was concentrated among women older than 30 years.



Data source: Compiled data of the sixth population census in 2010.

Figure 2. Age-parity-specific fertility rates in China (2010)

To more clearly illustrate the differences and characteristics of age-specific fertility, Brass's Gompertz relational fertility model was constructed to demonstrate the time course of childbirth and the change in the curve of the age-specific fertility rate. This model is able to establish the standard fertility patterns of the local region based on historical fertility data. In addition, by controlling parameters with clear demographic significance (e.g., total fertility rate or median age at childbirth), we can predict the age-specific fertility rate in the future. This prediction has a far-reaching significance for the population projections needed for a policy analysis.

Brass's Gompertz relational fertility model assumes that the ratio of the total fertility rate of women aged over the total fertility rate follows a Gompertz distribution:

$F(x)/TFR=\exp[A\times\exp(Bx)]$

where $F(x)=\sum_{y=15}^{x-1} f(y)$, and A and B are constants.

The standard age-specific cumulative fertility rate was $F_s(x)$. According to the Gompertz assumption, $F_s(x)$ is expressed as $F_s(x)/TFR_s=\exp(A\times\exp[Bx])$. The standard age-specific cumulative fertility rate is based on Brass's standard fertility pattern[3].

"Gompit" conversions of F(x) and Fs(x) were conducted, and the following formula was obtained:

$Y(F[x]/TFR)=(B/Bs)\times Y_s(F_s[x]/TFR_s)+\ln(-A)-(B/B_s)\ln(-A_s)$

$\alpha=\ln(-A)-(B/B_s)\ln(-A_s)$; $\beta=B/Bs$

The least squares method was used to estimate α and β values (see Table 1).

Table 1. Coefficients of Gompertz relational fertility model

	α	β
2000	-0.635	1.093
2005	-0.474	1.085
2010	-0.016	0.842

The significance of the α and β values is clear. α reflects the timing of childbearing. If α is less than 0, then the actual childbearing age of the population is older than that of a standard population. In 2000, 2005, and 2010, α was less than 0 in China, which suggests that the childbearing age during these years was older than that of the standard population, and it continued to increase over time. The β coefficient determines the degree of dispersion or concentration of the age-specific fertility pattern. If β is less than (greater than) 1, then the degree of dispersion of the fertility pattern of the actual population is greater (smaller) than that of the standard population, and the curve is also wider (narrower) than that of the standard population. With regard to the Chinese fertility pattern, only the β coefficient in 2010 was less than 1, and the degrees of dispersion for fertility in 2000 and 2005 were smaller than the standard population. These results suggest an overall trend of postponing childbearing, which is markedly different from the fertility patterns of Western countries in which childbearing starts late and ends early.

(3) Total fertility rate and lifetime fertility rate

The total fertility rate (TFR) refers to the average number of children to whom each woman will give birth, assuming that a specific cohort (usually a given year) of women continue the current fertility pattern and fertility level and no one dies.

The total fertility rate was 1.22 in 2000 and 1.18 in 2010, which marks a decrease of 0.04 over one decade. This decline was consistent with the information demonstrated by the figures of age-specific fertility rate. In 2010, the total fertility rate was 0.88 in cities, 1.15 in townships, and 1.44 in rural areas. The five regions with the lowest fertility rates were Beijing (0.71), Shanghai (0.74), Liaoning (0.74), Heilongjiang (0.75), and Jilin (0.76). The five regions with the highest fertility rates were Guangxi (1.79), Guizhou (1.75), Xinjiang (1.53), Hainan (1.51), and Anhui (1.48). The difference between the highest and lowest total fertility rates was more than twofold, which suggests that a significant regional imbalance exists in the fertility levels within China.

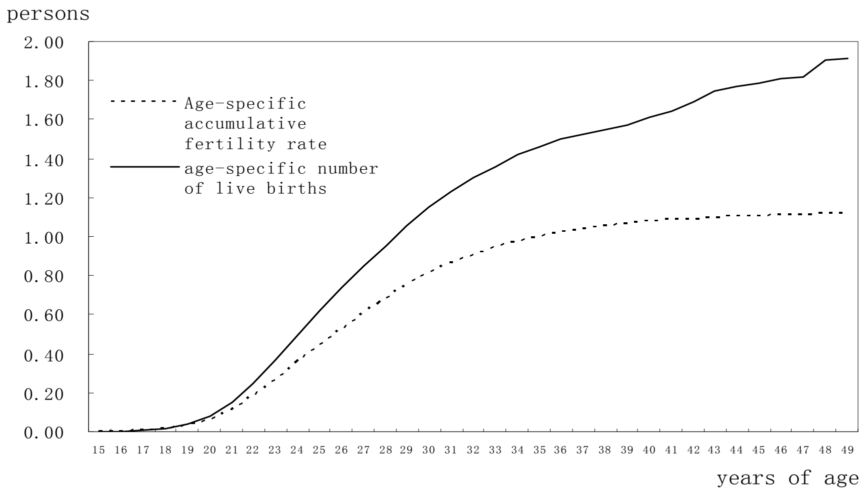
China's current total fertility rate reached a very low level in 2010. The 2010 *World Population Data Sheet* [4] showed that women gave birth to an average of 2.5 children worldwide, with 1.7 in developed countries, 2.7 in less developed countries, and 4.5 in the least developed countries. After the data of China were excluded, 3.1 children were born in less developed countries. China's total fertility rate is less than half of the world's average and much lower than the average level of developed countries.

However, does such a low fertility rate present the true picture of the situation in China? In fact, debates regarding China's fertility level have existed for a long time, especially after the 2000 census, because serious inconsistencies were found between the results of the National Population and Family Planning Commission and the survey results of the National Bureau of Statistics. Specifically, the total fertility rate of the 2000 census was 1.22; however, the National Population and Family Planning Commission as well as the Study of *National Population Development Strategy* believed the total fertility rate to be about 1.8. The total fertility rates from the surveys of the National Bureau of Statistics and the National Population and Family Planning Commission were between 1.4 and 1.6 thereafter; however, a gap remained between the level of TFR recognized by the National Population and Family Planning Commission and the actual survey results. The 2006 survey results of the National Population and Family Planning Commission was the only exception: This survey found the total fertility rate to be 1.87, which was close to the level consistently recognized by the National Population and Family Planning Commission.

Previous studies have found that the fertility level of rural childbearing-age women is consistently higher than that of their urban counterparts due to the dual urban-rural structure of China's family planning policy and regional differences in the process of fertility transition. The fertility level of childbearing-age women with primary (or below) education levels are higher than that of those with middle school (or higher) education levels. The 2000 census data showed that the total fertility rate of rural childbearing-age women was 1.43, and the total fertility rate of these women with primary (or below) education level was 1.49. Given that the proportion of urban citizens was greater than 45%, we can infer that the total fertility rate of childbearing-age women should be less than 1.43 from the 2000 national census. Furthermore, it was virtually impossible to have a total fertility rate higher than that of rural childbearing-age women (1.49) with primary (or below) education level. In addition, the 2010 census revealed that the total fertility rate of rural childbearing-age women was 1.44; based on these data, we conclude that the fertility rate of childbearing-age women in 2010 should be less than 1.44. Moreover, it was virtually impossible to have a total fertility rate higher than that of rural Chinese childbearing-age women with primary (or below) education levels (1.64 in 2010). In addition, the 2010 census data regarding age structure can be used to indirectly estimate the history of changes in the fertility level of childbearing-age women from 2000-2010. This estimation shows that the fertility rates in 2000, 2005, and 2010 were approximately 1.34, 1.43, and 1.29, respectively. In short, a conservative estimate based on the available data showed that the total fertility rate in 2010 should be less than

1.44, and the chance of it being higher than 1.64 is minimal [5].

Lifetime fertility rate refers to the average number of children to whom any one female age cohort gives birth. If all women strictly abide by the family planning policy, then lifetime fertility equals the fertility policy. Figure 3 shows that the curves of age-specific cumulative fertility rate and the number of live births for women under 20 were essentially coincident in 2010; however, the difference between these variables gradually widened for women older than 20, and the number of live births for 49-year-old women was 1.91 (this statistics is the lifetime fertility for 49-year-old women), whereas the total fertility rate was only 1.18 with a difference of more than 60%. If not all 49-year-old women were affected by the family planning policy①, then the lifetime fertility rate might be higher. However, the cohort of 45-year-old women spent their entire childbearing years under the family planning policy, and their lifetime fertility rate (1.79) remained higher than the total fertility rate in 2010 by more than 50% and higher than the policy fertility rate (1.47)[6] by nearly 22%. The lifetime fertility rate of 35-year-old women (1.46)② was closer to the policy fertility rate. If women who were single, without children, infertile, or who gave birth after 35 years old were ignored, then improvement was observed with regard to the implementation of China's family planning policy since the 1990s.



Data source: Calculated from the data of the sixth census in 2010.

Figure 3. A comparison of the age-specific cumulative fertility rate and the number of live births

Given the acceleration of the urbanization process, the continued increase in the floating population and the changes to the industrial structure of the population, the proportion of rural citizens continues to decline. Even if the current fertility policy remains unchanged, it will essentially continue to promote the decline in the overall fertility level of childbearing-age women due to changes in the composition of the population; in other words, the long-term effect of the current fertility policy is to promote a continued decline in the overall fertility level of childbearing-age women. Thus, even if the family planning policy remains unchanged, the overall

① China began to implement the family planning policy in 1980.
② This cohort of women entered their childbearing years in 1990.

fertility level of childbearing-age women will not stay at the current level [7].

II. Fertility pattern analysis

(1) Average age at childbearing

According to the fifth and sixth census, we calculated that the average age at childbearing was 28.18 in 2010 and 26.29 in 2000; thus, the average age at childbearing was postponed by 1.89 years. The logical explanation for the postponement of the average age at childbearing for Chinese women is that the average first-marriage age was also delayed, which not only postponed the average age at first childbearing but also affected their age at additional childbearing.

The comparison of the differences in the median, the first and third quartiles of parity-specific age at childbearing between 2000 and 2010 clearly shows that the inherent pattern of the postponement in average age at childbearing.

Table 2. The quartile comparison of the average age at childbearing in 2000 and 2010

	2010				2000			
	Overall	First parity	Second parity	Third parity	Overall	First parity	Second parity	Third parity
1st quartile	22.71	21.79	25.70	27.90	22.35	21.63	25.41	26.40
Median	26.00	24.04	29.14	32.01	24.65	23.52	28.05	29.26
3rd quartile	30.38	27.47	33.42	36.81	27.66	25.57	30.47	32.67
	Differences between 2010 and 2000							
1st quartile	0.37	0.16	0.30	1.51				
Median	1.35	0.52	1.09	2.75				
3rd quartile	2.71	1.89	2.95	4.14				

Data source: Calculated from the 2000 and 2010 population censuses.

Table 2 shows that the average age at first parity did not differ much between 2000 and 2010. The first quartile and median of the average age at childbearing were slightly postponed, whereas the third quartile of the average age at childbearing was postponed more; however, the extent of this postponement remained smaller than that of the average age at childbearing of the second or third parity. The average age at childbearing of the third parity was postponed most, and the postponement of the average age at childbearing of the first and third quartile differed by 2.63 years. Thus, the average age at the third parity was extended. Overall, the extent of postponement of the average age at childbearing was similar to that of the second parity, which suggests that the average age at childbearing was determined by the average age at the second parity in 2010.

(2) Birth interval

Birth interval refers to the difference in the average age at childbearing between the i and i+1 births. However, the compiled census data did not generally include the information needed to calculate birth interval. This paper used Ryder's method[8] to calculate the interval between the first marriage and the first birth. Using this method, only the average age at the first marriage, the average age at the first childbirth, and the parity progression ratio (a0) from 0 to 1 child were needed. The average ages at the first marriage and first childbirth were obtained using a simple calculation; however, the calculation of a0 required the raw census data. The raw data have not been released; therefore, we adopted the method of interval estimation to set a range for a0. Many studies have shown that a0 in China approximates 1[9-10]; thus, we assumed that a0 was 0.95-0.99 in 2010. The interval between the first marriage and the first birth was calculated as follows:

$$X_{i,1} - \bar{X}(1) = (\bar{X}_{i,1} - \bar{X})/a_i + \left[(1-a_i)(\bar{X}(2) - \bar{X}_{i,1})/a_i\right]$$

Where the left side of the formula represents the difference between the average ages of women with i+1 parity and those with i parity who would continue to give birth, which is the average birth interval to be estimated. If $a_i \approx 1$, then the second item on the right side of the formula was approximately 0. When i is set to 0, the result of the formula is the interval between the first marriage and the first birth.

The results of this calculation revealed that the interval between the first marriage and the first birth of Chinese childbearing-age women was 3.72-3.88 years in 2010, and this interval was 3.61 years in 2000. Thus, the interval between the first marriage and the first birth increased by 0.11-0.27 years over one decade. In addition to a0, birth interval was affected by whether the changes in the average first-marriage age and the average first-birth age were synchronized. The average first-marriage age in 2010 was 1.48 years later than in 2000, and the average first-birth age was postponed by 1.61 years, with a difference of 0.13 years. Therefore, the enlargement of the interval between the first marriage and first birth in China results from the more extent of postponement of the average first-birth age than that of the average first-marriage age. In theory, this change will contribute to the decline in fertility levels in the future.

(3) Parity distribution

As figure 4 showed, certain changes in parity distribution occurred between 2000 and 2010. First, the proportion of first parity changed from a steep decline in 2000 to a decline followed by an increase in 2010. Second, the balance between the proportions of first and second parity shifted from 28 years old in 2000 to 30 years old in 2010. This shift was primarily due to two effects: The postponement of the first parity inevitably led to the postponement of the second parity; a longer birth interval shifted the balance between the proportions of first and second parity to a later age. Third, the proportion of third parity declined. By 2010, the proportion of third parity was smaller than that of first and second parity for all childbearing-age women, whereas the proportion of third parity remained larger than that of first and second parity for women over 40 in 2000. The shift in parity distribution was a result of social development and, in a sense, the family planning policy because it was extremely rare for this policy to permit third (or later) parity. Unless many births occurred without permission, the proportion of third parity was not typically high.

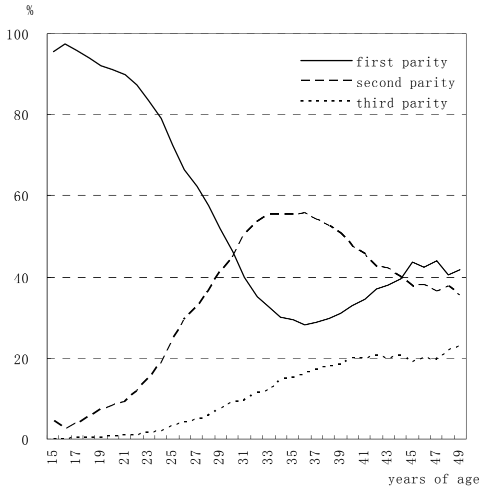


Figure 4a. The proportion of parity among Chinese women in 2010

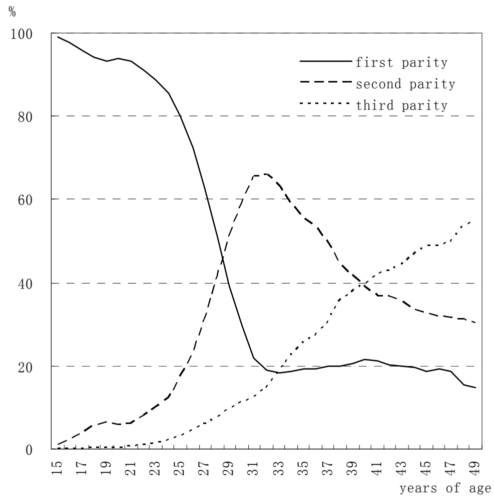


Figure 4b. The proportion of parity among Chinese women in 2000

III. Analysis of fertility-related factors

(1) Education level and parity

The difference in fertility levels among women with various education levels could be primarily observed through the parity-specific frequency distribution of women with various education levels. Table 3 showed that the proportion of second (or higher) parity significantly decreased with education levels increasing. Furthermore, the proportion of third parity was significantly higher among women with no education or only primary education compared with those with higher education levels. Moreover, the proportion of second parity was also significantly lower among women with college and higher education levels. We interpret the effect of education level on parity as follows: Women with higher education levels spent more years studying; thus, their age at first childbearing was postponed. In addition, the socioeconomic statuses of highly educated women were generally higher, so their opportunity cost of childbearing was also higher. The synergistic effect of these factors inhibited reproductive behavior of women with higher education levels.

Table 3. The frequency distribution of parity and education level among Chinese women unit: %

	First parity	Second parity	Third parity	Total
No education	30.87	39.24	29.89	100
Primary School	39.88	44.45	15.66	100
Middle School	58.94	35.01	6.05	100
High School	76.79	21.17	2.04	100
College	88.92	10.45	0.63	100
Undergraduate	93.55	6.17	0.28	100
Post-Graduate	95.67	4.05	0.28	100

Data source: Calculated from the 2010 census

The above conclusion was taken from survey data[③]; thus, an analysis was needed to determine whether this conclusion could be applied to the entire population. Education level is an ordinal variable, and parity was a continuous variable; however, because the sixth census raw data had not been released, we downgraded parity (i.e., first, second, and third parity) to an ordinal variable. To simplify the calculation process, we simultaneously re-categorized education levels into groups of primary school (no education or primary school), middle school (middle and high schools), and university (college, undergraduate, and post-graduate), and the corresponding frequency-number distribution was obtained.

After the above adjustments were taken, a coefficient of gamma sequence correlation was conducted, and the results of this calculation were as follows: G = -0.56, Z = -247.95, $|Z| >> Z_{0.025} = 1.96$, and G was applicable to the entire population.

Based on the significance of the above correlation coefficient, this result demonstrated that the relation between education level and parity was negative such that higher education levels denoted lower parity.

(2) Urban-rural difference in parity

Table 4. The frequency distribution of urban-rural parity of Chinese women unit: %

	First parity	Second parity	Third parity	Total
City	76.53	21.09	2.38	100
Township	61.66	32.76	5.57	100
Rural areas	55.39	35.71	8.90	100

Data source: Calculated from the 2010 census data

Table 4 shows that, regardless of urban-rural status, women with one child were most common. As for first parity, city’s proportion is the highest one, and rural areas’ proportion is highest for second and third parity. The proportion of multiple births in townships fell in between rural and urban areas. Given this distribution, we speculated that China's fertility level was higher in rural areas than townships and higher in townships than cities, with a marked difference between urban and rural areas.

In fact, the urban-rural differential with regard to the family planning policy existed in most regions of China. In rural areas, the family planning policy of "two-child" or "one-and-a-half-child" was generally implemented, which helped lead to a higher fertility level in rural areas. Townships fell in between cities and rural areas, and its residents originated from both rural and urban households; therefore, the policy fertility rate in township was higher than in cities and lower than in rural areas. In addition, the differences in lifestyle and production across cities, townships, and rural areas caused difference in the reproductive desire, despite the fact that this difference decreased during the urban-rural integration.

Likewise, the characteristics shown in the tables must be tested statistically. If the parity

[③] The fertility data of the sixth census originated from the long-table survey, and the sampling ratio was approximately 0.096.

distributions of rural and urban regions are similar, then the difference in the cumulative frequency should not be large across samples. D1, D2, and D3 were the cumulative differences in first, second, and third parity across the different regions, respectively, and D = Max (D1, D2, D3) was the largest difference of the absolute values.

$X^2 = 4D^2 * (\frac{n_1 n_2}{n_1 + n_2})$, where n_1 and n_2 denoted the sample sizes of different kinds of regions. When the sample sizes were sufficient, the results should show that X^2 followed the $\chi^2(2)$ distribution.

Table 6. Analysis results of the difference in parity between urban and rural areas

	City-township	City-rural areas	Township-rural areas
D_1	0.1487	0.2114	0.0627
D_2	0.0319	0.0652	0.0333
D_3	0	0	0
Max (D_1, D_2, D_3)	0.1487	0.2114	0.0627
X^2	11601.83	37934.71	2628.67

Data source: Calculated from the compiled data of the 2010 census.

The results of the calculation revealed that $X^2 > X^2_{0.005}(2) = 10.597$; therefore, significant differences were found with regard to parity among cities, townships, and rural areas.

(3) Factor decomposition of general fertility rate

Based on the available data, this section describes a factor decomposition regarding the decline in general fertility rate with the hope of developing an intuitionistic understanding of the demographic factors related to the current decline in fertility rate.

A triple-standardized method was applied to analyze the change in the general fertility rate (GFR) from 2010 to 2000, and quantitative analyses of the contribution of age structure, the proportion of married women, and the fertility rate of married women were conducted. The triple-standardized method is as follows:

$$GFR = \frac{B}{W} = \frac{\sum_{x=15}^{49} W(x) f(x)}{W} = \frac{\sum_{x=15}^{49} W(x) m(x) f_m(x)}{W} = \sum_{x=15}^{49} C(x) m(x) f_m(x)$$

Where C (x) was the proportion of childbearing-age women aged x years to childbearing-age women; m(x) was the proportion of married women aged x years to childbearing-age women aged x years; and $f_m(x)$ was the fertility rate of married women aged x years. The various parameters in 2010 were designated GFR_2, $C_2(x)$, $m_2(x)$, and $f_{m,2}(x)$; the various parameters in 2000 were designated GFR_1, $C_1(x)$, $m_1(x)$, and $f_{m,1}(x)$; and the parametric differences across 2010 and 2000 were designated $\triangle C(x)$, $\triangle m(x)$, and $\triangle f_m(x)$. The following formula was obtained:

$$GFR_2 - GFR_1 = \sum_{x=15}^{49} C_2(x) m_2(x) f_{m,2}(x) - \sum_{x=15}^{49} C_1(x) m_1(x) f_{m,1}(x)$$

$$= \sum_{x=15}^{49} C_2(x) m_2(x) f_{m,2}(x) - \sum_{x=15}^{49} [C_2(x) - \Delta C(x)][m_2(x) - \Delta m(x)][f_{m,2}(x) - \Delta f_m(x)]$$

Subsequently, the following formula was obtained:

GFR_2-GFR_1=the effect of the age structure of childbearing-age women + the effect of the marital status of childbearing-age women + the effect of the fertility level of married women + the effect of the interaction of the above factors.

where the effect of the age structure of childbearing-age women=$\sum \triangle C(x) m_2(x) f_{m,2}(x)$; the effect of the marital status of childbearing-age women=$\sum C_2(x) \triangle m(x) f_{m,2}(x)$; the effect of the fertility level of married women=$\sum C_2(x) m_2(x) \triangle f_m(x)$; and the effect of the interaction of the above factors = $\sum \triangle C(x) \triangle m(x) \triangle f_m(x) - \sum \triangle C(x) \triangle m(x) f_{m,2}(x) - \sum \triangle C(x) m_2(x) \triangle f_m(x) - \sum C_2(x) \triangle m(x) \triangle f_m(x)$.

Table 6. The factors that influenced the changes regarding the general fertility rates in 2010 and 2000 unit: ‰

GFR 2010	GFR 2000	GFR 2010-2000	Effect of age structure	Effect of marital status	Effect of fertility level	The interaction effect
33.31	36.11	-2.79	-3.18	-4.78	3.47	1.70
Percentage of GFR 2000 (%)		-7.74	-8.81	-13.25	9.61	4.71

Data source: Calculated from the 2000 and 2010 census data

The general fertility rate among the Chinese population continuously declined over the first decade of the 21st century, and it dropped by 7.4% in 2010 compared with 2000. However, a quantitative analysis was needed to analyze the factors that caused this decline. The results of the analysis revealed that the effect of the age structure of childbearing women decreased the general fertility rate by 3.182‰ from 2000 to 2010, which accounted for 8.812% of the general fertility rate in 2000.

The effect of marital status decreased the general fertility rate by 4.784‰ in 2010 compared with 2000, accounting for 13.251% of the general fertility rate in 2000. The effect of marital status primarily refers to the changes in the proportion of married women, which was a cumulative result of the historical changes in the age of marriage. The postponement of marriage (especially the first marriage) might be the dominating cause.

The fertility level of married women increased by 3.471‰ in 2010 from 2000, accounting for 9.613‰ of the general fertility rate in 2000. Due to data limitations with regard to calculating the fertility rate of married women, all births were regarded as births to married couples, which would overestimate the results; however, this error was likely small because both Chinese cultural traditions and the family planning policy do not encourage out-of-wedlock births.

In addition, the interaction effect resulted in a 1.701‰ increase in the general fertility rate in

2010 from 2000, accounting for 4.711% of the general fertility rate in 2000.

Given the overall national situation, the leading factor related to the decline in the general fertility rate from 2000 to 2010 was marital status, followed by the age structure of childbearing-age women. On the contrary, the fertility level of married women resulted in an increase in the general fertility rate. Currently, the proportion of married women in China is higher than 70%[11], which is a much higher rate than in developed Western countries. Thus, room exists for continued declines, making the proportion of married women a powerful potential factor that could affect the future fertility level in China. In summary, the above analyses showed that the changes in the general fertility rate in China are primarily due to structural factors (e.g., age structure and marital status), and the effect of endogenous factors (e.g., the age-specific fertility rate of married women) is shrinking.

IV. Summary

Although China has remained a relative lower fertility level for a long time, the characteristics of the fertility level were various across different periods. In recent decade, the characteristics and changes in fertility in China are as follows.

First, with the fertility levels decreasing, structural factors (e.g., age structure and marital status) were gradually becoming the determinative ones at present and in the future. The crude birth rate and general fertility rate were declining mildly; the results suggest an overall trend of postponing childbearing, which is markedly different from the fertility patterns of Western countries in which childbearing starts late and ends early. A conservative estimate based on the available data showed that the total fertility rate in 2010 should be less than 1.44, and the chance of it being higher than 1.64 is minimal [5]. Even if the family planning policy remains unchanged, the overall fertility level of childbearing-age women will not stay at the current level.

Secondly, as for fertility pattern, the average age at childbearing, birth interval, and parity became older, wider and less. Owing to the postponement of first marriage, the average age at childbearing were older, while the interval between the first marriage and first childbearing were enlarging and the parity was less. This trend was consistent with the reality of low fertility level in China.

Finally, given that the social factors (e.g., the education level and urban-rural distribution) continued to affect the reproductive behaviors significantly, the demographic factors (e.g., the age structure of childbearing-age women and marital status) were more and more important for the fertility level in China. Different education level resulted in different fertility level, and women with lower education level tended to have more children. Due to the difference of fertility desire and family planning policy between urban and rural areas, China's fertility level was higher in rural areas than townships and higher in townships than cities, with a marked difference between urban and rural areas. In addition, the results of the factor decomposition of general fertility rate revealed that the leading factor related to the decline in the general fertility rate from 2000 to 2010 was marital status, followed by the age structure of childbearing-age women. On the contrary, the fertility level of married women resulted in an increase in the general fertility rate. In summary, the changes in the general fertility rate in China are primarily due to structural factors, and the effect of endogenous factors (e.g., the age-specific fertility rate of married women) is shrinking.

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