

## The low fertility rate is the major demographic risk in China

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In this paper, I argue that China's population has retained a low fertility rate for 20 years. However, population research has failed to raise sufficient awareness on this major change over a long period of time. As it is proven by the data from the Sixth National Population Census in China, birth rate level and fertility level both have been seriously overestimated in the past, while population aging process has been underestimated at the same time. China has repeatedly failed to achieve its goals in population development plans by large gaps. Results in population forecast and simulation indicate that the main problem of China's population in the twenty-first century has already shifted from the excessive growth of total population to the issue of population age structure. Population over-aging becomes a serious problem that looms large over the country's future. The biases in the publicity on population theories and in relevant estimation and forecast in the past prohibited the correct understanding on China's general population trend. This mistake causes seriously low fertility rate in China and will bring population risks of too few children and over-aging in the future.

**Keywords:** low fertility rate; population risks; too few children issue; over-aging issue

**JEL codes:** J11; J13

### 1. The importance and urgency of population situation need to be reconsidered

The 40-year-long family planning policy has radically restrained China's rapid population growth. Total fertility rate (TFR) has been far lower than replacement level for many years. China's intrinsic natural population growth rate turned to negative early in the beginning of the 1990s. The size of population will still be an important constraint to social and economic development of China over a very long period of time in the future. And the issue of population and development in China has already fallen into a more complex situation. The population structure issues such as too few children and over-aging caused by low fertility rate are constantly aggravating and becoming increasingly prominent. In this critical period, China needs to make historical decisions concerning its population development strategies.

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There are two urgent issues that need to be addressed of China's current population situation. The first one is about the judgment on the current fertility level. From the 1990s, China's population and birth control areas have lost the judgement of actual birth rate level. On the one hand, almost all national population censuses in nearly 20 years showed that China's TFR was at a very low level. But these results were constantly challenged as being caused by serious omissions in birth reports so that TFR was adjusted to about 1.8 through various kinds of indirect estimations. However, these indirect estimations are mostly flawed because there are technical mistakes in methodology and defective data results. They only reflect serious subjective prejudice lay by prior hypothesis. The second issue is the counter-measures that should be taken in response to the prospect of population development. The first thing in this issue is at which level the fertility rate should be determined and for the next 20 to 30 years. Such decision must be made on the basis of far-reaching prospective study on China's population over a longer period in the future. However, because of the previous judgment of 1.8 fertility rate, which was widely believed but very unreliable, and out of the consideration to retain stability and avoid chaos in family planning work, some people assert that the 1.8 fertility rate should better be kept for another 20 or 30 years.

But as a matter of fact, the main population risk that confronts China now is no longer its rapid population growth but low fertility rate and the serious issues of too few children and over-aging caused by such low fertility rate. The task of reconsidering population situation is not only highly important but also very emergent. China's population development has entered a critical moment. Any misjudgment and hesitation might ruin the opportunity of taking proper measures and endanger the long-term balanced development of China's population.

The Sixth National Population Census (6<sup>th</sup> NPC) in 2012 revealed that China's national TFR was only 1.18. This renewed its records in lowest fertility rate. Although there might be certain error in this statistical figure, it did set an alarm once again on China's current too low fertility rate and warned people that such a situation should not remain the same anymore.

TFR is an important indicator in the research on current population situation and future development trend. In the past 20 years, the TFRs in the majority of data from national population surveys and censuses ranged between 1.3 and 1.5. However, competent governmental departments stick to the 1.8 TFR all the time so that the population plans formulated by the government, and most population forecasts, including the researches on national population development strategy, are all based on the hypothesis of an approximate 1.8 fertility rate. The 6<sup>th</sup> NPC's population age structure provides the information on the population development course in the past. With the simulative analysis on the basis of 6<sup>th</sup> NPC, it is possible that to expand the span of fertility rates comparison to the past 20 years.<sup>1</sup>

Figure 1 provides the comparison of TFRs obtained from different sources. It can be seen that the TFRs simulated on the basis of the SNPC results remain at a lower level below 1.5 for over a decade. In some years the fertility rate is lower than 1.4. In sum, the SNPC results confirm the very low fertility rates found in the nationwide surveys in the past. So the standard of the 1.8 fertility rate that the competent governmental departments have insisted for a long period of time has seriously departed from the actual situation. The results of nationwide population and family planning survey in 2006, which shocked both high and low ranking government officials and triggered a trend about the 'rebounding fertility posing severe problem', was in the end negated by the results in the population surveys in the same period and later, including the SNPC results. This development proved the challenge and analytical conclusion on the results of this survey (Guo Zhigang 2009)

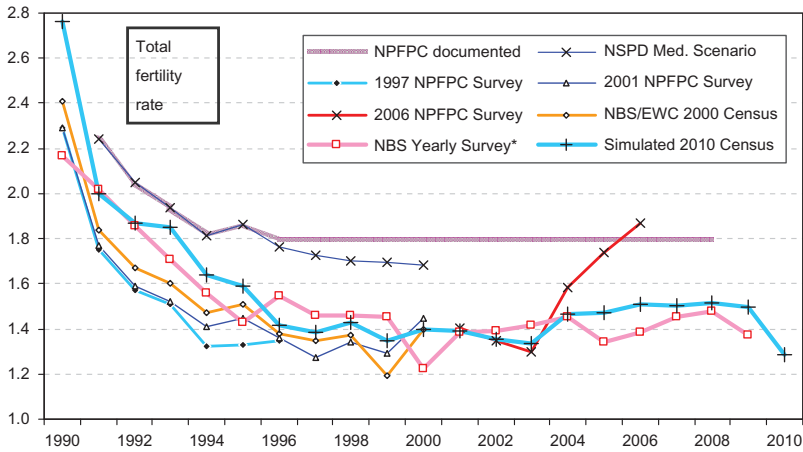


Figure 1. Comparison between total fertility rates from 1990 to 2010.

that the abnormal results obtained in the survey in 2006 were caused by the severe biases in the survey samples. As a matter of fact, we never see the huge rebound of fertility rate but population aging that occurs earlier than expected. However, this seriously misleading trend has not yet been eliminated or corrected. It still has impact on various areas.

### 1.1. Data sources and explanations

- (1) National Population and Family Planning Commission (NPFPC) documented: data published by the National Population and Family Planning Commission of People's Republic of China, from *Handbook on Frequently-Used Data about Population and Family Planning in China (2008)*, China Population Publishing House, 2009.
- (2) National Strategy on Population Development (NSPD) Med. Scenario: the medium scenario for China's population strategy, from *The Report on China's National Strategy on Population Development*, China Population Publishing House, 2007.
- (3) 1997 NPFPC Survey: a survey in 1997 with calculations made by Guo Zhigang (2000) on the basis of the data from the nationwide population and reproductive health survey in 1997.
- (4) 2001 NPFPC Survey: a survey in 2001 with calculations made by Ding Junfeng (2003) on the basis of the data from the national population and reproductive health survey in 2001.
- (5) 2006 NPFPC Survey: from *Tabulations of the 2006 National Population and Family Planning Survey*, China Population Publishing House. Edited by Zhang Weiqing (2008).
- (6) National Bureau of Statistics (NBS)/East and West Center (EWC) 2000 Census: estimations by NBS/EWC (2007) on the basis of the data from the national population census in 2000.
- (7) NBS Yearly Survey<sup>2</sup>: results from the surveys on population change in various years published by the NBS, see materials in the Department of Population and Employment of the National Bureau of Statistics of the People's Republic of China (1990–2010), including the results from the national population censuses and 1% population surveys.

- (8) Simulated 2010 Census: made for the SNPC, results obtained by Guo Zhigang (2011) through simulating the SNPC population structure on the basis of the data from the Fourth National Population Census.

Figure 1 also provides the estimations of the medium scenario on the TFR in the 1990s made by the national population development strategy research. It is almost the same as the government-published standard level in the first half of the decade, but it becomes slightly lower in the second half. The estimation for the year 2000 is 1.68. In fact, the research specially recommended in its high scenario that the TFR should be estimated at 1.77, which is basically similar to the official standard level of 1.8. It can be seen clearly in Figure 1 that the estimations show great departure from the actual survey results and they are also negated by the results in the SNPC simulation.

When China's low fertility rate is examined from a different angle, it still reveals the seriousness of the problem. In real life, women of and above 40 years old seldom give birth to children. So demographically, the average number of children born by women between the ages of 35 and 39 in survey data are usually used to represent the birth number in the whole life of these women. The figures for this statistical indicator obtained in the three national population censuses in 1990, 2000 and 2010 are respectively 2.48, 1.85 and 1.52. They respectively corresponds to a women cohort who were born from 1951 to 1955, from 1961 to 1965 and from 1971 to 1975. This indicator reflects that the women's lifetime fertility level had become significantly lower than replacement level (2.1) 10 years ago. At present it is lower than replacement level by 0.5 child. The TFR of 1.8 as shown in the SNPC seems different from the average number of children born by women between the ages of 35 and 39 (1.52). But there is no disagreement between the two statistics. On the contrary, they are highly consistent. The periodical indicator in SNPC shows the fertility level of the current year while lifetime indicator reflects the accumulative fertility level over many years. Under the circumstance that current fertility rate drops and marriage and child-rearing ages constantly increase, periodical fertility rate should become significantly lower than the lifetime fertility rate shown by women who just end their fertility period during the same period.

Like the statistical results in previous population surveys, the SNPC results prove once again that previous population statistics have constantly failed to recognize the reality that fertility rate is very low in China. There has been a serious prejudice of overestimating birth report omissions and fertility level in general so that relevant work has been trapped in a demographic statistical loophole for many years. This problem has severely misguided the formulation of population development strategies and hindered the timely adjustment of fertility policies. Such repeated mistake should not be allowed to reoccur. People must reconsider population situation and population development prospect. In fact, just like too high fertility rate problem, too low fertility rate will also cause huge risk to China's population development in the future. At present, the risk of too low fertility rate has already become the main risk in population development. But the entire society fails to achieve sufficient understanding of this issue.

## **2. Birth number and population growth were overestimated and population aging was underestimated in the past**

The SNPC data also indicate that the serious mistake in estimating TFR also resulted in serious mistakes in total population growth and population age structure in population projecting and planning in the past.

Very serious biases emerged in the population projections in the recent two 5-year population plans formulated by competent government departments. In the population projections of the Tenth Five Year Plan, the official standard of 1.8 TFR was adopted, which was far higher than all the statistical results in various surveys. In addition, the population base used in the forecast was a figure of the total population of 1.265 billion obtained in the population census in 2000 plus about a 17 million adjustment number. This shows that competent governmental departments did not trust the results in the Fifth National Population Census and further adjusted and increased the birth number in the 1990s. The forecast in the population plan for the Tenth Five Year Plan showed that China's total population will reach 1.331 billion in 2005. However, the nationwide 1% population survey in 2005 showed the result of the total population of 1.308 billion. The Tenth Five Year Plan required that population growth during the period should be no more than fifty six million. In 2005, the actual total population was twenty three million less than the forecast in the plan. In comparison with the population forecast of 1.283 billion adjusted and calculated on the basis of the population in the base period of the year 2000, the growth was only 25 million. And in comparison with the total population of 1.265 billion in the Fifth National Population Census, the growth was just 42 million. Such large biases occur in a forecast over only 5 years. This is reliable enough to prove that the population base adjustment number and fertility rate parameter hypothesis have both deviated greatly from the reality.

In the population plan for the Eleventh Five Year Plan, the population base for the forecast was directly taken from the figure obtained in the nationwide 1% population sampling survey in 2005, while the fertility rate was set as in the past. The forecast was that total population would reach 1.360 billion in 2010. However, the total population published by the 6<sup>th</sup> NPC was 1.340 billion. This indicates that the population projection in the Eleventh Five Year Plan was higher by twenty million. The situation foretold by the population plan of the Eleventh Five Year Plan that China's population would grow by ten million each year did not occur at all. The actual average annual population growth was six million. So again, huge bias occurred between the projection in the plan and the actual situation. And this, once again, shows the problem of seriously overestimating the fertility rate in the past.

Due to the huge social influence of official standard, the deviation of overestimating fertility rate was found generally in the majority of the population researches in previous years. This in turn misled the understandings of the current population situation in China and the development trend in the future. What is dangerous is that such a situation has lasted for many years and it dominates the mainstream in population research at present. It causes serious social influence and misleads the formulation of population development strategy and the government's population plans and policies. In fact, if we compare the population statistics published in the *Statistics Communiqués of the National Economic and Social Development of the People's Republic of China* in various years and the results of the majority of population forecasts with the results of the SNPC simulation, it can be seen that the population statistics and those forecasts generally show overestimation of birth number and underestimation of population aging.

Figure 2 indicates that, in comparison with the SNPC results, the population birth numbers in the statistical communiqués from 1994 to 2005 are all obviously higher than the actual situation. The problem is very serious with the numbers obtained from 1996 to 1999. The average overestimation is about four million, showing a percentage of deviation that ranges between 24% and 30%. According to the population age structure obtained from the SNPC, we calculated that the annual birth number has already dropped to sixteen million since 1996. In several years, the number became even lower than fifteen million. In some



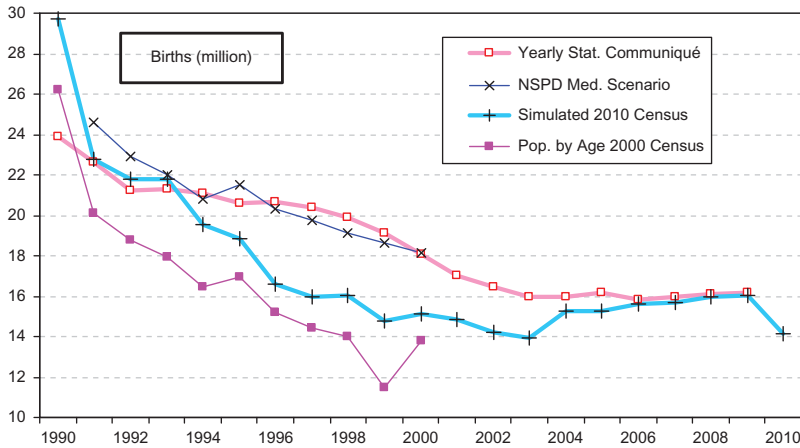


Figure 2. Comparison of birth numbers from 1990 to 2010.

years it was only about fourteen million. In Figure 2 only the birth number estimation in the 1990s made by the national population development strategy researches with the most authoritative influence in recent years were taken as examples to reflect the common problem in the previous population forecasts. Because the data of younger age population in the Fifth National Population Census encountered strong challenge and doubt, the research must make an acceptable birth number estimation for the period of the 1990s before it starts to make population projection. It can be seen from relevant curves in Figure 2 that sets of estimations are roughly based on the statistical communiqués. It is only slightly higher in the first half of the decade and a bit lower in the second. Therefore, the problem with this set of birth number estimations is still being seriously higher. At the same time, the population forecast which is on the basis of the set of estimations will definitely have serious bias even before it starts to be calculated.

### 2.1. Data sources and explanations

- (1) Yearly Statistical Communiqué: numbers published in statistical communiqué, the birth numbers in the *Statistical Communiqués on the National Economic and Social Development of the People's Republic of China*.
- (2) NSPD Med. Scenario: see *The Report on China's National Strategy on Population Development*, China Population Publishing House, 2007.
- (3) Simulated 2010 Census: results from the 6<sup>th</sup> NPC simulation, birth numbers from 1990 to 2010 calculated by Guo Zhigang on the basis of the SNPC population structure simulation (Population Census Office under the State Council and Department of Population and Employment Statistics of the National Bureau of Statistics of China, 2011, 2012).
- (4) Population by Age 2000 Census: populations of different ages in the Fifth National Population Census, *Tabulation on the 2000 Population Census of the People's Republic of China*, China Statistics Press, 2002.

Such a situation occurred frequently in previous population researches. It was rather widespread and there were few exceptions. This was caused by the strong influence of the widely rumored 30% omission in the birth report. In fact, many indirect population

estimations tried to prove that this high omission show obvious errors and defects. So such a high report omission level was just a widely spread erroneous message. No conclusive evidence was ever found nationwide. But because some competent governmental departments adopted and communicated it, this wrong information eventually dominated public opinion in the society. Because of this situation, many people were greatly surprised when the population of young children published in the 6<sup>th</sup> NPC showed a very low proportion of only 16.6%, a figure far lower than expected which revealed a serious issue of too few children. This issue did not come up overnight. Figure 2 shows that such a trend started to develop in earlier time and there were traces then. The only problem was that people refused to believe it and built a population landscape very different from the reality on the basis of some untruthful indirect estimations.

The above comparative study on the SNPC also indicates that the younger age population obtained in the Fifth National Population Census that was seriously doubted in the past is in fact closer to the SNPC result although there are certain report omissions in it. Such a situation indicates that the radical cause of the confused situation in demographic statistical work in the past was the problem of neither data quality nor technical method but the problem of thought and awareness. People would rather believe in subjective judgment on the basis of experience than the results from actual investigation. They adopted higher statistical adjustment rather than a lower one and failed to make it on the basis of scientific evidence and sufficient examination so that serious over-adjustment occurred. Such over-adjustment was worse than no adjustment at all. It caused greater confusion and misled the judgment on demographic situation and the formulation of the decisions in response.

Overestimation of fertility level and birth number will bring serious underestimation of population aging. Figure 3 provides the dynamic change of the proportion of the population over 65 years old as reflected by the SNPC. This change is used to compare with relevant results in the statistical communiqués in various years,<sup>3</sup> with the results of the forecast made by the National Population and Family Planning Commission of People's Republic of China according to a TFR of 1.8 in 2001<sup>4</sup> and used as the basis of the population plan of the Tenth Five Year Plan, and with the results of the forecast made in national population development strategy. Among these data, the results of the SNPC simulation reflect

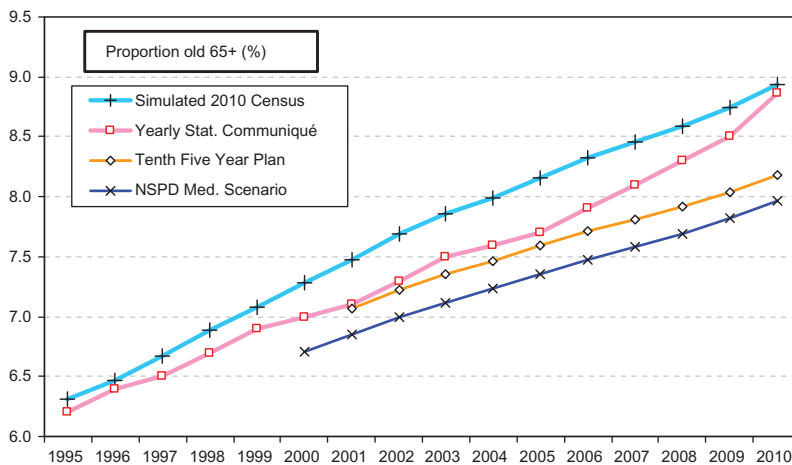


Figure 3. Comparison between the proportions of senior-aged population over 65 years old from 1990 to 2010.

the even development of population aging in the past 20 years in a roughly linear pattern. In comparison with these results, the proportion of senior-aged population published in the statistical communiqué in various years shows a pattern that it is closer to the SNPC simulation results in the years on the two ends while it is obviously lower than them in the years in the middle of the period. The statistical communiqués in recent years show a tendency of acceleration in the increase of senior-aged population. But in fact, this should not be interpreted as the natural result of population age structure because the results in the SNPC simulation have already incorporated the influence of age structure and also the influence of the increase in life expectancy and such results describe a population process with better consistency. Therefore, the recent acceleration of the increase in the proportion of senior-aged population in statistical communiqués might indicate that the statistical departments in the government have realized that there were deviations in their previous statistics and started to make conscious adjustments.

## 2.2. Data sources

- (1) Simulated 2010 Census: results in the SNPC simulation, namely the birth number from 1990 to 2010 in the SNPC population structure simulation made by Guo Zhigang (2011).
- (2) Yearly Stat. Communiqué: figures published in the statistical communiqués, namely birth numbers in the *Statistics Communiqués of the National Economic and Social Development of the People's Republic of China* in various years.
- (3) Tenth Five Year Plan: population plan for the Tenth Five Year Plan from the *Handbook on Frequently-Used Data about Population and Family Planning in China (2002)* (for internal use) compiled by the National Population and Family Planning Commission of People's Republic of China.
- (4) NSPD Med. Scenario: from *The Report on China's National Strategy on Population Development*, China Population Publishing House, 2007.

Note: The curve about the statistical communiqués includes the statistics in the national population censuses or the nationwide 1% population sampling survey. Besides, as the SNPC simulation is made with the proportion of senior-aged population taken at the end of each year, the results in the simulation in 2010 is slightly higher than that in the actual SNPC (carried out on 1 November 2010).

Comparing with the results in SNPC simulation, the forecast made during the formulation of the population plan for the Tenth Five Year Plan in 2001 underestimated the development trend of the proportion of senior-aged population and the degree of underestimation became larger and larger later. Although the population forecast made by the national population development strategy research was completed the latest, the deviation in the proportion of senior-aged population was even larger than the forecast made before it. Such problem was in fact caused by the over-adjustment to the underage population in the year 2000, namely the forecast base period. The proportions of senior-aged population in these two population forecasts had a difference of about one percentage point from the actual situation within only several years. So the deviation will cause more serious underestimation in describing the population aging in the future.

The comparison clearly shows that the overestimation of birth number and over-adjustment to statistics in the past caused serious underestimation to and covered up the true level of population aging. In fact, the 'birth number', which was speculated to be there in the adjustment but actually did not exist, statistically 'eased' population aging.



### 3. The proper fertility rate in the future must be re-studied carefully

We know that, if a TFR of 2.1 retains over a long period of time, the population will finally stabilize without any increase or decrease. That is to say, the 2.1 TFR is the replacement level of population development. Besides, this demographic principle tells that the replacement level fertility is the condition for population to achieve long-term balance. However, people might not understand clearly what the population prospects will be in the future if a low fertility level retains for a long period of time. According to the calculation and analysis on the basis of the stable population principle (Guo Zhigang 2010), if a TFR of 1.8 is retained over long period, the stable population formed in the future will decrease at a rate of half size in every 117 years. In fact, these two calculation results already show that it is not a good choice in population strategy to stabilize fertility rate at a low level of 1.8. Calculation also indicates that, if TFR is kept at 1.5 over a long period of time, population will be halved in every 54 years. This means that, although the difference of 0.3 in fertility rate looks small, it is like a millimeter move at the muzzle and the consequence to the population will be like a bullet that hit a place far from the target. Thirty years ago, some scholars suggested that China's proper population size should be 0.7–0.8 billion. Because the main population issue that China confronted in the past was to control the increase in population size. Such an outlook that pursued population reduction and belief that the less population the better were extensively publicized. But as a matter of fact, the academia of demography in China has been holding great controversy against this idea and there is always criticism that such strategic pursuit only focuses on the quantity of population and overlooked population structure and relevant social factors. When it is examined today, the pursuit also overlooked historical factors. China does have a big population. But it is a problem that develops over several centuries and it has not been produced out of people's will. Besides, this problem of a big population cannot be resolved in one generation or several generations. It can only be resolved gradually in history. The attempt to resolve it at one fell swoop is equivalent to launching a boastful and unrealistic 'Great Leap-Forward' in population issue. The mindset about population development strategy is in fact more important during a period of low fertility rate. Biased thinking on this issue will produce more direction jeopardy and loss. In recent years, some people suggested that one child policy should be implemented in both the countryside and urban areas throughout China without distinction. This suggestion was underlain by the 1.0 TFR. The intrinsic population trend of such a fertility rate is that the population will be halved every in 20 years or so. This is a utopian idea that disregards the principles of population development, of social development and of historical development. It will do harm to both the country and the people and it is very dangerous. So the issues such as how to practically reflect the actual current fertility rate and to properly decide fertility rate in the future are not just common academic issues anymore. They are important issues in strategic decision that concerns the future of the nation.

The calculation and analysis in theory based on stable population principle without considering the impact of current population structure would not be population forecasts in the real sense. This type of analysis would not specifically reveal the population development process in China for several decades in the future either. But it does reveal the long-term population trend and pattern under different fertility rates. It sets up the referential standard to formulate long-term population strategic decision. When the view that advocates retaining a low fertility rate of 1.8 for 20–30 years more<sup>5</sup> is re-examined under this framework, people can easily find the problems with it. First, the results of the above analysis on the 1.8 fertility rate already show that it will result in fast reduction in population. Second, retaining such a low fertility rate for 20–30 years more, which surpasses the

generational interval, will cause great impact to the development course of China's population. Third, the 6<sup>th</sup> NPC data show that the actual fertility rate of China in the past was far lower than 1.8 and such a situation lasted for nearly 20 years. It fails to reveal what problems such a low fertility rate would bring about if it is retained for a long period. Fourth, the policy suggestions proposed after 6<sup>th</sup> NPC are still to control total population size and to avoid the birth peaks caused by adjusting fertility policy. It fails to consider that what China is facing now is the issues of too few children and over-population-aging tendency. Even though it takes some elements of the issues into consideration, it fails to exhibit a broader view in this respect by considering a period that only extends to the middle of the twenty-first century. However, the basic characteristic of China's population structure is that there have been three major birth peaks from 1950 to 1990. The average annual birth number in this period was more than twenty million. Among them, the elder generations have just entered senior age and the main part of them will enter senior age successively in 40 years in the future. This determines that the most challenging period of China's population aging will be after 2050. So the population development strategy research in China must extend its view to cover the entire twenty-first century. Because of the reasons above, China's strategic decisions on population development must be re-studied and re-formulated carefully.

In fact, there has been no single serious study or discussion succeeded in suggesting retaining a 1.8 fertility rate a better population development strategy. There is only a simple description that such a target fertility rate will guarantee the goal proposed at the Sixteenth CPC National Congress that the GDP doubles by 2020 and GDP per capita reaches USD 3000, and that such a target fertility rate will ensure China's total population in the future not exceeding 1.5 billion before drops slowly. So such a target fertility rate is neither high nor low. Now these results have already been nailed down as inevitable outcome, so retaining the 1.8 fertility rate is not the reason to attain them anymore. As it has been announced in the *2008 Statistical Communiqué of the People's Republic of China on the 2007 National Economic and Social Development* published by the National Bureau of Statistics in China, China achieved the goal of USD 3000 GDP per capita in 2008. In addition to the reason that the high-speed growth of the economy has gone beyond expectation, another reason for the achievement of this economic goal is that population growth rate is far lower than the forecast in the past, namely that the actual birth number and fertility rate level are far lower than the judgments in the past. This proves the seriousness of the problem, namely the population development in the past has gone through an actual process of extremely low fertility rate under a nominal fertility rate of 1.8. If people still believe that such a situation should better continue longer, it will only cause larger damage to long-term balanced development of China's population. This will indiscreetly put the country's development, the nation's rejuvenation and the society's harmony under huge population risk. Calculated and examined on the basis of the SNPC results, there is very small risk that China's total population exceeds its proper limit in the future while the risks of over-population-aging and over-negative-population-growth in the future are increasing rapidly. This is because, on the one hand, the SNPC population age structure shows that the issues of too few children and population aging developed beyond expectation in the past while, on the other hand, large amount of surveys indicate that people have lower and lower intention to have children. There are even traces of obvious increase in the proportion of people who do not want to have any children. Therefore, to effectively increase a very low fertility rate might not be as easy as some people have imagined. The actual situation is that, on the one hand, competent government departments only have focused on strictly controlling high fertility rate and had almost no experience in

raising fertility rate while, on the other hand, other countries that are facing low fertility in the international community all have failed wretchedly in their efforts in this respect. Nonetheless, we can still assume that fertility rate 'can' be raised effectively as some people have wished. Then we can examine on the basis of the population simulation and forecast based on the 6<sup>th</sup> NPC population age structure what population consequences will be produced under different fertility rate when the impact of actual population structure taken into account.

On the basis of the SNPC population structure simulation, comparison is made on the projection and simulation results on four different assumed fertility rate scenarios in the future. For the population projections, the progressive fertility rate model by age, established by Chinese scholars Ma Yingtong et al. (1985), is adopted. The advantage of this method is that it overcomes the important defect in regular fertility rate model by age that the regular model cannot control the influence of fertile women's parity structure. First, the adoption of this progressive fertility model can more relevantly reflect the characteristics of the fertile women parity structure in China formed under the implementation of family planning policy over many years. For example, there are a huge proportion of women in China who only have one child. Second, the parameter of total progressive second-child fertility rate is raised in the projection so as to reflect the increase of the proportion of women who continue to give birth to their second child among the fertile women who have one child currently. Then, the result on regular fertility rate by age is obtained on the basis of the annual forecast of the number of fertile women by age and the number of women among them who have given birth to children. The fertility scenarios discussed here are divided according to the results on regular fertility rate. Among them, the three scenarios, respectively named as high, medium and low scenarios, are all built on the assumption that the current too low fertility rate be raised to a new level within several years from 2012 and retained over a long period.

In the low scenario, the TFR will be raised to 1.60. This reflects the continuation of retaining very low fertility rate over a long period of time under the nominal fertility rate of 1.8. It roughly reflects effects of some minor adjustments to fertility policies.

In the medium scenario, the TFR will be raised to 1.77. This reflects that people have realized that the actual fertility rate was already too low and intended to raise it to around 1.8 quickly and effectively. But they still believed that the 1.8 fertility rate should better be stuck to over a long period of time.

In the high scenario, the current TFR will be raised to 1.94. This reflects the total abandonment of the two 1.8 fertility rate standards. The two children policy will be implemented to effectively raise fertility rate to or get close to replacement level.

In the fourth scenario (named as 'VL→High 2035'), the current low fertility level will be retained. From 2035, the fertility rate will be gradually raised to 1.94 and retained from then on. This reflects that the two 1.8 fertility rate standards will remain unchanged and continue to be implemented under the actual extremely low fertility rate.

As it is discussed in the above, we are still not sure if fertility rate can be effectively raised when fertility policy adjustment is in place. Therefore, these four forecast and simulation scenarios are only provided for reference under the condition that this assumed fertility rate raise can be achieved. However, the results of these four simulations are different from the consequences caused by different fertility rates calculated and analyzed according to the stable population principle as the above. This is because these simulation results reflect the impact of China's current population structure. And these structures will have great impacts on China's population development course in the future. At the same time, these simulation results can better reflect the population development process itself

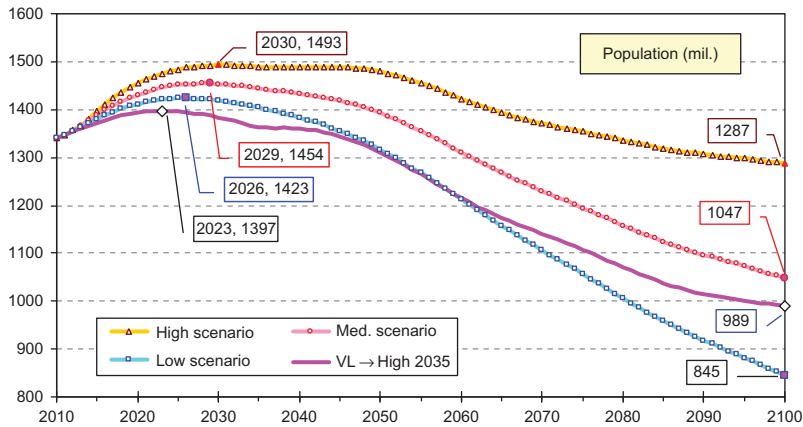


Figure 4. Comparison between the scenarios in total population sizes from 2010 to 2100.

under different fertility rates. This is different from the calculation and analysis based on stable population principle that can only reflect the final results of retaining certain fertility rates for a very long period of time.

The results in the total population forecast in Figure 4 indicate that the population peak in the high scenario will reach 1.493 billion in 2030. And this size of population will retain for a relatively long period of time. However, population will inevitably turn to reduction so that China's total population will be less than 1.3 billion by the end of the twenty-first century. The population peak in the medium scenario will reach 1.454 billion in 2029. Then population will turn to reduction so that China's total population will be less than 1.05 billion by the end of the twenty-first century. The population peak in the low scenario will reach 1.423 billion in 2026. The population will quickly turn into reduction so that China's total population will be only 0.85 billion by the end of the twenty-first century. The results of these scenarios all indicate that, as long as the fertility rate is retained under replacement level, China's total population will turn to reduction inevitably before the middle of the twenty-first century. However, different choices in fertility rate will make China's total population size by the end of the twenty-first century fall in a range between 0.85 billion and 1.3 billion. The number are greatly different because these results represent the different intentions to consciously pursue too quick reduction of population and to try to avoid this situation as much as possible.

In the fourth scenario, the raise of fertility rate is delayed. Its results look good in terms of the indicator of total population. Because the raise of fertility rate is postponed for 30 years so that the size of total population is kept at a notably low level early in the period and that later it falls between the results of the medium and low scenarios. When examined from the pace of the progressive population decrease, its results will fall between the high and medium scenarios. Maybe a total population landscape like this did inspire the policy suggestion that relatively low fertility rate should be retained for 30 years more. However, such a plan will cause huge cost in other respects behind the superficial benefit it will bring to total population size.

Figure 5 provides the simulation results on the proportions of the senior-aged population over 65 years old in various scenarios. The basic characteristic of the results is that the general tendency of population aging in the future is irreversible. At present, China has just entered the beginning period of the aging society. The most serious situation of

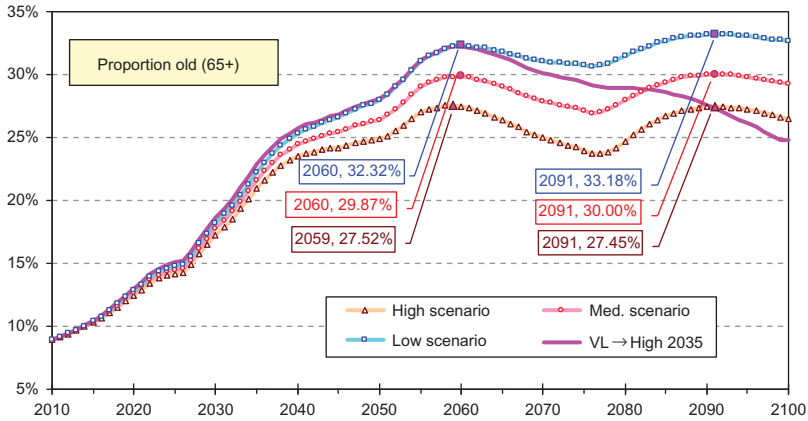


Figure 5. Comparison between the scenarios in the proportions of senior-aged population over 65 years old from 2010 to 2100.

population aging will occur at around 2060. After it reaches its peak, this situation will retain a very high level with only a number of fluctuations at the most. Therefore, different from the indicator of total population, the expression ‘peak period’ can hardly be used to describe the indicator of senior-aged population proportion in the high, medium and low scenarios. This situation is in fact determined by the current population age structure or, in other words, by China’s population development process in the past. The population born in a series of baby booms during the four decades from 1950 to 1990 is now basically still in the stage of working age. The earliest groups among them are just about to enter senior age. The majority of the population will enter senior age successively in 40 years in the future. Therefore, this determines that the burden of senior-aged population will see a stage of quick expansion in the following 40 years. This is a new characteristic in a new period of China’s population development. It is also the most important one among all the priorities that must be addressed in population decisions in the future. People will make historical mistakes if they overlook this situation.

Figure 5 also indicates the lower the fertility rate, the higher the degrees of aging. This reveals that the decisions on whether to make adjustment to fertility policies or not, to what extent such adjustment should be made and when such adjustment will be made will result in greatly different proportions of senior-aged population. It must be pointed out particularly that the difference between the results of the high and low scenarios of fertility rate is not just two percentage points as some demographers have asserted. The high scenario here sets an assumed fertility rate far lower than replacement level and that in low scenario is already notably higher than the actual fertility rate. So although the high and low scenarios have both assumed that fertility level can be raised within the recent period, the difference in their fertility rates has already resulted in five percentage points difference between the maximums of the senior-aged population proportion after the middle of the twenty-first century (respectively 27.5% and 32.3%). The reason that these demographers still believe that the raise of fertility rate will do nothing to population aging might be very likely because they are still making population forecast on the basis on the assumed fertility rate of 1.8. Therefore, the difference that they have seen is only the difference between the high and medium scenarios in Figure 5 so that they severely underestimate the seriousness of population aging in the future.

Any complete description of China population aging prospect should at least include two sentences: whether the fertility rate rises or not, the general tendency of population aging cannot be reversed. And whether the fertility rate can be raised will determine the difference in degrees of population aging in China in the future. Therefore, if people partially stress the first sentence and neglect or weaken the second sentence, they will create an impression that population aging cannot be alleviated or it is not worth any efforts to alleviate. And such an impression will naturally seriously misguide governmental decision and social public opinion. When judging whether a difference of two or five percentage points in the proportion of senior-aged population is big enough, people should first be fully aware that the indicator only has 100% for grading. At present, China has entered an aging society, but the proportion of senior-aged population over 65 years old is only 10%. The difference in degree here is the difference when China enters the severe stage of population aging (above 25%). This is of very special meaning. Of course, the true problem does not lie in which percentage point will become the last straw that collapses the camel's back but whether the quicker reduction of population size in the future deserves the price of a more serious problem of the population issues of too few children and over-aging.

Because, in the scenario of delaying the raise of fertility rate, the current low fertility rate of less than 1.5 as revealed in the SNPC will be retained before the scheduled raise of fertility rate, the proportion of senior-aged population in this scenario was even slightly higher than that in the low fertility scenario in the first half of the twenty-first century. Notably, this scenario displays an obvious dropping tendency different from other scenarios in the second half of the twenty-first century. However, this does not mean that the approach of raising fertility rate 30 years later would have any magical power to ease population aging. Because the extremely low fertility rate that will be retained first will result in very high over-aging in the middle of the twenty-first century, and then the raise of fertility rate will alleviate the already very high over-aging situation. In fact, according to the stable population theory, this scenario of later fertility rate raise will result in an aging level completely the same as that in a high scenario in long-term future. So this scenario only has the benefit of reducing total population size and it has no good in lowering over-aging.

Figure 6 reveals what a situation that a scenario of raising fertility rate 30 years later would bring about. The total dependency ratio before 2035 will be really the lowest in

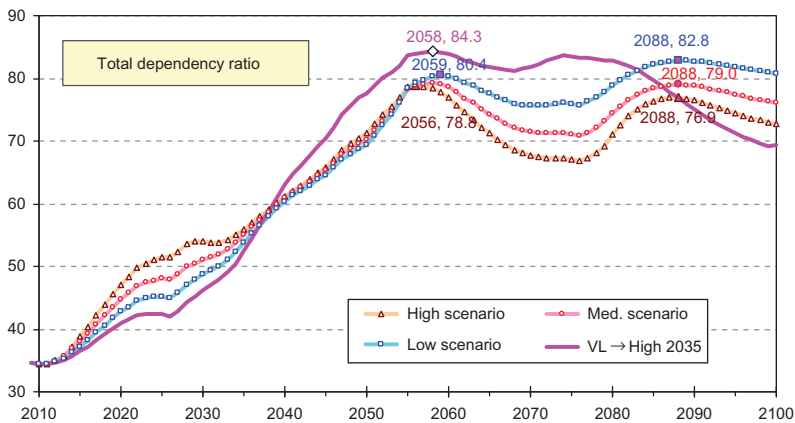


Figure 6. Comparison between the scenarios in overall dependency ratio of the population from 2010 to 2100.



this scenario. However, because birth number will increase at a period of worsening over-aging, the growths on the two ends will push the total dependency ratio to a shockingly high level. In recent years, population research and publicity partially over-exaggerated the seriousness of the problem of ‘two heavy ends’ in the early stage in the raise of fertility rate. But in fact, to increase birth number as early as possible is to supply fresh forces in the future to ease more serious over-aging. If the increase of birth number is delayed to 2035, the new born population in this increase will be underage population before 2050. They will not ease the over-aging at that time but increase social burden. Therefore, the scenario of raising fertility rate later will in fact miss the right time and opportunity and cause a situation that the resources to be ripe in the future cannot be used to resolve the pressing issue at present. Figure 6 shows that the total dependency ratio in the scenario is too high during the period from 2040 to 2080. Therefore, the scenario of delaying the raise of fertility rate is totally inadvisable.

Figure 7 reveals more clearly the population age structure in various scenarios with a visual presentation of population pyramid in chronological sequence. In the comparison among various scenarios of fertility rate, it can be seen that the population in the high scenario approaches stationary population by the end of the twenty-first century. Population

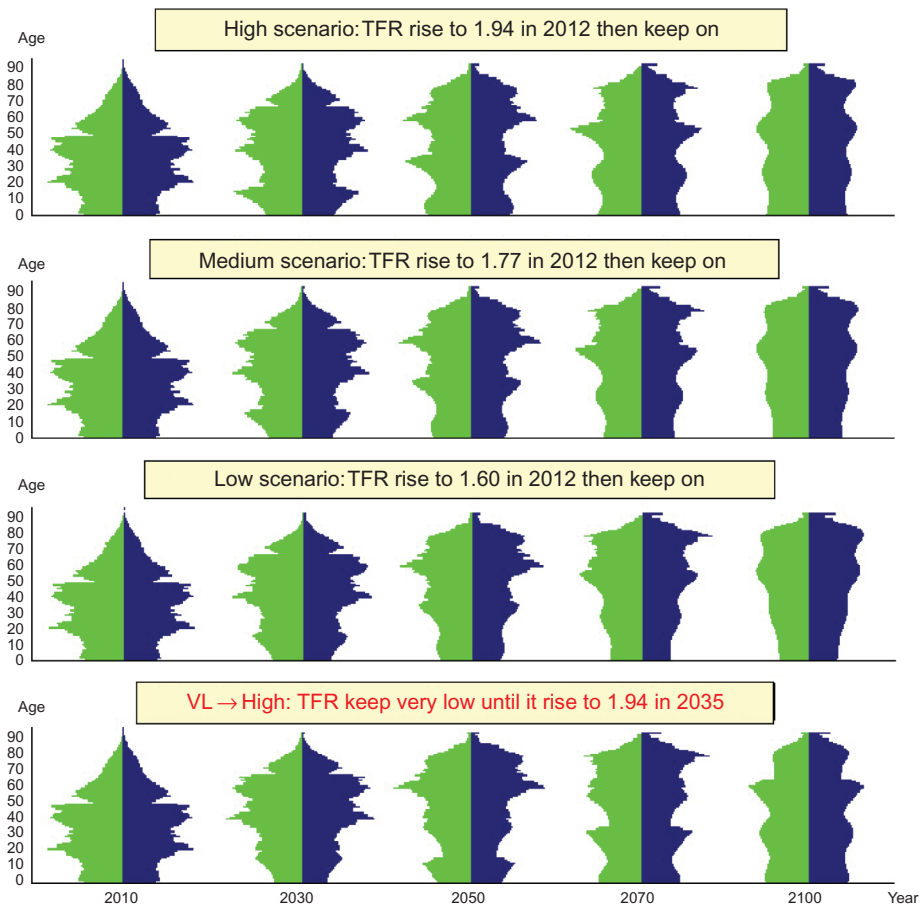


Figure 7. Population pyramid simulations for the scenarios from 2010 to 2100.

quantity and structure only show small changes in this case. And in medium and low scenarios, because fertility rate is kept far lower than replacement level over a long period of time, the population in these scenarios is closer to reductively stable population by the end of the twenty-first century. Namely, they will not end population change but leave the task of raising fertility rate to replacement level to the further future. The similarity in the high, medium and low scenarios is that they all raise fertility rate more or less as early as possible. So the new born population during a dozen years will start to enter working age by 2030 and there will be more working age population in 2050 when population aging becomes very serious. In comparison, no action is taken by 2030 in the scenario of delaying the raise of fertility rate so that the new born population will still be underage population in 2050 and thus the total dependency ratio will be exceptionally high in the middle of the twenty-first century, which means that there will be a serious 'two heavy ends' problem.

The scenarios that raise fertility rate as early as possible not only provide more labor force for the social and economic operations in the future but also provide more fertile women to the population reproduction in the future. Figure 7 indicates that the high, medium and low scenarios all form a large or small rise at the bottom of the population pyramid in 2030. In fact, it is because they employ the fertility potential of fertile women in the population pyramid in 2010 at different degrees under the current extremely low fertility rate. This 'turns around' more or less the population tendency of too few children that has already lasted for 20 years. However, the scenario of delaying the raise of fertility rate regards such 'turnaround' as a 'birth peak' unfavorable to population development in the future and tries to avoid it, and eventually miss the best opportunity to adjust fertility rate. When the moment of the best timing for adjusting fertility rate arrives, the population of fertile women will have already dropped to a terribly low level. What's more, another heavy burden of the rising proportion of underage population will have to be shouldered in the subsequent period of severe over-aging. In the comparison of the population pyramids of these four scenarios in 2050, we find that there is smaller working force to shoulder the burden of the 'two heavy ends' situation. This is the huge cost of delaying the raise of fertility rate by 30 years. Similarly, the scenarios of delaying the raise of fertility rate by 20 or 10 years are of the same problem. The only difference is to what extent.

In sum, the 'two heavy ends problem' in population burden is inherent to the population change caused by emergency-brake family planning policy and very strict fertility policy. It is unavoidable. If people still hesitate to make relevant adjustment for the reason of a huge population today when China's population has entered a stage of low fertility rate for 20 years, there will be population over-control and the family planning policy will end up far from its original goal. The above population forecast and analysis indicate that delaying the raise of fertility rate to replacement level will not truly avoid the problem of 'two heavy ends' population burden. It only postpones the population burden into the future so that the problem of China's population over-aging will continue to deteriorate when it is already in its worst situation. And what it pays is only a superficial benefit in total population size in the first half of the twenty-first century and in the quantity and proportion of senior-aged population in the second half. Such countermeasure suggestion is unfavorable for China's population to turn to long-term balanced development.

It needs to be reiterated that the population forecasts in the present study are all made under the premise that 'fertility rate can be effectively raised once it is necessary'. But many relevant studies at present already reveal that the ideal number of children in public opinion is far lower than replacement level. A large number of couples who meet the conditions for having a second child voluntarily give up their opportunity of birthing the second child. There is also a rise in proportion of couples who want no child. Therefore,

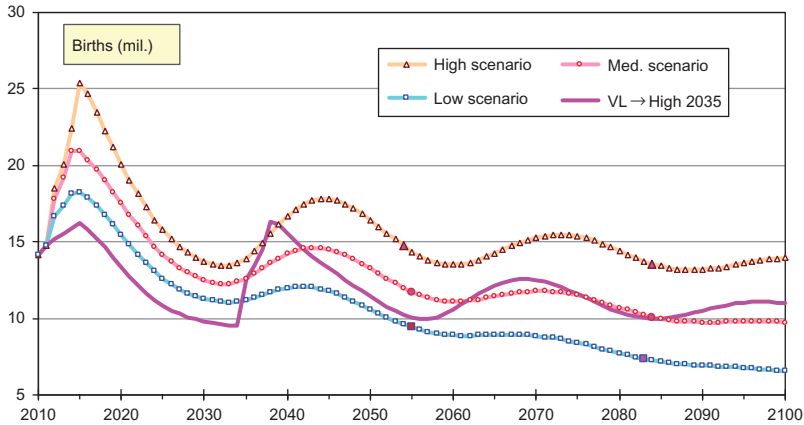


Figure 8. Birth number simulation for the scenarios from 2010 to 2100.

the above hypothesis might depart from the reality even at present, let alone in the situation when a very low fertility rate is retained for 30 years more.

Nevertheless, the results of birth number forecast in Figure 8 can still provide some useful information. Due to the requirement of a strict fertility policy, there is a large population of fertile women with only one child at present. In the figure, the high, medium and low scenarios start to raise fertility rate gradually in 2012. Although the second birth progressive proportion in these scenarios will all be obviously lower than 100%, the influence of fertile women's parity structure will result in conspicuous birth heaping. And such birth heaping will form an 'echo' of certain magnitude between generations. So it is also an important special research subject that proper measures should be adopted to control the process when fertility rate is raised so as to level peaks and valleys and avoid the huge rises and falls in birth number. But it is not the subject in the present article. In fact, nearly twenty demographic scholars jointly signed in 2004 on a suggestion for adjusting fertility policy. They also proposed specific countermeasures for this issue such as 'to implement by population category' on the basis of personal conditions and 'to gradually lift family planning policy in different regions'. With these measures, birth heaping can be effectively leveled when fertility policy is being adjusted (Research Group of the Study of China's Fertility Policy in the 21st Century 2010).

It needs to be pointed out that the main purpose of leveling birth heaping is to keep the birth number in different years in a relatively even pattern rather than to reduce the total birth number in the entire period. In other words, it aims to keep balanced population structure rather than to reduce peak population. So this practice is a specific tactic subordinate to the general strategy to resolve too low fertility rate and over-aging. The scenario of delaying the raise of fertility rate in Figure 8 reflects a totally different strategic purpose. It follows the strategy that the smaller birth number the better, and the smaller the total population the better. In fact, it wants to stop the fertile couples that have only one child at present to have another child. As discussed above, this scenario completely overlooks that the main risk in China's population development at present which are too low fertility rate and the population issues of too few child and over-aging caused by such low fertility. The birth number that this scenario tries to prevent is in fact the population that China depends on in the future to cope with over-aging and turn to balanced population development. Besides, this scenario will cause even bigger number and proportion

of senior-aged families with only one child in China's aging process in the future. It can also be seen from the figure that this scenario cannot automatically avoid the problems of birth heaping and fluctuation in the future. Further measures are necessary under such a scenario. This indicates that the radical cause of the occurrence of birth heaping during fertility rate adjustment is the problem that the proportion of fertile women with only one child is too large among all the fertile women. It is not one of timing adjustment. In sum, to raise fertility rate as early as possible or to continue to retain very low fertility rate reflects the argument on basic outlooks and evaluation criteria in population development.

#### **4. Current judgment and decision on population will determine how to respond to over-aging issue in the future**

Actual survey data have already revealed for many times that birth number level and fertility level were seriously overestimated, that population forecast in the past obviously underestimated the process of population aging in China, and the goals in population development plan failed to be achieved repeatedly by large gaps. Out of habitual way of thinking, these gaps were covered up as birth report omissions. People failed to make careful and in-depth study on new phenomena and issues in a new period. They even failed to correct those mistakes that already looked rather obvious. The SNPC data proved once again that the fertility rate was too low over a long period of time and revealed the aggravation of the population issues of too few children and over-aging. Besides, the SNPC data were also an important test of results in previous population research. They can fully reflect the problems present in the population researches in the past.

The real serious problem in the deviated situation of the population researches in the past does not lie in that their estimations have larger biases, but these biases mislead in development direction. They fail to timely reveal the main conflict and task in population development in the future so that people can timely formulate decisions to correctly respond to and solve these conflicts. In fact, people delay in solving these problems consciously or unconsciously so that the conflicts continue to worsen. The present study reveals on the basis of the SNPC population forecast and simulation that, as long as fertility rate does not exceed replacement level in the future, China's total population size will be in a dropping course in the future. China's population will reduce by several hundred million within the twenty-first century. However, population over-aging will become a serious problem in the future. The proportion of senior-aged population and the total dependency ratio in China's population will become unprecedented in human history. Therefore, the main conflict in China's population in the twenty-first century has already turned from the problem of total population size to the problem of population age structure. Although China has just entered aging society, people already start to feel the impact and they will have deeper and deeper feelings to this major change. This situation will not change at people's will. Population development always shows the characteristics of long periods and large momentum. We must become aware as early as possible of the changes in different stages of population development, of the changes in the main conflicts in population issues determined by those changes and also of the changes of the goals and tasks of population work.

China's population has entered lower fertility rate for a period of 20 years. The confusion about fertility rate has also lasted for nearly 20 years. China's population development is now at a very critical moment. The drastic fertility decline in the past results in a very abnormal population age structure in China. The rapid population aging must be addressed earnestly and practically so that China's population can turn to a sustainable and balanced

development path. It must be pointed out that because people are confined by the biases in the publicity of population theory and the estimation and forecast of population in the past, they have failed to achieve a clear understanding on the above-mentioned important population change. The right timing and opportunity has been missed because people fail to make the correct response and take proper countermeasure. This will result in the population issues of excessive too few children and over-aging in the future and endanger China's long-term balanced population development and the continuous social and economic development, and also the rejuvenation of the Chinese nation. The results of the forecast and simulation in various scenarios made on the basis of the SNPC data can prove that to change old population outlook as quickly as possible and to formulate effective decisions to raise fertility rate are the key to respond to population over-aging. If we continue to overlook this true population risk of over-aging and take an attitude of inactivity or a wrong countermeasure to aggravate this population conflict, historical mistakes would occur.

China's current population problem is a historical issue. However, whether China can handle its population issue well in the future, particularly the issue of population aging, depends on the judgments and decisions made at present.

## Notes

1. This simulation was completed before the publishing of all the SNPC data. The SNPC population structure was estimated on the basis of the published population pyramid. See Guo Zhigang (2011) for technical details.
2. This series includes yearly survey data and also some other statistics from population census as well as the 1% sampling surveys.
3. The Statistical Communiqués of the National Economic and Social Development of the People's Republic of China started to provide information on the proportion of senior-aged population over 65 years old from 1995 and that on the proportion of senior-aged population over 60 years old from 2006.
4. There are no content about population aging and no population forecast data in this respect found in the text of the population plan for the Eleventh Five Year Plan.
5. CNSPD Research Group (2007).

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