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Can Adjustments of China's Family Planning Policy Truly Relieve Pressures Arising from Population Aging?

Shiliang **Zhao*** and Yang **Gao****
Tianjin University of Finance and Economics

Abstract

The family planning policy has been implemented in China for three decades and leads to the rapid population aging. At the end of 2013, the Chinese government announced a significant adjustment to the family planning policy, which allows couples to have two children if one spouse is an only child. However, people still hope for "further relaxation" of the restriction: allowing couples to have two children without any limits due to increasing concerns that the rapid population aging will produce a heavy economic burden on families and society, and have a big impact on economic development of the whole country. This paper aims to investigate whether further loosening the family planning policy can truly relieve the pressure from population aging based on the scenarios that the second child could be allowed in different stages. Results indicate that the adjustment of the family planning policy at current stage may not efficiently ease the social and economic burden brought by population aging, but rather worsen population burden to China's economy over the long term. In addition, the cumulative dependency ratio over 50 years also suggests that it is not an economically appropriate option to adjust current fertility policy. In response to the upcoming severe aging, accelerating the construction of a sound old-age social service system may be more important than the fertility policy adjustment.

Keywords: *China, population aging, total fertility rate (TFR), family planning, population simulation*

JEL Classification: *J11, J13, J14, J18*

1. Introduction

Since the1980s, the family planning policy in China has been widely promoted and implemented (Festini and Martino, 2004), which successfully controls rapid population growth and provides a good population environment for economic development. After decades of efforts, the development mode of Chinese population has achieved a historic transformation by around 2000, from high birth, death, and growth rates to low birth, death, and growth rates (Merli and Smith, 2002; Yardley, 2008). Since the beginning of the new century, the low fertility level is not only sustained and consolidated, but has also moved to ultra-low fertility level (Retherford *et al.*, 2005). However, the rapid transition from high to low fertility rate also leads to rapid population aging (Isabelle, 2002; Chen and Liu, 2009; Cheng and Hu, 2011).

China's population aging has distinguishing features compared to other countries (Li *et al.*, 2011). The first, the process of population aging and economic development occur simultaneously in China. However, for other aging countries, population aging happens after they have had a highly developed economy and entered a stable period. In other words, aging after getting rich is the feature of population aging in the developed countries. On the contrary, aging before getting rich is the feature of China's population aging. The second, the aging process in China is extremely fast. Because the transition from high to low fertility rate occurs under government intervention and enforcement in China, the whole society maintains a highly consistent action and rarely fluctuates. As a result, the rapid fertility rate decline inevitably leads to extraordinarily rapid aging. The third, China's aging population occurs on a large population base. According to the sixth nationwide population census in 2010, the total population for mainland China exceeded 1.3 billion. That means Chinese society will also be saddled with a heavy

aging population burden under the situation of large population, which has put tremendous stress on environmental resources (Feng, 2005).

Considering the rapid and irreversible development trend of China's population aging and current stage of economic development, there has been increasing concern whether rapid population aging on such big scale and high speed will produce a heavy burden on the society, and have a big impact on economic development of the whole country and social stability (Vaupel and Zeng, 1991). Up to now, without the benefit of learning from the experience of other countries with similar situation, the Chinese government must find out an appropriate way to solve the population aging problem on her own. Regulation of fertility levels with proper strength at appropriate time may be the most intuitive and acceptable solution. Currently, many China's academics have proposed the need to adjust the family planning policy in order to relieve future potential aging pressure. Various views on the family planning programme were put forth by researchers at a conference on "China's population and economic development strategy forum" held in Peking University in June 2012. Zeng proposed that China should adjust current one-child policy, starting by introducing two-child and late child bearing policy, then gradually decreasing the child-bearing age limit of the second child birth, and finally allowing the second child without any limits after 2015. Cai was of the view that the reform of the family planning policy is expected to be more "people-oriented" and "reproductive rights should be returned to the people". However, Zhai asserted that two-child policy may only slow the aging process and speed, but will not solve the aging problem. He thought the fundamental policy to solve the problem of aging is to establish a sound and more comprehensive social old-age security system and social service system for old people (He, 2012).

In fact, the Chinese government has felt the pressure of aging and been trying to solve this problem. At the end of 2013, the Chinese government announced a significant adjustment to the family planning policy: allowing couples to have two children if one spouse is an only child, which was expected to be implemented in 2014. However, Chinese people still hope that the fertility policy can be further relaxed

to allow all families to have two children without any limits, considering the huge pressure of household-centred elderly care in 4-2-1 families. Currently, most of the elderly in China are still cared for by relatives, and only children from single-child parents face the 4-2-1 phenomenon: when the child from a 4-2-1 family reaches working age, he or she would have to care for two parents and four grandparents in retirement. Apparently, increasing fertility rate may relieve population aging, but children cannot provide much substantial support for household-centred elderly care before they reach working age. Those lead to two question arising: can the fertility policy adjustment truly relieve the pressure arising from population aging? How will that influence the population structure in the future? Answering those questions is important for the government to make the appropriate population policies.

Obviously, a sound population policy should be based on the accurate forecast for the future population trend. Currently, demographers have come to the similar conclusion on China's future population trend: population growth rate will slow down, the low fertility level can be maintained, and very serious population aging problem will occur. However, generally, most of those forecasts are only conceptual, and few studies are based on model-based calculations and numerical simulations.

In their studies on aging trends and possible policy adjustments in the early1990s, researchers had suggested that in order to avoid overpopulation in the future, there is a need to consider the appropriate degree of aging and fertility that is neither too high nor too low (Zeng and Vaupel, 1989; Zeng, 1991, 2001). According to Zeng, the appropriate total fertility rate in rural areas should be gradually decreased from 2.5 in 1987 to the replacement level in 2050, while for urban areas, gradually decreased from 1.9 in 1987 to 1.7 in 2050. On the basis of Zeng's study, Li projected the population size over 100 years under four fertility rate scenarios (Li, 1997). The results indicate that two of them are thought as appropriate fertility plans, which may avoid both rapid population growth and high degree of aging. Those are "two-child policy adjustment plan" (rural women are allowed to have a second child; urban women may also have a second child after 2000) and "late

child bearing and intervals between two child births plan" (on the basis of "two-child policy adjustment plan", delaying child-bearing age and leaving longer intervals between two child births). In addition, the latter is a better choice, with which population is expected to peak at 1.486 billion in 2030, and then gradually decline to 1.354 billion by 2060; the percentage of the aging population (65 years and older) will be 27.3 per cent in 2060. Li thought that China's population aging is mainly caused by the rapid decline in the fertility rate, which is closely associated with the strict family planning policy. Therefore, he proposed that the fertility policy should be adjusted from controlling population size only by low fertility rate to take both low fertility rate and regulation of population structure into consideration.

Since the beginning of the 21st century, the population situation in China has been undergoing great changes. Firstly, the drop in the fertility rate is much faster than originally expected by scholars. According to data from the sixth nationwide population census in 2010, the total fertility rate of women of child-bearing age is 1.1811, 0.8821 for urban areas and 1.4375 for rural areas, which is already far below the replacement level (Zhao and Chen, 2011). As urbanization increases and more farmers move to cities for jobs, low birth level has not only been consolidated, but also may be further continued. Secondly, another important change of demographic situation is the serious distortion of the sex ratio at birth (Cai and Lavely, 2003; Ding and Hesketh, 2006). The new born girls are 20 per cent less than boys, which means that with the current low fertility rate, the number of women of child-bearing age in the future will be less[1].

It is widely known that the complexity of population problems comes from a lag between cause and effect which may be 20 to 30 years. That requires the government to be more prudent in policymaking and scholars to make more forward-looking research. Based on the features of China's demographic changes in the 21st century and using numerical simulation as a tool, this paper does medium- and long-term simulation for several possible population policy adjustments and provides explanations about the current hot spot issues of population policies.

2. Model and Assumption

2.1. Model

In this paper, the cohort-component method is used for population estimation. This method was first introduced by Notestein to perform a global population projection in 1945 (Notestein, 1945). Since then, it has become a widely used standard method of projecting population and has remained essentially unchanged (O'Neilletal, 2001). Briefly, the initial population is grouped into the cohorts defined by age and sex. According to the assumed fertility, mortality, and migration rates, the population of each age- and sex-specific group is updated as the projection proceeds. For example, each cohort survives move into next age group based on the age-specific mortality rate. The size of new born group is obtained by applying the age-specific rate to the female cohort of reproductive age and then divided into males and females according to the assumed sex ratio.

Let P_{sx} denotes the population size by sex and age, where s and x represent sex (male or female) and age (year), respectively; F_x denotes the fertility rate of women at age x; D_{sx} denotes the sex and age-specific mortality rate; r_s denotes the ratio of male to female at birth; t denotes the time in years. The population at age x in current year equals the population at age x-1 in the last year subtracting the death population at age x-1. The new born population in current year equals the female population of reproductive age multiplied by the fertility rate at that age. Generally, the model can be expressed as follows:

$$\begin{cases} P_{sx}(t+1) = P_{s(x-1)}(t) \times (1 - D_{s(x-1)}(t)), x \in (1, X) \\ P_{s0}(t+1) = r_s \times P_{sx}(t) \times F_x(t) \end{cases}$$

At time t, the total population can be expressed as:

$$P = \sum_{s} \sum_{x=0}^{X} P_{sx}(t)$$

2.2. Assumption

In order to simulate the impact of population policy adjustment on population trend, assumptions are made as follows:

1. Three assumed time scenarios for the fertility policy adjustment are the year 2015, 2020 and 2025. The fertility policy adjustment means that the government begins to implement "two-child policy", allowing couples to have a second child without any limits.
2. Once the government implements "two-child policy", people will reduce their boy preference and the incentive of female baby abortion. Therefore, the sex ratio at birth will return to the natural level, about 106 male babies per 100 female babies.
3. Assuming that the total fertility rate will increase by one unit once the government implements "two-child policy". The exact value of the increase of total fertility rate is unknown, but we can guarantee that the true values do not exceed our simulated results based on the assumption of one unit increase for the total fertility rate. In addition, we further assume that one unit increase for the total fertility rate is contributed by the females between age 25 and 35 according to their current age-specific fertility rates.
4. Three levels at which people make responses to the fertility policy adjustment by changing their reproductive behaviours are assumed for each time scenario.
   (a) Low level: high fertility rate will only maintain for 5 years, and then decrease linearly until reaching the original level after 5 years. For example, if "two-child policy" begins in 2015, the total fertility rate will increase one unit and stays at that level until 2020, and then decrease linearly back to the level of 2015 in 2025. That is, policy effects disappear and people voluntarily choose to have just one child.
   (b) Middle level: high fertility rate will continue for 5 years, then decrease linearly, and go back to the original level after 10 years.
   (c) High level: high fertility rate will continue for 10 year, then decrease linearly, and go back to the original level after 10 years.

Nine simulation models are obtained by combining three time scenarios and three response levels (Table 1). For example, Model-1 means the Chinese government implements "two-child policy" in 2015 and people make responses at a low level. Other models may be deduced by analogy.

The issue of international migration is not involved in the model analysis. According to the 2013 report by the World Bank, net migration in China is around 1.5 million during the period of 2009-2013 (0.3 million each year), which only accounts for 0.02 per cent of the population (World Bank, 2013). Even if the scale increases 50 times after 50 years, the net migration will still only account for 0.1 per cent of total population. As a result, the issue of international migration does not affect the predicted results.

In addition, the simulation based on current new population policy (allowing couples to have two children if one spouse is an only child) is not included in this study because there is no reliable official statistical data about the size and distribution of families which meet the requirement of the new policy. Wang (2012) estimated the number of women of reproductive age, who are an only child. According to his calculation, there are 29 million, which only accounts for 7.96 per cent of women of reproductive age. Obviously, the influence of the current new policy is much less than the assumed policies in this paper and the result and conclusion of the latter can cover the former.

Table1 The Description of Models

	Maintaining for 5yrs Declining for 5yrs	Maintaining for 5yrs Declining for10yrs	Maintaining for 10yrs Declining for 10yrs
In 2015	Model-1	Model-2	Model-3
In 2020	Model-4	Model-5	Model-6
In 2025	Model-7	Model-8	Model-9

3. Results

3.1. The Population Trend

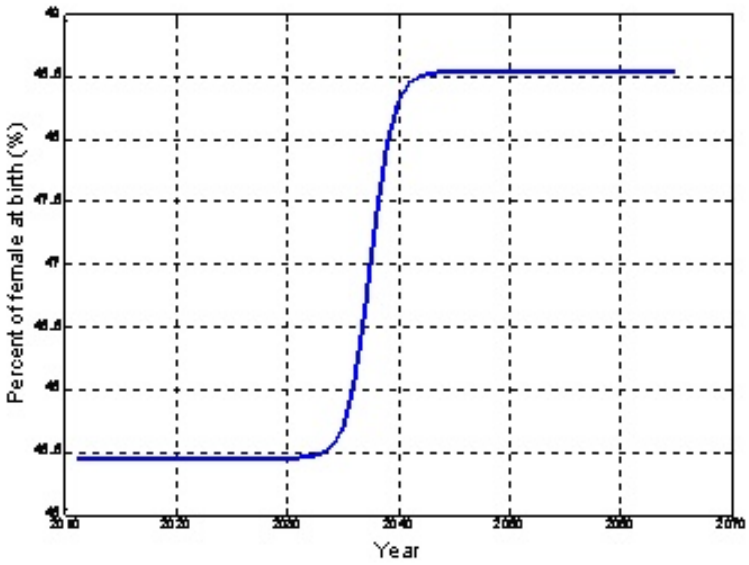
3.1.1. Reference population trend

It is necessary to predict China's population trend without the fertility policy adjustment (the reference model) before testing any policy scenario. In this paper, according to the sixth national population census data, the total population (1,339,724,852) by sex and age is used as the calculation basis. Additionally, other data such as fertility rates for women of reproductive age, mortality rates by sex and age and the sex ratio at birth come from *China Population and Employment Statistics Yearbook* (2008, 2009, 2010). Because data in that Yearbook are obtained via the annual 1 per cent population sample survey, in order to reduce errors, average values of 3-year statistical data (2008-2010) are used for model calculations.

In this paper, we simulate and predict population trend in a period of 55 years, which is from 2010 to 2065. In such a long period, some changes may occur to affect population growth and human behaviour. For example, the innovation in biomedical technology may reduce mortality rates at all ages and extend life span. In addition, people may change their reproductive behaviours as well. However, in order to simplify the calculation process, this paper does not consider the above situation, and assumes that the fertility and mortality rates in the next 55 years will keep the same values as the averages of 2008-2010. Meanwhile, we allow them to fluctuate around their mean values. Assuming F_x and D_{sx} represent the average fertility rate and mortality rate in 2010, the distribution of the fertility rate (F_x) and mortality rate (D_{sx}) is as follows:

$$F_x(t) \sim N(\overline{F_x}, 0.01)$$
$$D_{sx}(t) \sim N(\overline{D_{sx}}, 0.01)$$

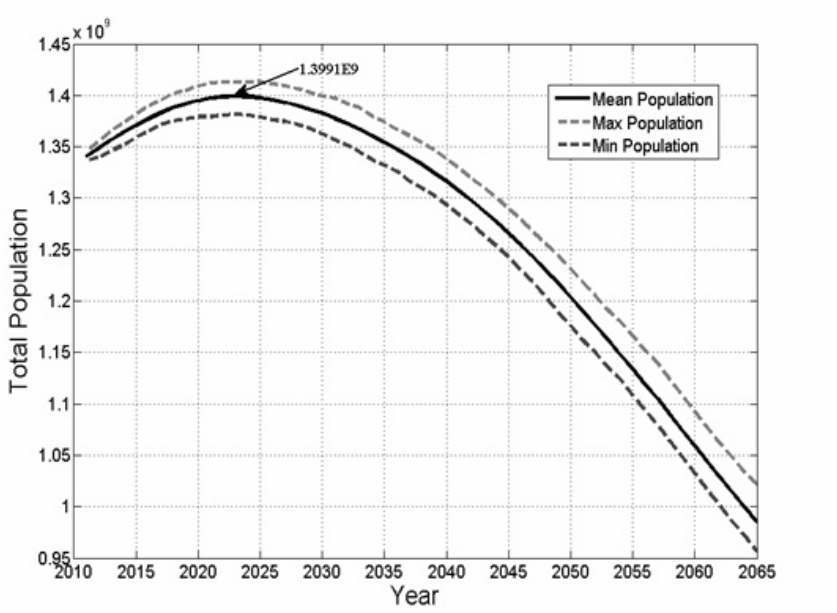
Figure 1 The Proportion of Baby Girls in Total Number of Babies over a Period of 50 Years



As mentioned earlier, the current sex ratio at birth is seriously distorted in China, up to 120 boys to 100 girls. This paper assumes that in the study period (55 years), the sex ratio at birth will gradually return to a normal level. Figure 1 shows the proportion of baby girls in total number of babies at birth. It indicates that the trend in sex ratio at birth follows a logistic curve, and high sex ratio at birth will still continue for 20 years and then rapidly decline to the normal level within 10 years.

A thousand times of simulation are run to get the population trends over a period of future 55 years, and average, maximum and minimum values are calculated as well. The results show that China's population will continue to grow until 2024 and then gradually decline. It is expected that the average population will peak at 1.399 billion with a maximum of 1.417 billion and minimum of 1.383 billion. That is consistent with Wang's estimation (Wang, 2012), in which, China will

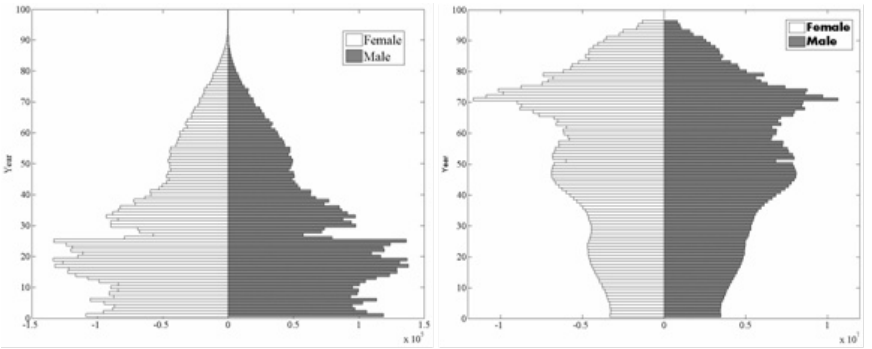
Figure 2 Population Trends of the Reference Model



reach its population peak between 2023 and 2025 with an average of 1.392 billion and maximum of 1.41 billion without the fertility policy adjustment. By 2065, the average population is 0.99 billion with a maximum of 1.025 billion and minimum of 0.955 billion (Figure 2).

Excluding the adjustment of the family planning policy, there are two factors that likely affect the population in the future. One is the further extension of life span, which means a decrease in the mortality rate. As a result, the actual population size may be slightly higher than what we observe in the reference model. The other is the voluntary reduction in the fertility rate caused by the change of women's socioeconomic status, resulting in the actual population maybe slightly lower than the observed in the reference model. However, considering that the mortality rate in China has been very low comparing with other developing countries, a significant decline is not likely to happen. An

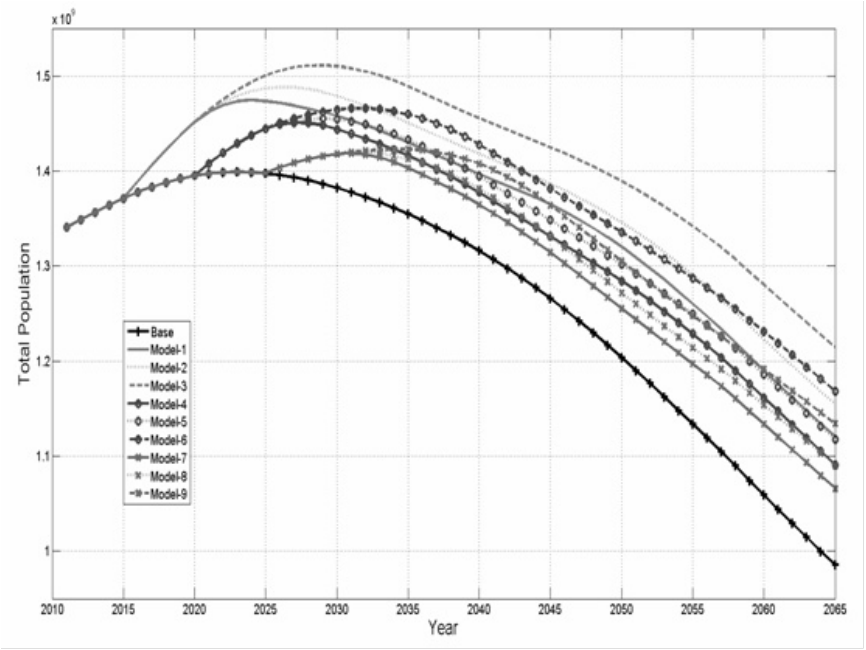
Figure 3 Population Structure in 1981 (left) and 2065 (right)



increase in life expectancy is also limited before remarkable advances come in biomedical technologies. Additionally, given current low fertility status[2], a further decline in the fertility rate caused by women's willingness is unlikely to happen. Therefore, the actual population size is very likely between maximum and minimum in the reference model. In general, without the policy adjustment, China's population will continue to increase until 2024, with a peak value between 1.383 and 1.417 billion. By 2065, China's total population will drop to a value between 0.955 and 1.025 billion, which is approximately equivalent to the population size during the period 1978-1983. However, population structure in 2065 will be much different from the early 1980s. Figure 3 shows the difference of population structure between 1981 and 2065, and it is obvious that the population structure will change from a young-age type in 1981 to an old-age type in 2065.

Given the total population from the sixth national census as reference, without the family planning policy adjustment, China's population will continue to increase by about 60 million, and then gradually decline. The pressure from the rapid population growth rate from which the Chinese government has suffered for several decades will gradually be relieved in the future. However, China's total population will still be around a billion by 2065, which keeps the per capita possession of natural resources in a low level compared with other

Figure 4 Population Trends in Different Simulation Models



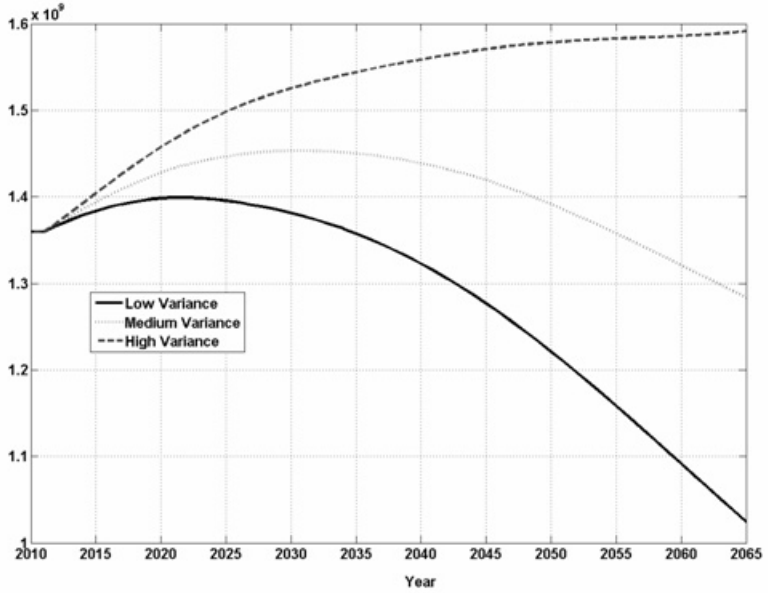
countries. The Chinese government will still face the huge challenge of providing adequate food, fresh water and healthy environment for such a huge population and become more worried about how to meet their demands for high-quality life.

3.1.2. Population trends in nine simulation models

Computer simulation is carried out in accordance with various models in Table 1. It should be noted that for all of simulation models, allowing couples to have a second child reduces people's motivation for sex selection at birth greatly. Therefore, we set the sex ratio at birth at 106:100 (106 boys for every 100 girls) in the simulation.

Figure 4 shows total population trends of different simulation models. Of them, the curves with no marker, with diamond marker and

Figure 5 Population Trends with Different Fertility Variances (United Nations)



with "x" marker represent population trends for implementing the fertility policy adjustment in 2015, 2020 and 2025 years, respectively. The curve with "+" marker represents the population trend of the reference model. For each of these curves, solid, dotted and dashed lines represent low, middle, and high response levels, which are corresponding to the high fertility rate maintaining for 5, 5, 10 years and declining for 5, 10, 10 years, respectively.

Let us make a comparison with the United Nation's results (Figure 5). The comparison between Figure 4 and Figure 5 shows that the results in our base model is consistent with that of the United Nations in the low variance model, which indicates that our model estimation is reliable and parameter selection is reasonable. In addition, in their population forecasting methods, the United Nations and other international agencies do not take into account the adjustment of China's family planning policy and only use different variances to express uncertainties. On the

contrary, different assumptions of the fertility adjustment are involved in our models. So our population estimation and prediction are in a more targeted manner and avoid the divergent results which happen in the United Nations' high variance model.

Under the assumption of adjusting the family planning policy in 2015, if the high fertility rate maintains for 10 years and gradually drops for 10 years (a dashed curve with no marker), the total population will rapidly increase in the short term with a peak at 1.54 billion, and then show a slow downward trend. By 2065, it will still stay over 1.2 billion. If the high fertility rate only lasts for 5 years and gradually drops for 5 years (a solid curve with no marker), the total population will reach a peak at 1.47 billion. By 2065, it will decline to about 1.12 billion. In other words, adjusting the family planning policy in 2015 makes a peak population 80-150 million and the total population 150-250 million more than those without the policy adjustment after 50 years (in 2065).

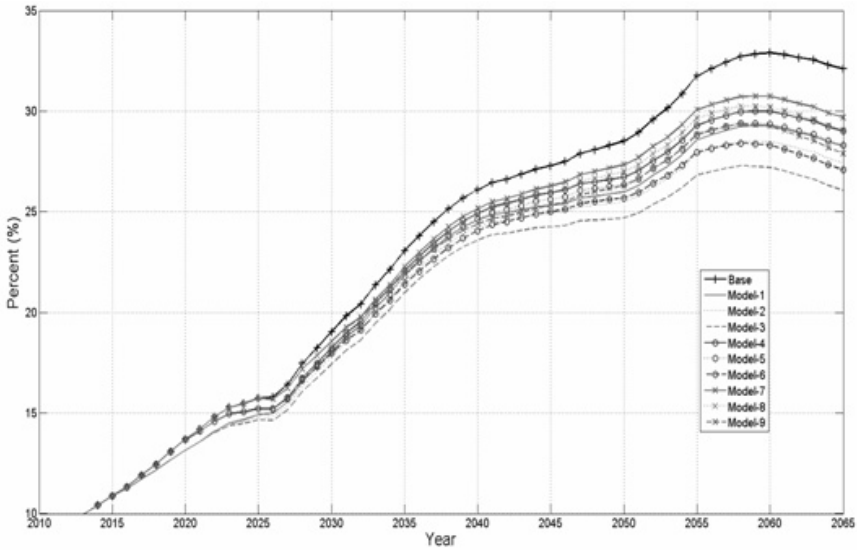
Under the assumption of adjusting the family planning policy in 2025, if the high fertility rate maintains for 10 years and gradually drops for 10 years (a dashed curve with "x" marker), the peak population will reach 1.465 billion by around 2034. If the high fertility rate only lasts for 5 years and quickly returns to the original level, the peak population will reach 1.45 billion by around 2028. Both make a peak population 60-75 million and the total population 100-180 million more than those without the policy adjustment in 2065.

In general, if the government adjusts the family planning policy in the near future (within10 years), the total population will be more than that without policy adjustment. The earlier the government makes the adjustment, the greater population increments are. Population increases of 100 million will be a huge pressure on the food, resource and environment of the whole country.

3.2. The Proportion of Elderly Population

No matter which assumption is made, the proportion of elderly population will continue to rise, and the degree of aging will become more and more serious until about 2060, when a slight decline will begin (Figure 6). The most serious degree of aging happens in the reference

Figure 6 Aging Trends in Different Simulation Models



model, in which the proportion of elderly population will reach 0.33 by 2060 (one out of three persons will be aged 60 years or older). The Model-3 shows the lowest degree of aging, in which, the fertility policy is adjusted in 2015, and meanwhile people make responses at the high level (the high fertility rate lasts for 10 years and then gradually returns to the original level after 10 years). However, the proportion of elderly population will still reach 0.275 by 2060. If adjusting in 2025 and people's responses being at the low level (the high fertility rate only lasts for 5 years and returns quickly to the original level after 5 years, Model-7), the proportion of elderly population will reach 0.31 by 2060.

Therefore, only considering to reduce the proportion of elderly population, the fertility policy need to be adjusted as soon as possible, and at the same time, the government should also stimulate people to maintain high fertility desires as long as possible. However, the cost of reducing the proportion of elderly people by that way is the increase in total population size. For example, Model-3 displays the lowest degree

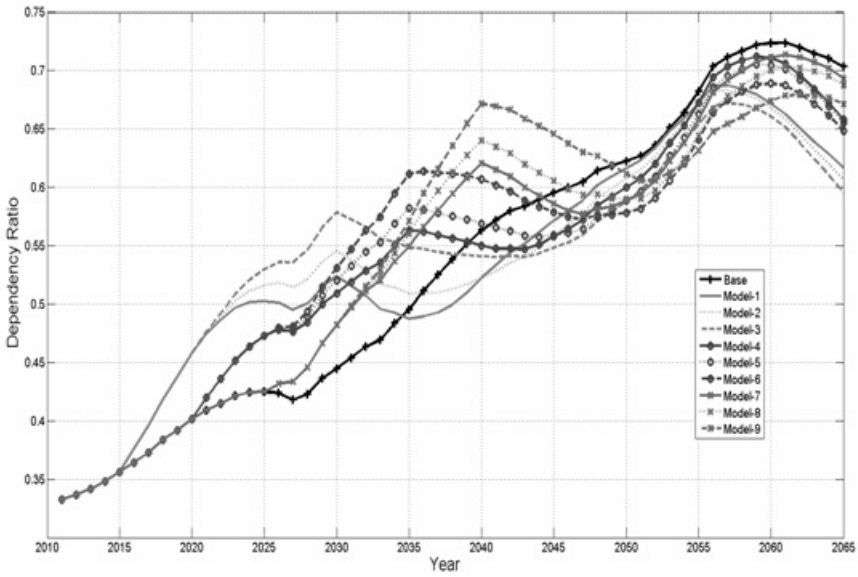
of aging, but the largest total population increments (the dashed curve with no marker in Figure 4). In essence, the solution of reducing aging by increasing population size is equivalent to constantly adding solvent to dilute solution concentration, but the precondition is that there must be a large enough container to accommodate increments of solution. The current data show that in the past few decades, the space of the population container, which consists of water, energy, arable land, and other environmental resources, is getting smaller and smaller. Of course, improving resource efficiency may endogenously expand carrying capacity of the container. However, problems about the population carrying capacity are beyond the scope of this study, and need to be stated specially with new topics. In addition, the immediate transformation of the fertility policy from maintaining a low fertility level to stimulating to attain a high fertility level (above the replacement level) breaks the consistency and continuity of policies and is undesirable.

3.3. The Dependency Ratio

The dependency ratio is the ratio of dependent population (younger than 14 or older than 64) to the working-age population (aged 15-64), which intuitively reflects the dependency burden of a society. Due to a synchronous nature of the change in the mortality rate and fertility rate over the course of the demographic transition, a decline of the dependency ratio may occur for some period of time. Many scholars believe that demographic dividend induced by a decline of the dependency ratio contributes to China's rapid economic growth (Wang, 2005; Andrew, 2005; Cai, 2009). But as time goes on, the original working-age population is transformed into dependent population and China's new working-age population is also decreasing year by year, which make the dependency ratio increasing gradually.

An intuitive solution is if there are more children born, when the severe population aging occurred, those children will just join the working-age population and make up for those elderly population gradually withdrawing from the labour market, which would partially offset the economic burden induced by population aging. However, an

Figure 7 Trends in Dependency Ratios in Different Simulation Models



unavoidable fact is that, before entering the labour market, those children also need society's long-term nurture or upbringing. So there exists a problem about the efficient allocation of social resources: would we rather carry heavier burden at present than the future or vice versa? Can what we pay now get adequate return in the future?

Figure 7 shows the dependency ratio in different simulation models. In 2010, the dependency ratio is less than 0.35, which means less than 2 dependents for every 5 workers. Without family planning policy adjustments, the dependency ratio curve is almost monotonically rising. It is expected that there will be 3 dependents for every 5 workers by 2045. The dependency ratio will reach a peak of above 0.73 by 2060, and it will even still stay at 0.7 in 2065, which means 3.5 dependents for every 5 workers.

Once the family planning policy is adjusted, the maximum value of the dependency ratio is smaller than that without policy adjustment. For example, if adjusting the family planning policy in 2015, the maximum

dependency ratio is between 0.66 and 0.68; if adjusting in 2020, the maximum is between 0.68 and 0.71; if adjusting in 2025, the maximum is between 0.67 and 0.72. Obviously, those data demonstrate that implementing the policy adjustment earlier contributes to much lower dependency ratio in the future.

However, after adjusting the family planning policy, dependency ratio curves have significant increases immediately. For example, if the policy adjustment is implemented in 2015, the dependency ratio will increase to 0.5 no later than 2023 (depending on the strength of people's responses), which means 1 dependent for every 2 workers, more than 10 years earlier than without policy adjustment. Even if the policy adjustment is implemented in 2025, time used for increasing the dependency ratio to 0.6 is also 6 to 10 years earlier than without policy adjustment. In a word, regardless of any policy adjustment assumption, the dependency ratio mostly hovers at a high level. Even if a slight decline appears, the dependency ratio will increase again soon.

Over all, figure 7 indicates that a lower future dependency ratio is at the cost of recently rapid rising of the dependency ratio. Therefore, the most appropriate time for the fertility policy adjustment is to reach the lowest total dependency ratio over the whole period.

In order to get optimal economic profits, the government should carefully make the decision on how to allocate limited social resources on the whole horizon. Should the government put more resources on raising more children at present to achieve a lower dependency ratio in the future or put more resources on accelerating current economic development so that the country will have larger wealth to support a large elderly population induced by a high dependency ratio in the future? That is a subtle balance and the key point is to estimate the cumulative dependency ratio over the whole period. Assuming the discount rate is r, meaning that the present value of expenditure used to support one unit of the dependency ratio at time t+1 equals r at time t. Then, the cumulative dependency ratio in the entire time T can be expressed as follows:

$$D = \sum_{t=1}^{T} r^{t-1} d_t$$

where d_t is the dependency ratio at time t and D is the cumulative dependency ratio.

We assume the long-run discount rate equals 0.98 (based on the current interest rate), and cumulative dependency ratios are calculated and shown in Figure 8. The figure intuitively reflects the dependency burden of a society in different simulation models. Without policy adjustment, the cumulative dependency ratio is the lowest over a period of 50 years, which also means the lowest social costs. Once the family planning policy is adjusted, based on previous assumptions, longer time for maintaining high fertility rate (e.g. for Model-3, Model-6,and Model-9, high fertility rate maintains for 10 years and declines slowly) produces higher cumulative dependency ratio. There is almost no difference on corresponding points between implementing the policy adjustment after 5 and 10 years (e.g. Model-4 vs. Model-7, Model-5 vs. Model-8, and Model-6 vs. Model-9).

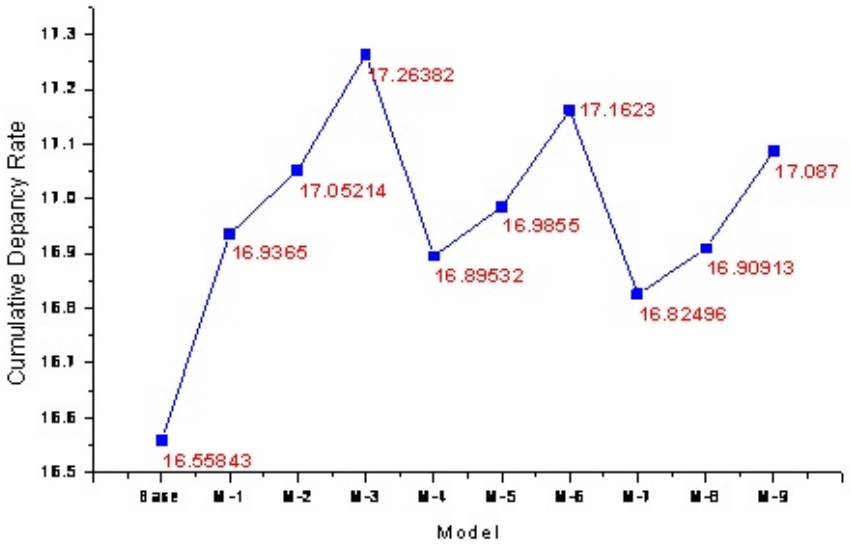
4. Conclusion

Population policies are fundamental, strategic, and have long-run effects for any country. Except for objective factors, such as population size and structure, adjustments of the population policy are also affected by moral and value judgments.

The Chinese government has been implementing the one-child policy for over 30 years and individual families' desire to have more children has not be satisfied for a long time. On the other hand, government propaganda on population aging exacerbates people's worries about their future. There has been an increasing concern over the huge pressure of household-centred elderly care in 4-2-1 families. Many scholars have raised concerns that high dependency ratio and labour shortages will hinder economic development. So even if the government recently announced the adjustment to its one-child policy, the Chinese people still hope that the fertility policy can be further relaxed: a second child is allowed in all families without any limits.

According to the estimation results in this paper, under current family planning policy without any change, the total population in China

Figure 8 Cumulative Dependency Ratios over 50 Years in Different Models



will reach its peak in 2024 and then start to decline. Although the total population will decline after that, the degree of aging and dependency ratio will still increase continuously until the end of this study period (in 2065). If the government further relaxes the one-child policy in the near future: a second child is allowed in all families without any limits, the future dependency ratio will decrease from 0.6 from 0.7.

However, the cost of that is to increase the total population by about a quarter billion. In addition, adjusting the family planning policy immediately will also bring a high dependency ratio in the future forward to the present. So we should consider the tradeoff between present and future high dependency ratio. Considering cumulative dependency ratios for all the scenarios in the entire study period, the minimum value just appears when the policy is not adjusted, which means maintaining current family planning policy is the optimal choice to minimize social costs.

The complexity in the study on Chinese population is to take into account both population structure and huge population size. Considering China's huge population base, limited capacity for environmental and natural resources, and people's demands for improving quality of life, controlling the population at an appropriate size is still the primary issue that the Chinese government should take into account. Even if no adjustment was made to the strict family planning policy, the population would still be more than one billion by 2065. Providing high-quality life for such a huge population is almost an impossible task for any government in the world. In view of that, this paper suggests that currently, diluting the aging population by increasing the number of people may not be a feasible solution in China. On the whole, only to reduce the pressure of population aging, allowing a second child without any limits before 2020 is not an appropriate option. Of course, making adjustment of population policies would not only involve considering population size, but also political influence and the will of the people. Therefore, population policies need to be constantly adjusted with the economic and social development.

Notes

* Dr Shiliang Zhao 趙時亮 , an Associate Professor at the Department of Economics, Tianjin University of Finance and Economics, Tianjin, China, holds a Ph.D. in agricultural and applied economics from Texas Tech University, USA. He obtained his Bachelor of Science from Lanzhou University, China, Master's in Philosophy and first Ph.D. in population economics from Nankai University, China. His current research interests include population and environmental economics, rural development, agricultural productivity and sustainable development. *<Email: shiliang-zhao@tjufe.edu.cn>*

** Yang Gao 高揚 is a Master's student at the Department of Economics, Tianjin University of Finance and Economic, Tianjin, China. He obtained his Bachelor of Economics from Dalian University of Technology, China. His current research interests include population and environmental economics, labour economics. *<Email: gaoyanggeili@163.com>*

1. "Gender gaps in China: Facts and figures", World Bank Report, 2006. *http://siteresources.worldbank.org/INTEAPREGTOPGENDER/Resources/Gender-Gaps-Figures&Facts.pdf*

2. Based on the latest World Bank data, the TFR is 1.6 for China, 1.9 for US, 2.0 for UK and 2.0 for France. *http://data.worldbank.org/indicator/SP.DYN.TFRT.IN*

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