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The Choice of Low Fertility Level Adjustment in China

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Abstract

The study introduces the background of current low fertility and reflects the difference between fertility desire and fertility level. According to the negative effects of low fertility under the current fertility control policy, the study points out that the choice of low fertility level should be conducted by the requirement of sustainable population conditions and sustainable fertility policy. The study makes an analysis on fertility desire used 2002 National Urban-Rural Resident Fertility Desire Survey Data, and displays the gap between people's fertility desire and fertility level under the current fertility policy. The study also attempts to make a feasible analysis on elevating the low fertility used the revelation of experiment on "Two-children Policy" areas for reference. Based on 2005 National 1% Sample Survey Data, the study designs three TFR projects to make a scientific population projection on China's population trend in the future. Comparison of three scenario simulations demonstrates that the Medium Project is the best choice of low fertility in the future, which will adjust TFR in 2020 to the replacement level in 2030. The choice of low fertility will be in favor of the implementation of long-term, comprehensive, co-coordinated, complete and sustainable development strategies of population.

Key word fertility policy fertility rate fertility desire population projection sustainable development

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Introduction

1. The past and present of fertility rate in China

China has experienced the conspicuous fertility decline since 1970's due to fertility control policy implemented. The fertility control policy aimed to keep the fertility level down and decrease the total population amount. The total fertility rate declined from 4.95 in 1972 to 2.72 in 1979 sharply, added up to decrease 56 million population of birth during this time. The TFR kept the decline trend with fluctuation and went down to 2.35 in 1989 and to 2.31 in 1990. China came to low fertility countries of the world since 1991. The TFR sneaked into the replacement level in 1992 and dove to 1.82 which was below the replacement level in 1997. Then, it remained 1.8 or so in 2000. [1]

The official and demographers can not figure out the accurate TFR about the low fertility level in China since 2000, because the quality of fertility data had deteriorated. However, the majority agreed that the point of view of fertility which is below the replacement level（Xiaochun Qiao，2005[2]）. Some scholars summed up the estimated TFR within a range of 1.2 ~ 2.3（Guangzong Mu et al. ，2005[3]）. < World Population Prospects: The 2008 Revision> published by Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat online shows that the estimated TFR in China is 1.77 during the period of 2000 ~ 2010 [4]. Many demographers argued about fertility data which published in official report and estimated TFR by various indirect estimation methods. Most TFR estimations show that China now has a below replacement fertility ranged of approximately 1.6 ~ 1.8[5]. This estimated value above is basically consistent with the estimated tempo-free TFR' value（Bongaarts，2002[6]） equal to 1.7 that is obtained by excluding the factor of childbearing postponement and reflects the actual lifetime fertility level（Zhigang Guo，2000[7]）. Hence, it is of extreme importance to research on the tempo effect on the fertility level under current low fertility（Bongaarts，1998[8]；Zhigang Guo，

2000[9]）. Some scholars, by calculating the intrinsic rate of natural increase of population, disclose a negative momentum of population accumulated by the continuous low fertility rate in China, which poses new challenges to population situation of China（Zhenwu Zhai，2008[10]；Feng Wang，Zhigang Guo，2008[11]）. In addition, another scholar point out that the biggest risk for China in the 21st century is the risk caused by the negative growth of population（Feng Wang，2009[12]）.

The fertility control policy of China is complex and diverse, with varying policy fertility rates permitted in different regions. Research indicates that there is a gap between policy fertility rate and observed fertility rate of each province[13]. According to the calculation of experts, China's current fertility policy corresponding to the full realization of the policy of lifetime fertility rate was 1.47[14]. Due to the regional differences of fertility level caused by diverse fertility policy, China shows the pattern of low fertility level featuring “duality in rural and urban areas” and “diversity in different regions”. On the one side, some ultra-low fertility areas which are Beijing, Shanghai, Tianjin and the rural developed areas of Jiangsu are similar to that of Europe’s which are Italy, Spain etc. On the other side, some comparative high fertility areas passed through the substantive transition are similar to America or other countries, which are the marginal and poverty of mountainous areas of Guizhou, Tibet, and the municipalities of minority. In some sense, the discrepancy of fertility rate in various regions of China can be seen as a miniature of the countries’ in the world（Baochang Gu，1987[15]）。In addition, due to the regional difference in society, economy and culture, the observed fertility rates obtained by the survey conducted at the same time point display different population transitional features in spatial levels. [16] However, recent research indicates that the fertility rates in different regions under different fertility policies show the population dynamics of “Polarization before Convergence”. [17]

2. The official reports on TFR since 1990

Since 90's in the 20th Century, Family Planning Departments and relevant institutions carried out many surveys on fertility level. Table 1 shows a summary of the findings of all surveys. The results show that TFR represents a significant decline since China entered the low fertility era from1990s. Moreover, TFR of official reports published is much lower than that being estimated, which triggered the deep consideration of China's Government and scholars. Which level can real fertility reach in China?

1990 National Census Data shows that TFR is 2.31, 1995 National 1% Sample Survey Data shows that TFR is 1.43, 2000 National Census data shows that TFR is 1.22. 2005 National 1% Sample Survey Data shows that TFR is 1.33, 2006 National Survey on Population and Family Planning Data shows that TFR is 1.74 in 2005. There is a gap existed both of TFR value in 2005, which is 0.41. In view of the dramatic difference between the results of the two surveys, one scholar pointed out that "notable "Pick Up" of the fertility rates in recent years" mainly caused by the sampling bias in the survey of 2006, could not represent the fertility level in whole country. Therefore, the TFR in recent years still maintained at a relatively low level.

Table 1 The official reports on Total Fertility Rate in China since 1990

year	1990 National Census	National Bureau of Statistics	1992 National Sample Survey on Fertility	1995 National 1% Sample Survey	1997 National Survey on Population and Reproductive Health	2000 National Census	2001 National Survey on Family Planning and Reproductive Health	2005 National 1% Sample Survey	2006 National Survey on Population and Family Planning
1990	2.31	2.17	2.04		2.29	2.37	2.29		
1991		2.01	1.65（1.66）		1.75	1.80	1.77		
1992		1.86*	1.52（1.47）		1.57	1.68	1.59		
1993		1.71*			1.51	1.57	1.52		

1994	1.60			1.32	1.47	1.41		
1995	1.46		1.43	1.33	1.48	1.45		
1996	1.55			1.35	1.36	1.36		
1997	1.49				1.31	1.27		
1998	1.49				1.31	1.34		
1999	1.47				1.23	1.29		
2000	1.22				1.22	1.45		
2001	1.39							
2002	1.38							
2003	1.40							
2004	1.44							
2005	1.33						1.33	1.74
2006	1.38							
2007	1.43							

Data Source: TFR of National Bureau of Statistics calculated by age-specific fertility rate in < China' s Population Statistics Yearbook > (1991 ~ 2006) and <China Statistical Yearbook of Population and Employment> (2007 ~ 2008). TFR of 1992 National Sample Survey on Fertility calculated by Zeng and Yu & Yuan according to 1992 National Sample Survey on Fertility Data (Zeng Yi, 1995[18]; Jingyuan Yu, Jianhua Yuan, 1996[19]). TFR of 1997 National Survey on Population and Reproductive Health calculated by Guo according to 1997 National Survey on Population and Reproductive Health Data（Zhigang Guo, 2000[20]）.TFR of 2000 National Census calculated by Guo used Matching Method of Mother-Child according to National Census 1 ‰ Data, TFR* estimated by Guo used Interpolation Method on the National Bureau of Statistics data from 1991 to 1994 （Zhigang Guo，2004[21]）. TFR of 2001 National Survey on Family Planning and Reproductive Health calculated by Ding according to 2001 National Survey on Family Planning and Reproductive Health Data （Junfeng Ding，2003[22]）. TFR of 2006 National Survey on Population and Family Planning obtained from <2006 National Survey on Population and Family Planning Data Collection> (edited by Weiqing Zhang et al.).

3. The gap between fertility desire and childbearing behavior in China

Fertility desire is a value that develops under certain socioeconomic cultural and political conditions, reveals people's wills and desires on the number of children, quality of children, childbearing time and children's gender, reflects objective factors which influence childbearing, is one of important determinants that affect

childbearing behavior (Fishbein, 1973[23]; Pritchett, 1994[24]), and is an important basis to make population planning and goal scientifically. As a social phenomenon, fertility or childbearing has “three-dimensional characteristics”: quantity, time and gender (Baochang Gu, 1992[25]).

Childbearing behavior diverges from fertility desire at the modern developed and developing countries which located the different demographic transition period (Bonggarts, 2001[26]). But the empirical experience thought that individual intentions about future fertility are significant predictors of future behavior（Bumpass, 1987[27]; Rindtuss, Morgan, & Swicegood, 1988[28]; Thomson, 1997[29]; Westoff & Ryder, 1977[30]）。However, meta-analyses have shown that intentions alone are not sufficient to predict behavioral change satisfactorily (Sheeran, 2002[31]), as they leave large amounts of behavioral variance unexplained. This phenomenon has been labeled “Intention–Behavior Gap” (Urte Scholz et al. , 2008[32]).

In post-transitional society, new insight about the discrepancy and causes between fertility level and fertility desire with cross-sectional evidence obtained from recent surveys in 42 developing and 12 developed countries demonstrates that the observed level of fertility exceeded desired fertility level in the early or middle stages of population transition of many countries, in reverse, the observed level of fertility was lower than desired at the end of transition. Whereas, there is a positive relation existed between observed fertility level and desired fertility level. （Coleman, 1996[33]; Westoff, 1991[34]; Westoff et al. , 1987[35]） One chart in this paper shows that the diverging trend of TFR and desired family size in Thailand during the time of 1968 ~1993（Bongaarts，2001[26]）.

Childbearing behavior diverged desired fertility among women of childbearing age in China since 1990’s（Juhua Yang，2008[36]）, which represent the widening gap between low fertility level and desired fertility level. There is a certain gap between the desired fertility rate of women of childbearing age and the observed fertility rate published by

office obtained from the results of 1997, 2001, 2002, 2006 and 2007 Surveys. For example, the desired fertility rate of women of childbearing age is 1.88, and the observed fertility rate is 1.43, the difference of both is 0.45. Moreover, the results from National Urban-Rural Resident Fertility Desire Survey in 2002 and National Social Conditions and Public Opinion Polls on fertility desire of residents in 2007 show that two children are the ideal number of childbearing and one son with one daughter is the ideal sex structure of childbearing, which are most couples expected.

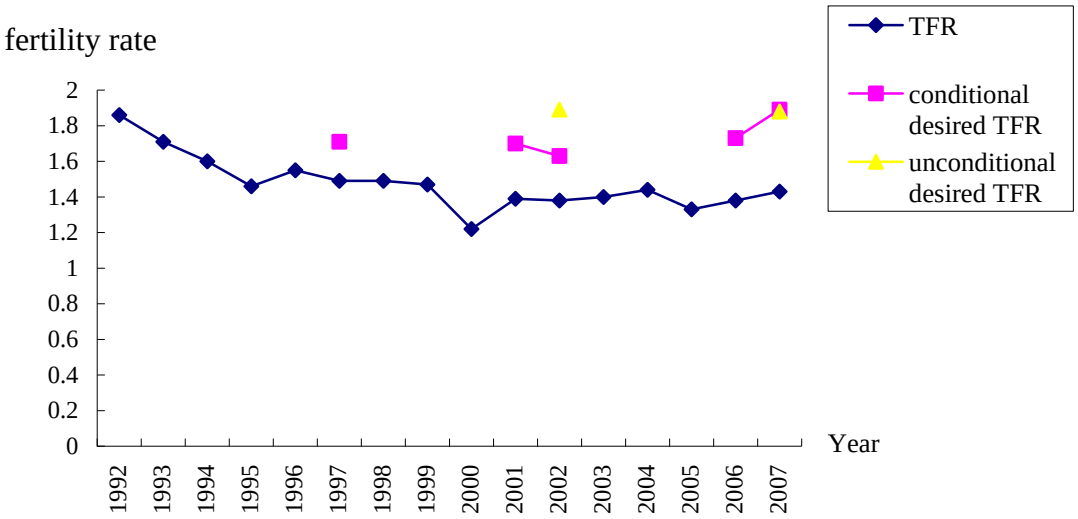

Chart 1 The gap between fertility desire and childbearing behavior

Fertility behavior and fertility level are affected by fertility desire via fertility plan, which also affected by social, economic, political and cultural factors at the same time. One scholar reveals further the essential of the relationship, which is a conditional probability, and makes an empirical analysis on the adjustment of fertility policy study by using the data of Jiangsu survey （Baochang Gu, 2008[37]）. Another scholar hold the views that the relationship is not only positive but also inverse; there is not a direct bridge between fertility desire and fertility behavior and any step in this process will be affected by other factors （Juhua Yang, 2008[38]）. In addition, other researches indicate that son preference of women of childbearing age exerts an important effect on fertility behavior （Wei Chen, 2002[39]）, fertility desire is the rational basis of decision-making on fertility behavior （Changhong Zhou et al. , 2000[40]）, and in this

process of transformation from fertility decision-making to fertility behavoir is affected by much more factors of actual problem and current situation （Zhenzhen Zheng, 2008[41]）.

4. Theoretical model of low fertility in China

The low fertility model indicates that several factors enhancing fertility which are unwanted fertility, replacement of deceased children, sex preferences, and several factors inhibiting fertility which are postponing age at childbearing, involuntary infertility, and competition preferences（Bongaarts，2001[26]）. China's low fertility model that is characteristic of native is distinguished from the low fertility model which mentioned above. The new depressing factors of fertility based on Bongaarts' low fertility model including rate of misreporting, life-time fertility rate, policy fertility rate, and rate of population floating, whereas, sex preferences also become to inhibit factor by fetal sex selection and induced abortion（Zhigang Guo，2008[42]）. In human fertility revolution, the change of childbearing motivation and fertility desire is an essential and original revolution, and the transition of observed fertility rate reflected desired fertility rate changed in fact. According to character of motivation and demand, wanted fertility used to decompose four components, which are replacement effect, cost effect, policy effect and desired number of children（Jianmin Li，2008[43]）.

Literature Review

1. Point of views of fertility control policy adjustment

Many scholars argued about the current one-and-a-half fertility policy in domestic and put forward to some opinions on the future choice of China's fertility policy in the 21st century. Some poeple advocate "one-child policy", others insist on "two children policy" and still others hope to keep the current one-and-a-half policy. All in all,

different people have different opinions. At present, the research on fertility policy development trend is mainly based on the following assumptions.

Table 2 Assumptions of Fertility Control Policy future trend in China

sequence number	Policy Recommendation	Main Reason	Source Point of View	Parity
1	Adhere to the promotion of a couple only one child and Further expand the proportion of one-child families	Control population growth at the macro level and relieve the dependency burden of family	Wenyao Yin, 2001[44]; Wenzhen Ye, 2002[45]	One Child
2	Keep TFR= 1.8 around or take the strategy of negative population growth	Release the pressure of resource, environment and employment, enhance the support capability of population ageing	Jintang Liu, Fude Lin, 2000[46]; 2001[47]	Among One Child and Two Children (Half a Child)
3	achieve the zero population growth	Country would be unbearable load of total population exceed 1.6 billion	Honggui Li, 2000[48]	
4	Stabilize low fertility and focus on the distorted sex ratio at birth and population ageing	The possibility of “rebounding” occur if low fertility level ahead of the economic and social development; low fertility produce the negative effects	Shuzhang Yang, Mengjun Tang, 2001[49]	
5	Stabilize the low fertility is the concept of a pluralistic，which denote depressing the high fertility, consolidating the moderate and elevating the low fertility	Low fertility rate kept in the long term brought out many problems	Xuejun Yu, 2001[50]	

6	Two children with childbearing interval, which is the same to fertility policy 70s in the 20th century	It's scientific in accordance with fact compared with one child policy which got across the reasonable boundary of culture	Guangzong Mu, 2000[51]	Two Children
7	Adjust the current parity of fertility policy and make a transition to Two children policy	Elevate the low fertility of city for avoiding the "4-2-1" family structure, which combines quantity with structure of population simultaneously	Jianxin Li, 2000[52], 2001[53]	
8	Two children with childbearing interval	Loose two children policy benefits fertility control in accord with population development trend in the future	Zhongtang Liang, 1999[54]	
9	Two children with late childbearing "soft-landing"	Keep late childbearing and make a smooth transition, appropriate to relax the two-child policy gradually, meet fertility desire of couples in the long term and relieve the negative effects of low fertility	Zeng Yi, 2005[55], 2006[56], 2007[5]	
10	Make a 15 year steady transition from 2005 and implemented Two children policy till 2020	It's necessity and feasible to make a transition to universal Two Children Policy gradually from current fertility policy	Baochang Gu, 2004[57]	

11	The experience of “Two-children Policy” areas is impossible implemented gradually on the condition of economic development, family planning basis and stable cadre-masses relation	Revelation of experiment on “Two-Children Fertility Policy” areas which are Jiuquan of Gansu province, Shien of Hubei province, Yicheng of Shanxi province and Chengde of Hebei province.	Baochang Gu, Jian Song, Jinying Wang, Zhongchuan Shi, Lihua Jiang, 2007[58][59]	
12	The experience of “Two-children Policy” areas is universal and unconditional	Compared the Bonsai experiment of two children policy areas, which are Jiuquan of Gansu province, Shien of Hubei province, Yicheng of Shanxi province and Chengde of Hebei province, with the natural experiment of two children policy areas, which are Hainan Province, Yunnan Province, Tibet, Qinghai Province, Ningxia, Sinkiang, both of them achieved the low fertility level	Youhua Chen, 2007[60]	

2. Scenario simulation of population projection in China

Many studies both at home and abroad on the population projection of assumed scenarioes reflect the development trend of population in the future. These main studies of population projection are as follows, which are Sino-Japanese scholars in 1985, research results of Zeng Yi (China Center for Economic Research at Peking

University) [61]P402[5], which are “Two children for only-child couples”, “Two children with late childbearing soft-landing”, “Two children with constant mean age at birth”, and “Two children with one-year decline in the mean age at birth”; research results of U.N. , research results of Jintang Liu & Fude Lin (Institute of Population Research at Renmin (People's) University of China) [46][47] ; research results of Jianxin Li (Institute of Sociology and Anthropology at Peking University) [62]; research results of China Population Information and Research Center; research results on national and regions of Zhenghua Jiang (National Population and Family Planning Commission of P. R. China) [63]; research results of Xin Yuan (Institute of Popualtion and Development at NankaiUniversity) [64]； research results of “Panel of Future Population Development and Fertility Policy in China” (National Population and Family Planning Commission of China, chair: Yiman Jiang, Xuejun Yu, Jianmin Li, Xiaochun Qiao） [65]P35； research results of Weimin Zhang, Gang Xu, Hongwen Yu, Hongyan Cui [66]； research results of Wenyao Yin (Institute of Population and Development at Zhejiang University) [67]； research results of Zhigang Guo (Center for Sociological Research and Development Studies of China) [68][69]P67； research results of Xiaochun Qiao & Qiang Ren (Institute of Population Research at Peking University) [70]； research results of Jinying Wang (Institute of Population Research of the College of Economics at Heibei University) [71][72]P37； research results of Wei Chen (Center for Population and Development Studies at Renmin (People's) University of China) [73].

3. National and regional fertility desire surveys

In recent years, many large-scale surveys on fertility desire had been conducted, which are National Survey on Population and Reproductive Health in 1997, National Survey on Family Planning and Reproductive Health in 2001, National Survey on Population and Family Planning in 2006 and National Urban-Rural Resident Fertility Desire Survey in 2002 and National Social Conditions and Public Opinion polls on Fertility Desire in 2007. In these above surveys, the first three surveys conducted by

staff of government agencies and latter two surveys conducted by social research company (e.g. “Zero Point Index and Information Consultation Co. Ltd.”) and some universities. Therefore, the results of latter two surveys reflect the real fertility desire, which are not “conditional fertility desire” under the current fertility control policy （Xiaochun Qiao，1999[74]）.

Some studies on fertility desire used the data of National Urban-Rural Resident Fertility Desire Survey in 2002 belong to descriptive statistics analyses, which are fertility desire of China’s rural residents（Lixia Mo, 2005[75] and Caixia Chen & Chunyuan Zhang, 2003[76]）, the definition on indicators of fertility desire （Fulin Zhou，2005[77]）and a comparative analysis of fertility desire on rural and urban in China （Fulin Zhou，2005[78]）. However, so far as I know, the new study used data of National Social Conditions and Public Opinion polls on Fertility Desire in 2007 does not appear.

In addition, many regional surveys on fertility desire also had been conducted, which are Beijing Survey (1979), Hubei survey (1998, 2000), Shanghai Survey (1994, 2003) and 14 cities Surveys in China (1998) etc. . One scholar make a summarized analysis on these surveys（Xiaotian feng，2002[79]）. Some studies on fertility desire used these data are descriptive statistics analyses, which are report of fertility desire survey in Zhejiang (Wenyao Yin et al. , 2000[80]), study on Only-child's fertility desire in Beijing (Yafei Hou, Xiaohong Ma, 2002, 2007[81] and Jiayan Li , 2003[82]), report of rural residents’ fertility desire survey on Chengde, Handan and Tangshan areas (Jinying Wang, 2008[83][84]) , study on the childbearing desire with a low fertility rate in Jiangsu (The Research Team of "Child-Bearing Desire and Behavior in Jiangsu", 2008[41]). Moreover, a comprehensive study on fertility desire used many regional data and National Urban-Rural Resident Fertility Desire Survey in 2002 is valuable and significant （Zhenzhen Zheng，2004[85]）.

Chapter 1 The negative consequences of low fertility under the current fertility control policy

China's current family planning policy is promoting late marriage, late childbearing, fewer and healthier births, promoting a couple only one child. National cadres and workers, urban residents with special circumstance in addition to an approved the second child, a couple only one child. Some rural couples with actual difficulties are allowed to give birth to a second child. Generally speaking, we called fertility control policy instead of family planning policy in China. In order to improving the development of economy and culture and the national literacy quality, family planning will be also implemented in minority areas, which are specific requirements and practices developed by the relevant provinces, autonomous regions in accordance with local conditions. Aimed to control population quantity and improve population quality as the goal, China's current fertility policy has complexity and diversity objectively, which represent the differential treatment according to the specific circumstances of different regions. Fertility control policy has made great contribution to fertility decline in China. However, due to the discrepancy of policy making and its implemented effect, the policy-induced fertility decline too fast and too low caused negative impacts on the following.

1.1 severe population ageing

Population Ageing is a climbing process for the proportion of elder population. In accordance with the international standards, the proportion of the elder population aged 60^{+} exceed 10% or the proportion of the elder population aged 65^{+} exceed 7% are considered to enter the population ageing society. The main factors influenced the population ageing are as follows: the decline of fertility rate, the decline of mortality among the elder popultion, population migration, prolonged the average life expectancy, etc. The decisive factors of accelerating population ageing are the decline

of fertility rate sharply and the continuous low fertility, which formed under the current fertility control policy, whereas, the current family planning policy promoted the population ageing at the same time in China.

Due to the long-term family planning policy controlled population birth strictly, the rapid decline in fertility and mortality rates trigger a climbing of the elder population, which displayed smaller cohorts born under the current fertility control policy with below the replacement fertility level and the age structure of population aging with the proportion of elder population continue to rise. The proportion of the elderly aged 65^{+} is only 3.56% in 1964, increase to 4.5% in 1972, up to 4.91% in 1982, reach to 5.6% in 1990, achieve to 7.08% in 2000, still up to 7.69% in 2005, and reach to 8.3% in 2008. October 20, 2004, the 16^{th} Internatinal Ageing Conference hosted by International Association on Aging in Hangzhou pronounced that China is the fastest aging country in the world.

Population ageing in China is different from the developed counties in the world. In most industrialized countries, population ageing is a gradual and natural process with economic growth rapidly. However, population ageing is an unanticipated by-product of tough birth control measures before the economy is fully developed in China. China's population ageing brought about a series of socio-economic problems, and whether China's economy can grow fast enough to meet the mounting need for elder support is still uncertain. So, establishing and improving the official pension security system for elder support in urban and rural areas is a critical issue of global strategic stability.

1.2 distorted birth sex ratio

Accelerated decline of low fertility and long-term low fertility kept induced by strict fertility control policy has led to higher distorted sex ratio at birth. The number of children birth is restricted by fertility control policy, especially fewer and healthier

births. The conflict was occurred between condensation of childbearing space and expectation of sex structure (Baochang Gu & Krishna Roy, 1995 [86]). The essential of the conflict is a choice between number preference of children and sex preference of children (Baochang Gu, 2007[87]). It can be seen that the current fertility policy intensified further selective sex-preference among some people and induced the distorted sex ratio at birth. The study shows that sex ratio at birth is distorted seriously at 1.5-child fertility policy areas, whereas, sex ratio at birth is normal at two-children fertility policy areas (Erli Zhang, 2005[88]).

Preference to sons at the core of the traditional fertility culture had been shaped in the traditional family support model. The traditional fertility conception intensified the consciousness of sex preference in the course of childbearing (Hongping Lv, 2003[89]). So, most people took a way of "Quality alternative Quantity" in order to obtaining a son. So, the traditional fertility culture is an important social factor to promote sex ratio at birth higher. In addition, the modern science and technology -B widely used to determine the fetal sex and the practice of sex selective abortion make it possible to meet the sons preference accompanied by sex ratio at birth diverged from the normal range seriously. China's sex ratio at birth is 108.5 in 1982, reach to 110.9 in 1987, achieve to 111.3 in 1990, up to 116.6 in 1995, keep to 116.9 in 2000, reach to 118.9 in 2005, up to 120.56 in 2008.

In addition, discrepancy of family planning policy implemented has also led to sex ratio at birth distort, which displays the differences of sex ratio at birth at the areas of regional and urban-rural. The results of table 1-1 show that the distorted sex ratio at birth in western and rural areas is higher, which is produced by high-parity distorted, whereas, the distorted sex ratio at birth in eastern and urban areas is lower respectively, which is promoted by economic development and low childbearing culture. Structural imbalance on sex ratio at birth will give rise to serious marriage squeeze and instability phenomenon, which belonged to unstable factors. The center government of China has clearly put forward to the containment on the sex ratio at

birth kept its momentum down within 5 years or so during the "Eleventh Five-Year" period. [90] So, the government should take effective methods (eg. Adjust the fertility policy) for easing the dynamice of sex ratio at birth.

Table 1-1 The sex ratio at birth in China (1982-2005)

year	total	urban	town	rural
1982	107.6	106.9	107.7	107.7
1987	110.9	110.5	113.4	113.6
1990	111.3	108.9	112.3	111.8
1995	116.6	111.9	115.6	117.8
2000	116.9	112.8	116.5	118.1
2005	118.9	113.9	117.2	121.2

Data source: 1982, 1990, 2000 National Census, 1987, 1995, 2005 National 1% Population Sample Survey.

1.3 discrepant population quality

In the modern society with the rapid development of knowledge-based economy and information technology, the essence of the international competition is human capital and high technology. The revolution of economic growth mode will focus on the quality advancement of labor force not quantity increase any more in the future. The effect of knowledge on the economic growth exceeded that of physical capital and labour force and the intensive and efficient growth needs more high-quality and versatile personnel. Therefore, the quality of the population become to an important factor of China's future economic development and social progress. So, there was a significant positive correlation between the quality of the population and the sustainable development.

Under the actual situation of China, discrepancy of urban-rural areas on the quality of the population has emerged, which is a comparison between a large number of low-quality labor resources in rural, such as large groups of migrant workers, and some high-quality and knowledge-based human capital in urban, such as high-tech engineer. On the one hand, regional discrepancy and implemented effect of fertility

policy induced differences of fertility rate between developed and depressed area, which represent population growth rate in rural higher than in urban. So, under the dual economic structure, the discrepancy of physical quality and cultural educational quality had been formed due to the different population environment of the birth and survival. On the other hand, the fertility policy rule shows that the couple may have the second child legally if the first child is not hereditary patient. So, it led to many patients with recessive inheritance of Health can lawfully two fetal. Moreover, many dominant genetic patients also gave birth to 2 children or more, especially in some mountain areas. Many handicapped increased due to the higher fertility rate of patients with genetic diseases, which will led to the quality decline of population in regional areas. [91] The quality of population is related to the rise and fall of the Chinese nation, so elevating the quality of population is urgent.

Table 1-2 The comparison of urban-rural population quality (1982-2005)

year	average educational year		average life expectancy	
	urban	rural	urban	rural
1982	7.12	4.68	70.87	65.79
1990	7.98	5.60	71.83	67.13
2000	8.97	6.76	76.14	70.63
2005	8.99	6.77	78.60	73.61

Data source: 1982, 1990, 2000 National Census, 2005 National 1% Population Sample Survey.

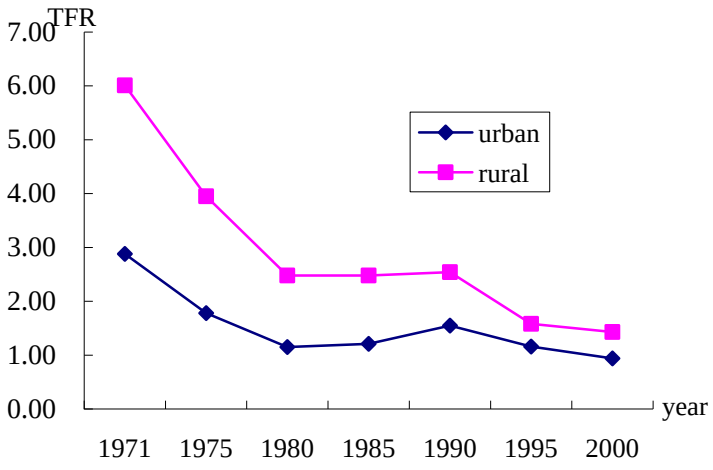

Chart 1-1 TFR at Urban and Rural

1.4 increased one-child family risk

Currently, the double- singleton families in cities and towns who were born in the 70s ~ 80s have entered the period of marriage and childbrearing. The family planning policy regulation promoted double-singleton to birth the second child from 2005 in order to elevating the ultra-low fertility in urban areas and alleviating the pressure of "inverted pyramid" family structure. In theory, it can induces a certain degree of rebound on fertility rate, but the facts show that many couples do not tend to re-birth second child. Due to modern fertility concept consolidated, urban residents tend to consider much on the maintenance costs and the opportunity costs. That is most couples do not like to have the second birth any more. Therefore, the increasing number of nuclear families caused much more problems, such as the heavy burden of “4-2-1” family, the age structure of population ageing and so on. The essential of two-independent family is “Vulnerability caused by Single”. [92] It can not be ignored that many two-independent families will encounter the accacident risks and the pension risks. Although the proportion of casualties among one-child families is not high, the risk of accidental injury leads to a fatal hit on these families because the loss caused by contingency can not be irreparable. Therefore, the singleton’s family is a high risk family in essence. [93] It can be seen that the single structure of "4-2-1" family induce the risk of singleton’s family and lead to the shortage of labor force in the macro level, which will not inconducive to the sustainable development of society and economy. Therefore, the government should pay more attention to the singleton’s families and take an effective method to improve them.

1.4 different regional transition of population

Due to the comprehensive factors of different historical backgrounds, family planning work and socio-economic development level, the discrepancy of population situation, population problem and population control with different starting of various regions had been formed during the same period. The difference of family planning policy

implemented (see Table 1-2 [69]P68~69) and the effect of "Fine-tuning" [94] under the current fertility policy led to the inadequacy and incompletion of transition at the rural areas, which had the possibility of rebounding or kept the fertility higher than replacement level. At the same time, population in urban areas have gone through the transition of negative growth, such as the fertility rate dropped to below 1.0 in Beijing, Shanghai and other developed areas. Fertility level shows the obvious differentiation on regions, which called "city low and rural high" and "east low and west high". The areas of east and west, urban and rural, or Han and minority are at different stages of population transition in terms of time and space. At the same time, the stage of regional population and development inevitably lead to the imbalance of regional economic development. All of them above made every region in modern society locate the diffenrent stage of population and development. The phenomenon occurred is inconducive to the optimal allocation of resources and the coordination development of economy, which also is not propitious to achieve a harmonious state of human and society. Therefore, to adjust the family planning policy and narrow the regional differences of fertility level will conducive to form the integrated fertility pattern of urban and rural areas. [95] The measure should be taken for maintaining the stability of society, equipoising the distribution of population, promoting the coordinated development of regional population and achieving the goal of constructing a well-off society.

Table 1-3 Pattern and Proportion of current fertility policy

Policy for short	Content	Proportion of coverd population (%)
One child policy	Urban and town areas and some advanced rural areas	35.4
One and a half child policy	Most rural areas if the first child is a girl	53.6
Two children policy	some economic underdeveloped rural areas	9.7
Three children and more policy	Part of Minority areas	1.3

Chapter 2 The reasons of future choice on low fertility level in China

Based on the sustainable development theory, the choice of future low fertility level should be consider to meet the fertility desire of residents and to absorb the revelation of “Two-children Policy” areas in 2006.

2.1 Sustainable Development Theory

Sustainable development is not only meeting the needs of contemporary population but also not against the ability of the development to future generations to meet their needs. [96]P318 Sustainable development concept is a time and a space. Sustainable development is the fundamental issues related to the survival of human society and the future development, sustainable development of population is the main core, the economy is the material foundation for sustainable development, social relations is the framework of sustainable development, resources and environment is the necessary precondition for sustainable development. Sustainable development emphasized on the overall system optimization of population, resources, environment and socio-economic development, and stressed the coordination among sub-systems and the sustainability of development. The achievement of sustainable development requires the following principles, which are sustainability principle, co-ordination and harmony principle, fairness principle, demand and progressive principle, efficient and stage principle.

2.1.1 sustainable population condition

The number, structure, quality is the three elements of the organic unity of population, and sustainable development conditions of the population require a reasonable total population , rational natural population structure and social structure, as well as the improvement of the quality of the population, in order to achieve the coordination of

the population size, population structure and population quality.

(1) Population size for sustainable development.

Moderate Population Capacity is an optimal population size at a certain region, which can accommodated by the socio-economic development and the capacity of resources and environment, under a certain level of productive forces and historical conditions. To achieve sustainable development, the population size should be limited within the threshold of carrying capacity of resources and environment. Only doing these, the relationship between population and ecological environment can harmonious. If population growth is so rapid to beyond ecological environmental capacity, ecological system will imbalance that are not good for sustainable development.

Sustainable development needs appropriate population growth rate and population size. Population growth, size and socioeconomic development, together with environmental capacity are vital for realizing sustainable development and also the core of it.

To achieve the coordinated development of environment and population, the population size should be reasonable, which requires us must to maintain the appropriate long-term low fertility level, take negative population growth strategy, so that the total population in a certain period of time gradually reduce until come to the size which is required by sustainable development. Simply considering population quantity is not sustainable, while at the cost of imbalanced population structure and degrading population quality. From this, it can be seen that the implementation of sustainable development strategies considering only from the scale is not enough, we must combine the population structure and population quality.

(2) Population structure for sustainable development.

It refers to the reasonable natural population structure and rational social population structure. Natural structure of the population includes gender, age structure. Social

structure contains population geographical structure, urban and rural structure etc. .

Demographic common sense tells us that to make population gender and age tend to become reasonablely, must have two conditions: first, fertility rate stabilizes at replacement level; second, the sex ratio at birth remains at normal levels. [97] Therefore, to implement the strategy of sustainable development, total fertility rate should be gradually adjusted to the replacement level, while coordinating the imbalance of sex ratio at birth.

Replacement level is the most important prerequisite to achieve zero growth of population. It is essential to gradually make the total fertility rate return to replacement level before population grow comes to zero. Reasonable population age structure requires that the different between replacement level and total fertility should be slight. From the view of sustainable development of population, it is optimum that the total fertility rate stabilized at the replacement level in a long-term. The further total fertility rate deviates from the replacement level, the more it exerts the bad impacts on the population age and sex reasonable structure. It will bring about problems, like excessive ageing population structure, heavy burden about labor force and newborn population sex imbalance, which are all against population, social and economic sustainable development. When the level of total fertility rate is far higher than the replacement level, "population bonus" period will come, during which rich labor resources will become an important impetus for economic growth; When the level of total fertility rate is far below the replacement level, inevitably "population deficit" will harm it; "population bonus" period is bound to experience "population deficit" period. It is only making the total fertility rate reach the appropriate level that can achieve a reasonable age and sex structure of population and thus realize burden balance and equal opportunity inter-generations, as well as socio-economic sustainable development and the sustainable use of resources and the environment.

Continuous lower fertility rates will lead to a great many of socioeconomic problems

and contradictions, like reducing population size, ageing population age structure, inadequate supply of labour, birth sex ratio imbalances, pressure on old-age security, the difficulties for men to find a spouse, the destruction of the ecological environment, degrading the integrated defence force, weakening the international competitiveness, all of which threaten national security and national interests. When low fertility rate is becoming inertia, it may destroy modern economic system which have been made by a nation or even the whole human species, make human society decay and damage human civilization. Obviously, low fertility goes against forming reasonable population age and gender structure, what is more, is contrary to the principles of sustainable development.

Long-term low fertility level will lead to negative population growth. If fertility levels can not be recovered in time, the population reduction will be unlimited, and ultimately result in the demise of mankind. It can be seen that the appropriate level of total fertility rate is vital to a country's demographic, social, economic sustainable development. The adjustment of the level of total fertility rate should both ensure that the future size of the total population will not place far more press on resources and environmental to prevent age and sex structure from imbalance. For this reason, the total fertility rate should be timely adjusted so that it will reach and stabilize at around replacement level.

The strategy of sustainable development asks for reasonable population geography, urban and rural structure, for a reasonable population distribution and mobility is a part of the goal of achieving population's sustainable development. The diversity of fertility levels among different regions results in inequality of opportunity of survival and development, which is contrary to the principle of inter-generational equity. Coupled with the accelerated process of urbanization, more and more people are moving to developed areas and large cities, which causes an unreasonable population distribution and mobility pattern and is not conducive to inter-regional coordination and the balanced development.

For this reason, to implement a sustainable development strategy, it is necessary to adjust the fertility policy, narrow the gap of fertility rates among different regions to achieve a rational distribution of population and coordinate inter-generational balanced development.

(3) Sustainable development requirements for the quality of the population.

The all-round development is the core of sustainable development and also the ultimate goal of sustainable development; the improvement of the population quality is the foundation of realizing people's all-round development. Sustainable development requires all-round improvement of population quality, which is continuously improving quality of newborn population and the level of human capital.

To improve and enhance the quality of newborn population is the precondition of improving human capital. Human capital is an important source of society development, as well as is an important driving force for a country's socio-economic development. The lower quality of newborn babies will have a serious impact on a country or even the whole nation's survival, development and ethnic continuity. Therefore, we should lower the incidence of birth defects and improve the quality of the newborn population, as well as enhance humans own capacity of sustainable development. In the era of knowledge-based economy in 21th century, the international competition in overall national strength is becoming more and more fierce that considers human resource and technology as core. This wants us to vigorously develop the education, comprehensively improve population quality, cultivate high-qualified people of ability and upgrade human capital level. In addition, to improve the quality of the population has a vital role in transporting the population pressure, reducing the ecological damage to the environment, achieving a virtuous circle of ecological environment.This shows that the level of the quality of the population reflect not only humans own the level of capacity of sustainable development, but also directly affect the effective allocation of resources and

environment and socio-economic development. [98]

Therefore, carrying out the sustainable development strategy must improve the quality of the population-oriented conform to the talent requirements of the knowledge-based economy times. In order to exert the strategy of sustainable development, the population size, reasonable population structure and improving population quality should be involved in it. Therefore, in order to co-ordinate these three elements about population, we must rightly control population size, improve population quality, optimize sex and age structure, guide reasonable distribution and mobility of population to make population size, structure and distribution more appropriate and realize humans' all-around and sustainable development. Considering the requirements of the demographic structure of sustainable development，China's total fertility rate of women should be maintained at an appropriate level which is slightly below the replacement level. Therefore, a women's fertility level is slightly lower than the replacement fertility level, which is necessary for Chinese population in terms of sustainable development. In return, sex ratio at birth will be normal and we can continuously improve the quality of the population. [97]

It can be seen that if we want to implement sustainable development, we must definitely adjust current fertility policy to balance fertility levels among different regions.

2.1.2 sustainable family planning policy

Country's fertility policy bestow fertility right and responsibilities to every citizen, concerned with each family's and even each person's practical interests. Social fairness is just used to judge whether a public policy is suitable or not. [99] Fertility policy of sustainable development requires not only realizing intra-generational equity, but also achieving inter-generational equity.

Childbearing behavior of individual citizens is not only related to the continuation of families, but also to the multiply of the entire race "People-oriented" standards require that we value reasonableness and fairness on fertility policy in the level of family. Fertility policy as an important public policy, in the development and refinement process, we not only consider the influence of macro-regulation of the population, more importantly, but take the possible impacts and results about family development into account. [99] Admitting and respecting basic people's fertility rights, the authority make appropriate fertility control policies. [100]

"controlling the growth of the population, improving the structure of the population and improving the quality of the population" are aimed to provide a population which is in moderate size, has optimal structure and high quality, to realize "the development under the condition of not damaging future generations developmental potential in China", which should inevitably be paid the topmost attention to. [101] Obviously, the Chinese government should develop and implement sustainable development policies of birth, pay attention to Chinese nation's long-term existence and developmental interests.

Fertility policy adjustments will change the family's reproductive behavior and reproductive way, not only exert an important impact on the country's population development and, more importantly, affect every family' practical interest, and matter the unity of citizens' reproductive rights and responsibilities of citizens and responsibilities of unity. Therefore, the adjustment of fertility policy should actually protect legitimate rights and interests of every citizen. Truly achieve "people-oriented" to come to organically unite value rationality with instrumental rationality. [102]

2.2 National Residents' Fertility Desire[1]

[1] I would like to thank Department of Publicity and Education at National Population and Family Planning Commission in China for the important database of fertility desire survey.

National Urban-Rural Resident Fertility Desire Survey in 2002 and National Social Conditions and Public Opinion polls on Fertility Desire in 2007 were hosted by Department of Publicity and Education at National Population and Family Planning Commission in China. They cooperated with specialized social investigation organization--“Zero Point Index and Information Consultation Co. Ltd.” or some universities. To some extent, the two sample surveys reflected true fertility desire of national resident in China. But, this research does not offer the results of 2007 National Fertility desire Data because it does not report in public.

2.2.1 National Urban-Rural Resident Fertility Desire Survey in 2002

National Urban-Rural Resident Fertility Desire Survey in 2002 was composed of 10 cities, 10 towns and 545 villages of 16 provinces. The N is 17380, with 8800 males, who account for 50.6%, and 8580 females, who account for 49.4%. The sex ratio is 102.6. 73.2% of respondents who are 20~49 years old are fertile ones. According to the criteria for the classification of urban-rural, 4225 urban respondents, who account for 24.5%, 2655 town respondents, who account for 15.3%, 10470 rural respondents, who account for 60.2%. [103]

2.2.2 Results and Analysis

（1）Desired Number of Children

The survey results show that the desired number of children under no Family Planning Policy is larger than that under Family Planning Policy for different age groups in both rural and urban areas, indicating that there is a gap existed between fertility desire and Family Planning Policy and Family Planning Policy has some binding force on fertility desire. Generally speaking, the desired number of children under Family Planning Policy is 1.78 on average; whereas that under no Family Planning Policy is 2.04 on average. This indicates that the number of desired children

fall by 0.26 due to Family Planning Policy. Seeing from rural residents and urban residents respectively, under Family Planning Policy, the number of desired children among urban residents is 1.39, that among town residents is 1.53, and that among rural residents is 2.01; under no Family Planning Policy, the number of desired children among urban residents is 1.70, that among town residents is 1.78, and that among rural residents is 2.23; 0.31, 0.25 and 0.22 more than that under Family Planning Policy respectively.

Table 2-1 Desired fertility rate at average age group in urban and rural area

age group	under the family planning policy				without the family planning policy			
	total	urban	town	rural	total	urban	town	rural
16～19	1.25	1.12	1.23	1.29	1.69	1.63	1.78	1.70
20～24	1.35	1.20	1.28	1.44	1.68	1.61	1.64	1.72
25～29	1.49	1.29	1.29	1.61	1.73	1.64	1.57	1.80
30～34	1.62	1.37	1.39	1.80	1.84	1.65	1.60	1.99
35～39	1.77	1.41	1.48	1.99	1.99	1.65	1.71	2.20
40～44	1.82	1.36	1.50	2.14	2.08	1.65	1.73	2.36
45～49	1.94	1.35	1.51	2.22	2.19	1.68	1.71	2.44
50～54	2.10	1.52	1.66	2.37	2.32	1.80	1.95	2.56
55～59	2.31	1.68	1.77	2.68	2.52	1.94	1.93	2.88
60～64	2.51	2.02	2.02	3.14	2.75	2.37	2.16	3.39
65～70	2.04	--	2.04	--	2.27	--	2.27	--
合计	1.78	1.39	1.53	2.01	2.04	1.70	1.78	2.23

Data source: 2002 National Urban-Rural Resident Fertility Desire Survey.

"--" denotes missing value.

Since people of different ages are affected by traditional childbearing concept and culture to different extents, and their education backgrounds are different, the desired number of children is in positive correlation with age differential. That is to say, with the increase of age, the number of desired children increases too, and the number of desired children increases more dramatically in rural areas than in cities and towns. This indicates that the fertility desire changed with social, economic and cultural development.

Among the women of childbearing age aged 15 to 49, the desired number of children is 1.61 on average under Family Planning Policy, among which that among urban residents is 1.30, that among town residents is 1.38, and that among rural residents is 1.78; whereas the desired number of children under no Family Planning Policy is 1.89, among which that among urban residents is 1.64, that among town residents is 1.68, and that among rural residents is 2.03. The desired number of children is generally 0.28 more under no Family Planning Policy, among which 0.34 more among urban residents, 0.29 more among town residents and 0.25 more among rural residents. It can be seen that the fertility desire level among women of childbearing age exceeds fertility level under the current family planning policy.

（2）Desired Childbearing Gender

Table 2-2 comparision of 2002 Natioan residents' desired fertility parity in urban and rural area（%）

category	under the family planning policy			without the family planning policy		
	urban	town	rural	urban	town	rural
One child	49.43	42.61	22.80	37.64	33.45	16.81
Two children	39.50	44.06	56.37	56.75	56.65	58.82
Three children or more	2.81	6.44	18.42	5.01	8.98	24.11

The survey results show that the percentage of urban respondents who desire to have one child is 9.93% higher than that of urban respondents who desire to have two children under Family Planning Policy; whereas under no Family Planning Policy, the percentage of urban respondents who desire to have two children is 19.11% higher than that of urban respondents who desire to have one child. This indicates that there is a large gap existed between the request of Family Planning Policy and fertility desire of urban respondents and Family Planning Policy restricts urban residents' desire to have two children. Likewise, among town residents and rural residents, the

percentage of respondents who desire to have two children is higher than that of respondents who desire to have one child if without Family Planning Policy, indicating that two children is the ideal desired number of children among most people.

Table 2-3 Sex preference at different child in urban and rural area (%)

categories		under the family planning policy			without the family planning policy		
		urban	town	rural	urban	town	rural
no child		8.26	6.90	2.41	0.60	0.90	0.25
One child	1 girl	18.88	14.56	5.14	14.70	11.40	3.73
	1 boy	23.58	19.17	13.31	17.36	14.62	9.49
	either	6.97	8.88	4.35	5.58	7.43	3.59
Two children	2 girls	0.76	0.80	0.56	0.86	0.94	0.51
	1 boy1 girl	36.97	41.27	52.79	53.99	53.47	55.68
	2 boys	0.98	0.88	2.34	0.94	0.65	1.90
	either	0.79	1.11	0.68	0.96	1.59	0.73
Three children and above	3 girls	0.12	0.08	0.05	0.16	0.12	0.06
	1boy2girls	0.74	1.41	2.96	1.04	1.67	3.39
	2boys1girl	1.36	4.15	13.39	2.84	5.80	17.69
	3boys	0.45	0.61	1.96	0.76	0.90	2.84
	either	0.14	0.19	0.06	0.21	0.49	0.13

Data source: 2002 National Urban-Rural Resident Fertility Desire Survey.

With social economic development and the change of childbearing concept, most respondents who desire to have one child no longer prefer to have a son. The data analysis results indicate that, among the respondents in cities, towns and villages who desire to have one child, the percentages of the respondents who prefer a son are all higher than those of the respondents who prefer a daughter with or without Family Planning Policy. In addition, the percentage of the respondents who desire to have a son for their first child under no Family Planning Policy is lower than that under Family Planning Policy whether in cities, towns or villages. It can be seen that strict Family Planning Policy objectively motivates the son preference of people to have a son as their only child, and causes the distorted the sex ratio at birth.

Among the respondents who desire to have two children, most people desire to have one son and one daughter with or without Family Planning Policy, which is the ideal sex structure of birth and the ideal number of children. The data indicates that the percentage of urban residents who desire to have one son and one daughter under Family Planning Policy is 36.97%, that among town residents is 41.27%, and that among rural residents is 52.79%; whereas under no Family Planning Policy, the percentage of urban residents who desire to have one son and one daughter is 53.99%, that among town residents is 53.47%, and that among rural residents is 55.68%. Hence, Family Planning Policy should be adjusted according to actual situation so as to meet the fertility desire of most residents and create relatively relaxed fertility environment, which shall help reduce the sex ratio at birth and realizes the consistency between fertility level and fertility desire.

In essence, family planning is to reconcile different interests. [104] It is improper that the adjustment of Family Planning Policy is only based on the consideration of national interests. What's more, people's interests and needs should be taken into consideration and a balance should be struck between national interests and people's interests[74], so as to balance national interests and family interests.

People's fertility desire should be taken into full consideration when adjusting Family Planning Policy, so as to win the support from urban and rural residents, create relaxed fertility environment, gradually shorten the distance between people's fertility desire and Family Planning Policy, realize the consistency between fertility desire and childbearing behavior , and reduces the conflicts in family planning work. In addition, "human-oriented" sustainable population development strategy should be adopted, fertility level should be elevated at proper time before fertility rate has not yet losing the elasticity, and a gradual transition[105] should be made level by level according to the situation of different regions.

2.3 revelation of experiment on two-children fertility level areas in 2006

2.3.1 Background

"21st century China's Fertility Policy Study Panel" aims to explore the necessity and feasibility of China's Fertility Policy Adjustment on the basis of making the investigation on "Two-children Fertility Policy" areas during the period of 2005-2006 which are authorized by Family Planning Commission in the mid of 1980. The "Two-children Fertility Policy" areas are typical and natural "Society Experiment Fields" which are the special cases including of three areas--"Jiuquan, Chengde, Shien" and one county-"Yicheng" implemented the strict fertility policy in the 80's. The experiment of 8,400,000 number of population is successful, which offered invaluable practical experience and theoretical wealth for "Two-children Fertility Policy Study" in the new era of China. Population and Development Studies Center at Renmin (People's) University of China had hosted the "Population Dynamics Symposium of "Two-children Fertility Policy Areas" on September 16, 2007 successfully.

2.3.2 revelation came from two-children fertility policy areas[59]

This research attempts to make a feasible analysis on low fertility rate elevation used the revelation of experiment on "Two-children Fertility Policy" areas in 2006 for reference.

The finding shows that modern fertility concept and fertility desire are important determinants to childbearing behavior and fertility level among many factors, such as fertility policy, economy growth, social security, culture habitude, urbanization process, family planning management, publicity education and interest-oriented mechanism, and geography environment. With the development of society and economy, fertility conception and fertility desire of couples have gone through the fundamental transition, childbearing behavior will become convergent gradually, and

fertility policy was not the dominant element of childbearing behavior any more.

A new regulation of fertility policy will lead to change of traditional fertility culture, which presents fertility conception and fertility desire will be changed gradually. When the new regulation of fertility policy stabilized and formed to a habitude or an institution, childbearing habit and childbearing behavior of women will be changed fundamentally. So, moderate fertility policy is very important to low fertility level adjustment, which facilitates fertility desire of couples realized, meanwhile, presents the spirit of "people-oriented", and achieves the purpose of fertility control, at the same time, eases the tension between the cadre and the masses.

The finding illustrates that there is no simple linear correlation between the loose or tight fertility policy and high or low actual fertility level[59] because of many factors at the several aspects among them. Under the comparative loose environment of "Two-children Fertility Policy", the actual fertility rate is not necessarily higher than the policy fertility rate.

Weighing the success of "Two-children Fertility Policy" should be considered from four aspects below, which are whether low fertility level attained and keep stabilized, whether sex ratio at birth distorted, whether the pressure of ageing relieved, whether the relation between the cadre and the masses coordinated. [106]

The comparative analysis and practical evidence presented by “Two-Children Fertility Policy” areas clearly demonstrates that these areas kept the low fertility level without rebound for a long time under the comparative loose environment and the TFR of “Two-Children Fertility Policy” areas is close to or lower than “One-Child Policy” areas’, eased distortion of sex ratio at birth to some extent and facilitated the normalization, met the fertility desire of couples and formed two-children atmosphere of birth, improved the relation between the cadre and the masses and built the modern fertility culture. As to alleviating the influence of ageing is not clear, which depended on the effectiveness of fertility control.

There is need to grasp the optimal opportunity for adjusting fertility policy and extending “Two-Children Fertility Policy” experience, which advance low fertility or lowest-low fertility to replacement level nearby before the momentum of modern low fertility conception formed. If “Two-Child Fertility Policy” areas kept a long term low fertility, do we have reason to doubt that other areas which implemented “Two-Child Fertility Policy” on the basis of the advanced social and economic development level, stable foundation of Family Planning work and the masses’ ideology, and the fertility desire transition of mass prior to “Two-Child Fertility Policy” rural areas will exceed “Two-Children Fertility Policy” areas which are Jiuquan of Gansu province, Shien of Hubei province, Yicheng of Shanxi province and Chengde of Hebei province. Therefore, “Two-Child Fertility Policy” is universal and feasible within the range of our whole country. However, various conditions will produce catalysis at the same time. So, it is necessary and imperative to advance low fertility to the moderate or slightly lower than replacement level.

Chapter 3 Scenario simulations of population development trend projection in China

Future fertility level in China to choose not only to follow the requirements of sustainable development strategy and accord with fertility desire of majority of the residents, but also to make a scientific population projection on population development trend in the future based on the new statistic data. Scientific Population Projection is the basis of the choice of future fertility level in China, which also is the guarantee of achieved sustainable development strategy.

This research attempts to make a comparative analysis of three scenario simulations, which demonstrates the results of natural growth rate, total population size, proportion of the elderly aged 65^{+}, labor force-age population size and total dependency ratio. Based on estimation and calculation, this research will put forward to the optimal opportunity for choice of low fertility level in the future in China.

3.1 data source, integrate, test, evaluate, reconstruct

3.1.1 data source

Discrete Population Development Dynamics System and Decomposition Technique will be used to make population projection of dynamic trend. Life Table and Lexis Diagram also will be used for population projection. Basic data of population projection is needed to derive primarily from 2005 National 1% Sample Survey and 2000 National Census, which are age-sex-specific population in 2005, age-specific fertility rate of women of childbearing age in 2000, age-sex-specific mortality and death population in 2005.

Due to a certain degree of omission and misreporting existed in 2000 National Census data and 2005 National 1% Sample Survey data, data quality needs to be tested. The midyear population backed up and age-sex-specific population reconstructed are also needed.

The reasons for use of fertility pattern of women of childbearing age in 2000 is more in line with the reality of the situation, which be better able to predict the future population. This research hypothesizes that the fertility rate and fertility pattern in 2005 in accord with 2000, because large quality error of fertility data existed in 2005 National 1% Sample Survey and age structure needs to be adjusted.

3.1.2 quality test of age-sex-specific population data

In order to make an age shift operator of population and push back the history of population, it is necessary to test the quality of age-sex-specific population data on the 2000 National Census and 2005 National 1% Sample Survey for judging the problems of age heaping and sex preference. Only does not exist in two aspects of problem, can be obtain the scientific and accurate population data relying on the age population shift operator.

（1）Age preference index test.

Age Preference Index is a basic method for testing “age heaping” phenomenon produced by age preference at a certain age of the age structure of population data. [107]P27

Table 3-1 calculated results of age preference index in 2000 and 2005

	In 2000							In 2005					
age	10	13	30	32	37	43	45	15	35	37	42	48	50
total	114.2	109.9	107.2	108.9	127.7	111.5	103.1	113.5	105.9	108.6	128.5	112.0	104.4
male	114.4	109.6	107.2	109.1	128.0	111.7	103.6	113.7	105.9	108.6	129.4	112.3	105.4
female	114.0	110.2	107.1	108.6	127.3	111.4	102.7	113.3	105.9	108.6	127.6	111.6	103.4

It can be seen from the table that “age heaping” existed in some individual age of 2000 National Census, which are 10, 37 and 43 with IAP_x value ranged of 110 ～ 130. The results show that the phenomenon of age heaping is not severe and the quality of data can be accepted. It should be noted that year of birth at 37-year-old population is 1963, which went through the 3 Years difficult period, began to recover from low birth tide rapidly and form a high compensatory baby boom. So, the age heaping displayed by age preference index is not caused by age preference but caused from population is not subject to uniform or linear distribution. It can be also seen from the table that “age heaping” existed in some individual age of 2005 National 1% Sample Survey, which are 15, 42 and 48 with IAP_x value ranged of 110 ～ 130. The results show that the phenomenon of age heaping is not severe and the quality of data can be accepted. It should be noted that year of birth at 42-year-old population also is 1963, which is the same to 2000 National Census on age test and reason. Overall, the quality of 2000 National Census data and 2005 National 1% Sample Survey data can be accepted and used as the basis of making an age shift operator of population and population projection.

（2）Quality test of age-sex-specific population data.

Myer's Index is a comprehensive evaluation method for testing and weighing the quality of overall age structure of population data, i.e. Myer's Blended Method. The age structure of population at the regular stationary population as the standard, it judges the uneven degree of actual age structure of population and the phenomenon of age heaping by calculated the mixed product. [107]P30 U.N. Composite Index, i.e. U.N. Age-sex Accuracy Index, is a comprehensive method for testing the sex-age-specific structure of population. [107]]P33

Table3-2 Index of data quality test at age-sex specific in 2000 and 2005

	2000 National Census			2005 National 1% Population Sample Survey		
	total	male	female	total	male	female
Myer's Index	2.08	1.97	3.86	1.36	1.33	1.41
U.N. age-sex accuracy Index		30.76			29.07	

It can be seen from the table that Myer's Index less than 5 calculated by 2000 National Census data and 2005 National 1% Sample Survey data, which denotes the quality of data is reliable without obvious age preference; however, U.N. age-sex accuracy Index between 20 ~ 40 of both indicates the sex strucrure of both is volatile and sex ratio at birth is abnormal, which should be backfilled and reconstructed for omission in all age especially 0 ~ 9-year-old born population backfilled. Overall, the quality of age-sex-specifix population data from 2000 National Census and 2005 National 1% Sample Survey is better without obvious age preference heaping and across age, which can be used for age shift operator of population and population projection.

3.1.3 pushed back to the midyear age-sex population used Lexis Diagram

Due to the point of 2005 National 1% Sample Survey is zero hour on 1 November, 2005, in order to compare with the midyear population on July 1, 2000 and forecast

the future accurate midyear population, the age-sex-specific population on November 1, 2005 is pushed back for July 1, 2005 by age population shift operator of Lexis Diagram. The population estimation does not take into account the situation of omission at the 2005 National 1% Sample Survey, only estimate by registered population for the basis.

According to the method of omission assessment and midyear population estimation[108], the age-sex-specific population on zero hour of November 1, 2005 in 2005 National 1% Sample Survey Data is pushed back for zero hour of July 1, 2005, and the population age pyramids which represent the age-sex-specific population on zero hour of November 1, 2005 and of July 1, 2005 are made. Compared with two population age pyramids, the shape of both are basically the same. Therefore, 2005 midyear population pushed back can be used as the basis of the age-sex-specific population backfilled for omission and the population projection.

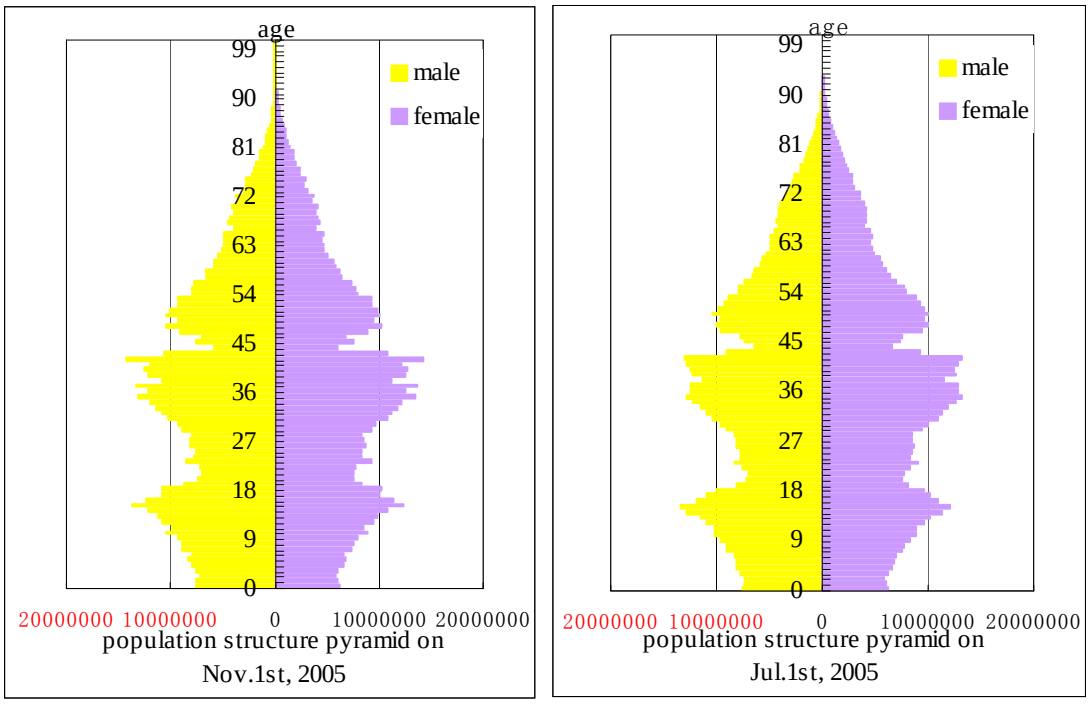

Chart 3-1 The comparison of population age structure pyramid in 2005

3.1.4 evaluate the omission, backfilled population, reconstruct the midyear age-sex population

（1）0 ~ 9-year-old population backfilled for omission.

2005 National 1% Sample Survey Data shows that the rate of misreporting is 1.72% and the sampling ratio is 1.325%. Due to sampling ratio of age component unable to obtain, it's assumed that the average sampling ratio at different age is 1.325%. Calculated by 2005 National 1% Sample Survey Data, the total number of omission population is 22435335. In the process of backfilled for omission, this research draws on the results of research scholar Wang[108], which demonstrate 0 ~ 9-year-old age group population omitted accounts for 91.09% of the total omission population, omissions of other age population shared equally; males account for 46.38% and females was account for 53.62% of the 0 ~ 9-year-old age group omission population; the sex ratio distribution of 0 ~ 9-year-old age group population omitted is consistent with 1990 National Census's (See table3-3). The results show that the total number of 0 ~ 9-year-old age group population omitted is 20435584, among which males are 9478024 and females are 10957560. Omission population of 0 ~ 9-year-old age group and midyear population backfilled for omission in 2005 are as follows.

Table 3-3 omission population of 0～9 age group in 2005

（including active duty soldier）

age（year）	Omission distribution of 0～9 age group in 1990（%）		Male omission	Female omission	Midyear male population backfilled for omission	Midyear female population backfilled for omission
	male	female				
0	26.60	22.48	2521154.33	2463259.50	10005742	8672550
1	14.43	15.41	1367678.83	1688560.01	8766487	7637005
2	8.69	9.86	823640.27	1080415.42	8151552	6969152
3	8.76	9.11	830274.88	998233.72	8496741	7230872
4	8.32	7.42	788571.58	813050.96	8909938	7476227
5	3.75	4.47	355425.89	489802.94	8559109	7277162
6	9.29	10.77	880508.41	1180129.22	9224083	8128175

7	5.59	9.74	529821.53	1067266.35	9496104	8575291
8	2.64	1.89	250219.83	207097.89	9337198	7922962
9	11.93	8.85	1130728.24	969744.07	10778360	9202621
total	100.00	100.00	9478023.79	10957560.06	91725316	79092015

（2）midyear population backfilled for omission at every age group and age-sex-specific structure of population reconstructed.

The accurate national age-sex-specific structure of population was obtained by midyear population on July 1, 2005 which backfilled for omission and backed up from age-sex-specific population on 1 November, 2005.

Table 3-4 Integrated midyear total population backfilled for omission in 2005

age-sex specific population	Puched back for calculated original population		backfilled population for omission		total population backfilled for omission
	male	female	male	female	
0	7484588	6209291	10005742	8672550	18678292
1～4	30514554	24732996	34324719	29313256	63637975
5～9	44248151	37192169	47394855	41106209	88501064
10～14	55588410	48839992	55643350	48894932	104538282
15～19	54410615	50793794	54465555	50848734	105314289
20～24	37818341	40790726	37873281	40845666	78718947
25～29	41302561	43544919	41357501	43599859	84957360
30～34	54917033	56742872	54971973	56797812	111769785
35～39	61229973	63027549	61284913	63082489	124367402
40～44	53670517	54395442	53725457	54450382	108175839
45～49	44453428	44005740	44508368	44060680	88569048
50～54	46250962	45612248	46305902	45667188	91973090
55～59	34225842	32890823	34280782	32945763	67226545
60～64	25619194	24358077	25674134	24413017	50087151
65～69	21448554	20837202	21503494	20892142	42395636
70～74	16625937	17148601	16680877	17203541	33884418
75～79	9928521	11397736	9983461	11452676	21436137
80～84	4774478	6549127	4829418	6604067	11433485
85+	1858969	3573148	2034777	3748956	5783733
total	646370628	632642453	656848559	644599919	1301448478

3.1.5 fertility pattern of women of child-bearing age in 2000

（1）fertility pattern of women of childbearing age in 2000.

On the basis of stable characteristic of childbearing behavior in adjacent time, it is hypothesized that the fertility pattern of women of childbearing age within the range of 1 November, 1999 ~ October 31, 2000 approximates the fertility pattern within the range of July 1, 1999 ~ June 30, 2000.

The research assumed that fertility pattern of women of childbearing age does not change which backfilled for omission, that is, the standardized age-specific fertility rate (i.e. fertility pattern) is real estimated by age-specific fertility rate in the 2000 National Census, which denotes the fertility pattern of backfilled for omission.

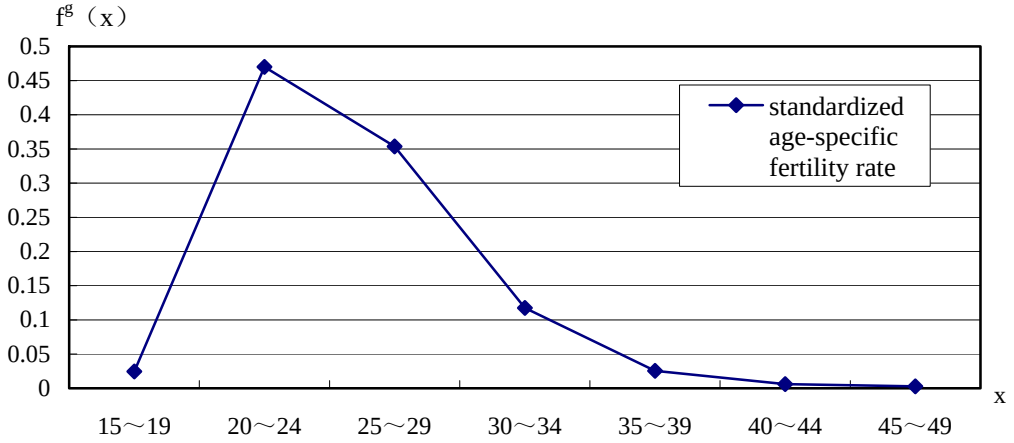

Chart 3-2 fertility pattern of women of childbearing age in 2000

（2）revaluation on TFR of women of childbearing age in 2005.

According to the age-parity-specific fertility rate of women of childbearing age in the <China Statistical Yearbook-2006>, the 2005 age-specific fertility rate of women standardized and 2005 TFR revaluated for testing the accuracy of age structure. The formula for the calculation is below[109],

$$TFR^{*} = \frac{B}{\sum_{x=15}^{49} W_{(x)} f_{(x)}^{g}}$$

Where, TFR^* is the re-estimated Total Fertility Rate of Women of childbearing age, $W_{(x)}$ is the backfilled number of midyear age-specific women of childbearing age for omission, $f^g_{(x)}$ is the standardized age-specific fertility rate (i.e. fertility pattern), B is the backfilled number of birth for omission. Note that according to the empirical value of separation coefficient on the infant mortality[110], which denote the number of infants who birth and died in the same year accounts for 2/3 of the total number of infant deaths[111]P101[112]P213, hence, B is the sum of midyear infants of male and female at age 0 who backfilled for omission and divide by (1-2/3*death probability at age 0) respectively. Calculated by the figures, total fertility rate of women of childbearing age is 2.08 in 2005. Therefore, quality of error in the data was existed.

3.2 scenario simulations designed

3.2.1 the quality and cycle of population projection

The research belongs to long term cycle population projection. The initial year of population projection is 2005, the last year of population projection is 2100, which crossed over 95 years. On the basis of midyear age-sex-specific population of 2005 National 1% Sample Survey Data, which will be backfilled, returned and reconstructed in order to deal with omission, this research attempts to make a consistent assumption of fertility pattern between 2000 and 2005, and hypothesize a reasonable dynamics of sex ratio at birth and ignore the international migration effect, and then make three scenario simulations of population development trend in the future under the circumstances of fixed mortality dynamic pattern.

3.2.2 death pattern hypothesis

In this research, the age-sex-specific average life expectancy of population projection at the initial year is used as the index of mortality pattern, and the dynamic track of future mortality pattern of population is determined by standardizing the model of death probability of age-sex-specific according to the distribution of the

age-sex-specific death rate showed at the 2005 National 1% Sample Survey Data.

The age-sex-specific death population in the 2005 National 1% Sample Survey Data indicated the situation of population death from November 1, 2004 to October 31, 2005. As there were only two months till the end of 2005, we presume that the level of death during that period was consistent with that of the whole year of 2005. In this research, the level of death is used as that of the whole year of 2005 and the basis for the estimation of mortality pattern.

It should be noted that the following calculations and estimation are based on the premise that the impact on the age-sex-specific mortality caused by age-sex-specific omission of birth, death and survival population in 2000 National Census and 2005 National 1% Sample Survey can be ignored.

In 2000, the average life expectancy of total population in China was 71.40, among which that of males was 69.63 and females was 73.33. In 2005, the average life expectancy of total population in China was 75.95, among which that of males was 73.47 and females was 78.44. We calculate that the life expectancy of males and females in China was 75.07 and 79.21 in 2100 respectively, according to the UN Step Empirical Value or Newton Interpolation Formula.

Table 3-5 The projection of average life expectancy at birth

year	male	female	year	male	female
2005	73.469	78.436	2055	74.822	79.202
2010	73.700	78.720	2060	74.874	79.204
2015	73.907	78.912	2065	74.917	79.205
2020	74.088	79.033	2070	74.952	79.205
2025	74.246	79.107	2075	74.982	79.205
2030	74.383	79.150	2080	75.007	79.206
2035	74.501	79.174	2085	75.027	79.206
2040	74.602	79.188	2090	75.044	79.206
2045	74.688	79.196	2095	75.058	79.206
2050	74.761	79.200	2100	75.069	79.206

Either Regional Model Life Tables developed by Coale & Demeny or Newton Interpolation Formula of equidistant points can be applied to forecast the average life expectancy[112]P453. Regarding the estimation of the age-sex-specific death probability, the probability under corresponding annual average life expectancy is obtained by using the method of variant parameter estimation for life expectancy[72]P35 in this research.

Table 3-6 change rule of average life expectancy at birth

Current average life expectancy at birth（year）	Average increased value at every 5 years（year）		Average increased value at every 1 years（year）	
	male	female	male	female
52.5 below	2.50	2.50	0.50	0.50
52.5～55.0	2.30	2.50	0.46	0.50
55.0～57.5	2.20	2.40	0.44	0.48
57.5～60.0	2.05	2.30	0.41	0.46
60.0～62.5	1.90	2.20	0.38	0.44
62.5～65.0	1.75	2.10	0.35	0.42
65.0～67.5	1.20	2.00	0.24	0.40
67.5～70.0	0.75	1.80	0.15	0.36
70.0～72.5	0.45	1.40	0.09	0.28
72.5～75.0	0.20	1.00	0.04	0.20
75.0～77.5	—	0.70	—	0.14
77.5～80.0	—	0.20	—	0.04

Data source：Zharui Chuan，Yimin Shen，Xiaochun Qiao. National Census data analysis techniques. Beijing: China Population Press, 1991: 452.

I calculate the current death probability of age-sex-specific according to the current average survival length of age-sex-specific death population ${}_{n}a_{x}$, and the relation between the death probability and mortality[113]P90. Thereby, I develop four abridged life tables of sex-age group-specific in 2000 and in 2005. (See Appendix)

3.2.3 TFR adjustment scenarios

The total fertility rate of women of childbearing age is used as the fertility parameter

in this research. By standarded fertility rate pattern of age-specific according to the age distribution of women of childbearing showed in 2000 National Census, and based on China's current fertility policy and actual fertility level, three TFR designed projects - low, medium and high scenarios are given here for the purpose of forecasting the dynamics of future fertility level and coming up with the reasonable choice for fertility level in the 21st century.

The childbearing behavior may be affected by the fertility policy, the development rules of human, the change of childbearing conception and the level of socioeconomic development. Therefore, in this research, the high project is established in such a scenario that the birth control is loose and the fertility level is only affected by the factors such as the level of economic development and marriage and childbearing conception; the medium project is established in such a scenario that the birth control is moderate and fertility level is suitable, and; the low project is established in such a scenario that the birth control is very strict and fertility level is low.

Low Project: under the scenario of this project, the current fertility policy and TFR＝1.8 will be maintained, and the state of long-term, low fertility level will last until the end of this century, taking into account the factors such as robust "rebounding" momentum of current low fertility level, large omission of birth in rural areas, growth of double one-child families in urban areas, improvement of urbanization, evolvement of marriage and childbearing conception and instability of regional floating population. The core of this project is to stabilize a low fertility level so as to implement the strategy of negative population growth.

Medium Project: Due to the third baby boom during 1980s and 1990s, there will be a small baby boom in the coming more than ten years because numerous women are in their prime of childbearing aged 20 to 29. In addition, more than 90 million singletons from one-child families come to their childbearing age in succession, and thus the fertility level under the current fertility policy will be elevated. Supposing under the

current fertility policy, TFR can be elevated since 2020 and the replacement level will be achieved in 2030 and maintained till the end of the 21st century under the scenario of this project. In compliance with the development rules of human and taking the fertility desire into consideration, this project is favorable for fulfilling the sustainable population development strategy and provides a viable reference for adjustment of China's fertility policy, which is of particular practical significance.

High project: With the acceleration of urbanization and growth of floating population, and taking into account the gap between the fertility desire and the current fertility policy, the effect of baby boom and the "fine-tuning" effect of double one-child families in urban areas, supposing the current total fertility rate is 1.8, TFR can be gradually elevated since 2010 and the replacement level will be achieved in 2020 and maintained till 2100 under the scenario of this project. This project aims at relatively high fertility, which is of fairly good value for reference.

Table 3-7 TFR designs of population projection

Year	2005～2010	2010～2015	2015～2020	2020～2025	2025～2030	2030～2100
low project	1.8	1.8	1.8	1.8	1.8	1.8
medium project	1.8	1.8	1.8	1.9	2.0	2.1
high project	1.8	1.9	2.0	2.1	2.1	2.1

3.2.4 sex ratio at birth parameter

In this research, a variant momentum of the sex ratio at birth is reasonably presumed among scenarios, which can reach the normal range of 103～107 within certain period of time. Given that the dynamics of sex ratio at birth has been distorted for a long term, hypothesized gradual normalization have been made to the sex ratio at birth with 107 as the upper limit in this research. The sex ratio at birth aged 0 was 118.88 in 2005. Under the scenarios of three TFR projects, the sex ratio at birth is normalized since 2005, reaching 107 in 2030.

3.3 comparative analysis on population development trend of China in the future

On the premise of taking the actual and accurate population information, based on midyear age-sex-specific population which will be backfilled, returned and reconstructed in order to deal with omission, according to TFR designed projects and hypothesized mortality pattern, this research make a comparative analysis on population dynamics of three scenario simulations in the 21st century, which demonstrates the results of natural growth rate, total population size, proportion of the elderly aged 65^{+}, labor force-age population size and total dependency ratio respectively. Based on estimation and evaluation of practical effects produced, and taking account of all the factors above, this research will put forward to the optimal opportunity of low fertility level choice in the future in China.

3.3.1 natural growth rate

Comparison of scenarios of population projection, the results demonstrate that the natural growth rates under low project, medium project and high project all display a trend of increasing before decreasing. Under the three scenarios, the natural growth rates will all reach a peak in 2010, and will realise zero population growth in 2030, 2035 and 2045 respectively due to the implementation of the population negative-growth strategy to control the increase of total population.

The population projection results show that, under the scenario of low project, the natural growth rate will hit a peak in 2010, reaching 6.41‰, drop to -1.07‰ in 2030, and then undergo a negative-growth period that last for as long as over 70 years, during which the natural growth rate will drop to -4.86‰ in 2050, -4.50‰ in 2060, -6.00‰ in 2075, the lowest point -6.08‰ in 2095, after slight increase, and -6.02‰ in 2100; under the scenario of medium project, the natural growth rate will hit a peak in

2010, reaching 6.41‰， reach 0.48‰ in 2030, and then undergo a negative-growth period that may last for as long as 65 years, during which the natural growth rate will drop to -0.67‰ in 2035, fall to the lowest point of -2.13‰ in 2050, and reach -1.25 ‰ in 2060, -1.99‰ in 2070 and -0.58‰ in 2100, approaching zero-growth point; under the scenario of high project, the natural growth rate will hit a peak in 2010, reaching 7.07‰, reach 0.76‰ in 2030, and then undergo a negative-growth period that may last for 55 years, during which the natural growth rate will drop to -0.85‰ in 2045, touch population negative growth limit of -1.44‰ in 2050, and reach -0.42‰ in 2060, -1.01‰ in 2070 and -0.58‰ in 2100.

Modern stationary population is the ideal state of population development. According to the stationary population theory, the natural growth rate should be kept near the zero point of population growth; in accordance with the requirement of sustainable development rules, the total fertility rate should return to the replacement level at the right time. So the change of natural growth rate should not deviate too far from the zero point of population growth, and the total fertility rate should return to the replacement level before the achievement of zero point of population growth. Under the scenario of low project, the natural growth rate deviate the furthest (max -6.08‰) from the zero point of population growth, which may hamper the achievement of modern stationary population, the low fertility rate has been kept for almost one hundred years, but according to the natural development rule of population, the continuous low fertility is not sustainable, which is lower than the replacement level. In the long term, the population size will steadily dwindle and disappear altogether at last. So the low project is not advisable. With the medium project, the deviation of natural growth rate (-2.13‰) from the zero point of population growth is a little longer (0.69‰) than the deviation of high project, the natural growth rate between 2040~2080 will be in a steady range of -1.02‰～-2.13‰, and gradually tend toward the zero point of population growth, which shall be conductive to the achievement of modern stationary population. Moreover, this project will start the adjustment from 2020, and raise the total fertility rate to the replacement level before achieving the

zero point of population growth in 2030, so it'd be helpful for the strategic target of sustainable development. So, for the achievement of zero population growth, the medium project is the second best. With the high project, the natural growth rate deviate a little closer (max -1.44‰ of negative growth) to the zero point of population growth, the natural growth rate between 2060~2100 will be in a steady range of -0.42‰～-1.01‰, and gradually tend toward the zero point of population growth, which shall be conducive to the achievement of modern stationary population. Moreover, this project will start the adjustment from 2010, and raise the total fertility rate to the replacement level in 2020 before achieving the zero population growth (before 2045), so it'd be helpful for the strategic target of sustainable development. So, in terms of the change of natural growth rate, the high project is the best choice. However, to adjust the fertility policy, factors such as the total population size, age structure and the change of labor population should also be considered.

Table 3-8 Comparision of china's population growth rate trend（‰）

Year	Low Project			Medium Project			High Project		
	Birth rate	Death rate	Natural increase rate	Birth rate	Death rate	Natural increase rate	Birth rate	Death rate	Natural increase rate
2005	12.40	6.51	5.89	12.40	6.51	5.89	12.40	6.51	5.89
2010	12.44	6.04	6.41	12.44	6.04	6.41	13.09	6.03	7.07
2015	12.47	7.03	5.44	12.47	7.03	5.44	13.73	6.98	6.75
2020	11.29	8.01	3.28	11.29	8.01	3.28	12.93	7.89	5.05
2025	10.05	9.16	0.89	10.85	9.13	1.71	11.43	8.95	2.49
2030	9.46	10.54	-1.07	10.91	10.43	0.48	10.96	10.21	0.76
2035	9.55	11.80	-2.25	10.93	11.60	-0.67	11.46	11.32	0.14
2040	9.67	12.61	-2.94	11.00	12.30	-1.30	12.01	11.95	0.06
2045	9.44	13.57	-4.13	11.06	13.12	-2.06	11.82	12.67	-0.85
2050	9.09	13.95	-4.86	11.20	13.33	-2.13	11.38	12.82	-1.44
2055	8.94	13.66	-4.72	11.26	12.88	-1.62	11.29	12.36	-1.07
2060	9.01	13.52	-4.50	11.31	12.56	-1.25	11.61	12.03	-0.42
2065	9.08	14.13	-5.05	11.38	12.93	-1.55	11.88	12.35	-0.47
2070	9.01	14.96	-5.96	11.47	13.46	-1.99	11.83	12.84	-1.01
2075	8.89	14.89	-6.00	11.58	13.16	-1.58	11.65	12.57	-0.92
2080	8.83	14.60	-5.77	11.64	12.66	-1.02	11.60	12.20	-0.60

2085	8.88	14.66	-5.79	11.67	12.49	-0.82	11.75	12.20	-0.46
2090	8.93	14.86	-5.93	11.71	12.47	-0.77	11.89	12.40	-0.52
2095	8.92	15.00	-6.08	11.75	12.47	-0.72	11.88	12.52	-0.64
2100	8.87	14.89	-6.02	11.78	12.36	-0.58	11.79	12.37	-0.58

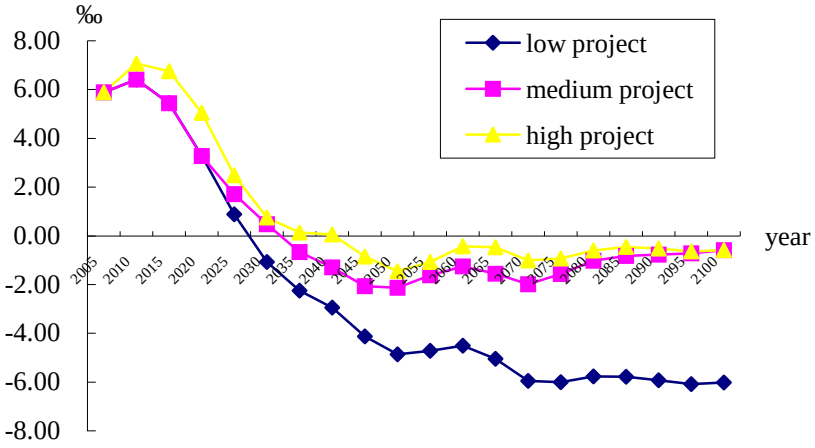

Chart3-3 Natural Growth Rate Projection

3.3.2 total population size

According to the research on the Maximum carrying capacity of resource and environment for population size: the maximum carrying capacity of China's resource and environment is 1.66 billion, which was considered as the highest standard for China to control population and choose an oppoetunity among the three scenarios of population projection. The results of population projection show that the peaks of total population sizes won't outstrip the maximum carrying capacity of China's resource and environment under the three TFR adjustment projections, which will accord with the highest standard for controlling population.

Under the scenario of low project, the result shows that the total population size will increase to 1.395 billion in 2015 from the 1.301 billion in 2005, almost a growth of 0.1 billion in a decade, and the total population size will reach its peak (1.451 billion) in 2030, achieving the zero population growth by and large; then we will have a

population negative growth period as long as 70 years, and the total population size will gradually decrease to 1.372 billion in 2050 and 1.201 billion in 2075, 1.028 billion in 2100. The planned total fertility rate level of this project may keep the total population size within the limited carrying capacity of resource and environment, and reduce the population gradually to relieve the pressure of excessive population size, but people will die out in the long run. So this project is inadvisable. So we cannot consider the low fertility as a permanent fertility level of fertility policy, but elevate the total fertility rate to the replacement level at the appropriate opportunity.

Under the scenario of medium project, the results show that the total population size will increase to 1.395 billion in 2015 from the 1.301 billion in 2005, almost a growth of 0.1 billion in a decade, after reaching 1.453 billion in 2025, the total population size will keep increasing and reach its peak (1.472 billion) in 2035, achieving the zero population growth by and large; then we will have a population negative growth period as long as 65 years, and the total population size will gradually decrease to 1.442 billion in 2050 and 1.393 billion in 2070, 1.343 billion in 2100. From 2020 to 2065, the total population size will be kept above 1.4 billion, a number advantageous for the sustainable and steady development. This project comply with the highest standard of carrying capacity of resource and environment, and it's both effective for releasing the pressure of population to resource and environment and advantageous for the sustainable development of population, society, economy and resource and environment. So, this project is an adoptable choice of fertility level for the adjustment of fertility policy. Compared with the high project, the peak of the total population size of medium project is lower, so the medium project is the best choice.

Under the scenario of high project, the results show that the total population size will increase to 1.409 billion in 2015 from the 1.301 billion in 2005, a growth of more than 0.1 billion in a decade, after reaching 1.504 billion in 2030, the total population size will reach its peak (1.515 billion) in 2040, achieving the zero population growth by and large; then we will have a population negative growth period, and the total

population size will gradually decrease to 1.505 billion in 2050 and 1.479 billion in 2070, 1.444 billion in 2100. From 2025 to 2065, the total population size will be kept the range of 1.483~1.515 billion, a number advantageous for the sustainable and steady development of society and economy. This project comply with the highest standard of carrying capacity of resource and environment, and it's both effective for releasing the pressure of population to resource and environment and advantageous for the sustainable development of population, society, economy and resource and environment. So, this project is also an adoptable choice of fertility level for the adjustment fertility policy. But compared with the medium project, the peak of the total population size of high project is 0.043 billion higher, so this project is the second best.

However, to adjust the fertility level, in addition to the total population size, we should also consider such factors as the age structure of population, labor supply and the total dependency ratio. Only by taking various factors into consideration and conducting systematic analysis and scientific judgment can we expect to identify the best project of fertility level choice for the adjustment of fertility policy.

Table 3-9 Projected China's total population size development trend

（a hundred million person）

Year	Low Project	Medium Project	High Project
2005	13.01	13.01	13.01
2010	13.51	13.51	13.55
2015	13.95	13.95	14.09
2020	14.29	14.29	14.56
2025	14.47	14.53	14.87
2030	14.51	14.69	15.04
2035	14.43	14.72	15.12
2040	14.26	14.67	15.15
2045	14.03	14.57	15.14
2050	13.72	14.42	15.05
2055	13.37	14.25	14.93
2060	13.04	14.13	14.85

2065	12.74	14.04	14.83
2070	12.40	13.93	14.79
2075	12.01	13.78	14.70
2080	11.64	13.67	14.62
2085	11.29	13.60	14.58
2090	10.95	13.54	14.54
2095	10.62	13.48	14.50
2100	10.28	13.43	14.44

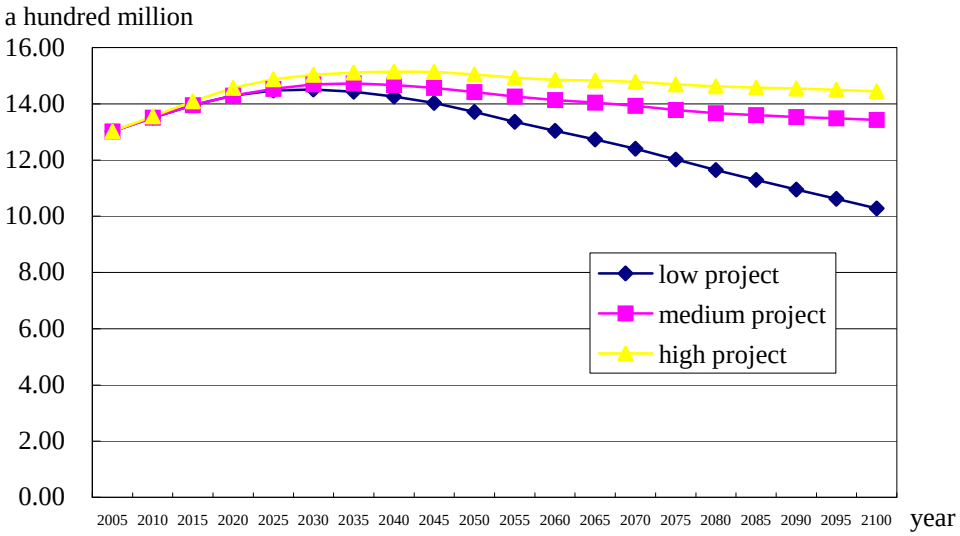

Chart 3-4 Total Population Development Trend

3.3.3 proportion of the elderly aged 65+

Under the scenario of low project, the result shows that the proportion of elderly aged 65+ will increase to 16.02% in 2020 and 21.43% in 2030, and it will reach a hypo-peak (27.17%) in 2045; after a little decrease the proportion of the elderly aged 65+ will increase fast with small fluctuation and reach the highest peak (31.61%) in 2090, then it will slowly reduce to 31.30% in 2010. From 2065 to 2100, the proportion of the elderly aged 65+ will be kept above 30%, the ever-higher aging degree and heavy pension burden will be a severe challenge for the social pension insurance system. So, with the continuous low fertility, although total population size can be effectively controlled, the proportion of the elderly aged 65+ will keep

increasing above 30% for 35 years resulting in population aging and heavy social pension responsibility, which are unfavorable for the sustainable development of population. So this project is inadvisable.

Under the scenario of medium project, the results show that the proportion of elderly aged 65+ will increase to 16.02% in 2020 and 21.17% in 2030, and it will reach a hypo-peak (26.23%) in 2040 and the highest peak (27.52%) in 2065; then it will slowly decrease to 26.54% in 2075, 25.64% in 2100. From 2040 to 2045, and from 2055 to 2085, the proportion of the elderly aged 65+ will be kept the range of 26.12%~27.52%. So, the increased aging degree will cause heavy pension burden to the pension insurance system. The aggravating of aging trend will upset the balance of population age structure, and it's unfavorable for the sustainable development of society and economy. So, solely in terms of the change trend of the proportion of the elderly aged 65+, the middle project is the second best choice of fertility level for the adjustment of fertility policy.

Under the scenario of high project, the results show that the proportion of elderly aged 65+ will increase to 15.72% in 2020 and 20.67% in 2030, then it will gradually increase and reach the hypo-peak (25.04%) in 2045 and the highest peak (26.06%) in 2065; then it will slowly decrease to 25.15% in 2075, 25.09% in 2100. From 2040 to 2045, and from 2055 to 2095, the proportion of the elderly aged 65+ will be kept the range of 25.15% ~26.06%. The increased aging degree will cause heavy pension burden to the pension insurance system, and also upset the balance of population age structure. Compared with the other two projects, this project has the lowest aging degree. So, this project is the best choice of fertility level for the adjustment of fertility policy.

These results of scenarios show that, China will face a serious population aging problem whatever project we choose. Though we don't have enough capacity to prevent this trend, we can choose the best project to relieve the aging degree and

decelerate the aging speed. So, to adjust the fertility level, beating around the bush is the only way, on the premise of the effective controlling of total population, considering the aging speed and degree of population aging, to resolve the population problem in a systematic way, medium project is the best choice.

Table 3-10 Projected proportion of China's elderly aged 65+ population trend （%）

Year	Low Project	Medium Project	High Project
2005	8.83	8.83	8.83
2010	10.62	10.62	10.59
2015	12.86	12.86	12.73
2020	16.02	16.02	15.72
2025	18.38	18.30	17.89
2030	21.43	21.17	20.67
2035	24.85	24.36	23.73
2040	26.97	26.23	25.40
2045	27.17	26.18	25.19
2050	26.77	25.47	24.40
2055	28.10	26.35	25.17
2060	29.67	27.37	26.05
2065	30.34	27.52	26.06
2070	30.49	27.14	25.57
2075	30.45	26.54	25.15
2080	30.90	26.30	25.37
2085	31.45	26.12	25.84
2090	31.61	25.97	25.81
2095	31.45	25.85	25.41
2100	31.30	25.64	25.09

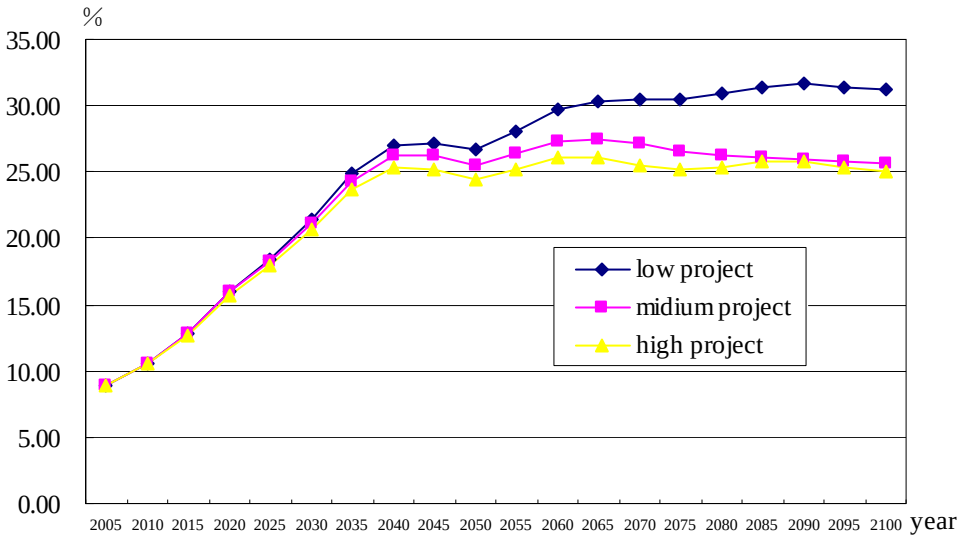

Chart 3-5 Proportion of the Elderly Aged 65+ Projection

3.3.4 labor force-age population size

Comparison of scenarios of population projection，The results of three projects show that for about twenty years before 21st century, the labor force-age population size of China will remain above 0.9 billion and its proportion above 65%, and the total dependency ratio below 50%, that means the population age structure has entered an era--'Golden Ages' that is favorable for the development of economy which is advantageous for the development of economy and society, i.e. a "Population Bonus" period or a "Population Surplus" period, during which there are plentiful labor force resource to provide good opportunities for the development of society and economy. We should take this opportunity to accelerate the development of economy, technology and society during the comprehensive construction of affluent society in the future.

Under the scenario of low project, the result shows that the labor force-age population size was 0.911 billion in 2005, and it will rapidly increase to its highest peak (0.968 billion) in 2015, then it will slowly decrease to 0.914 billion in 2030, 0.807 billion in 2050, 0.69 billion in 2070 and 0.564 billion in 2100. Under this scenario,, the labor

force-age population will keep decreasing and cause serious labor force shortage, which will hamper the sustainable development of society and economy. So, this project is inadvisable.

Under the scenario of medium project, the results show that the labor force-age population size was 0.911 billion in 2005, and it will rapidly increase to its highest peak (0.968 billion) in 2015, then it will slowly decrease to 0.873 billion in 2035, 0.836 billion in 2050, 0.764 billion in 2100. Under this the scenario, the “Population Bonus” period is as long as 15 years, and from 2060 to 2100, the labor force-age population size will be kept the range of 0.76~0.79 billion, the plentiful labor force resource is beneficial for the rapid development of economy. So, this project is a good on for the choice of fertility level by the adjustment of fertility policy.

Under the scenario of high project, the results show that the labor force-age population size was 0.911 billion in 2005, and it will rapidly increase to its highest peak (0.968 billion) in 2015, then it will slowly decrease to 0.928 billion in 2030, 0.872 billion in 2045, 0.844 billion in 2070. During the period of 2040~2075, the labor force-age population size will be kept the range of 0.842~0.876 billion, and decrease to 0.828 billion in 2100. Under this scenario, we will have a relatively larger labor force-age population size, which is advantageous for the rapid and steady development of economy. However, with consideration of the total dependency ratio of this project, the “Population Bonus” period is only 10 years, and we cannot maximize the advantage of labor force resource, so this project is second best for the choice of fertility level by the adjustment of fertility policy.

Moreover, the aging of labor force-age population should not be neglected. So, to adjust the fertility level, we should not only consider the supply of labor force, which is an important human resource required by the sustainable development, but also consider the problems such as employment pressure and how to protect the rights and interests of floating population, which is a strategic problem for the entire

development plan.

Table 3-11 Projected number of China's labor force-age population size trend

（a hundred million person）

Year	Low Project	Medium Project	High Project
2005	9.11	9.11	9.11
2010	9.56	9.56	9.56
2015	9.68	9.68	9.68
2020	9.53	9.53	9.53
2025	9.41	9.41	9.45
2030	9.14	9.14	9.28
2035	8.73	8.73	9.00
2040	8.37	8.43	8.76
2045	8.20	8.37	8.72
2050	8.07	8.36	8.75
2055	7.71	8.11	8.59
2060	7.36	7.89	8.45
2065	7.11	7.81	8.43
2070	6.90	7.78	8.44
2075	6.68	7.76	8.42
2080	6.43	7.71	8.36
2085	6.19	7.69	8.28
2090	5.99	7.67	8.26
2095	5.81	7.65	8.28
2100	5.64	7.64	8.28

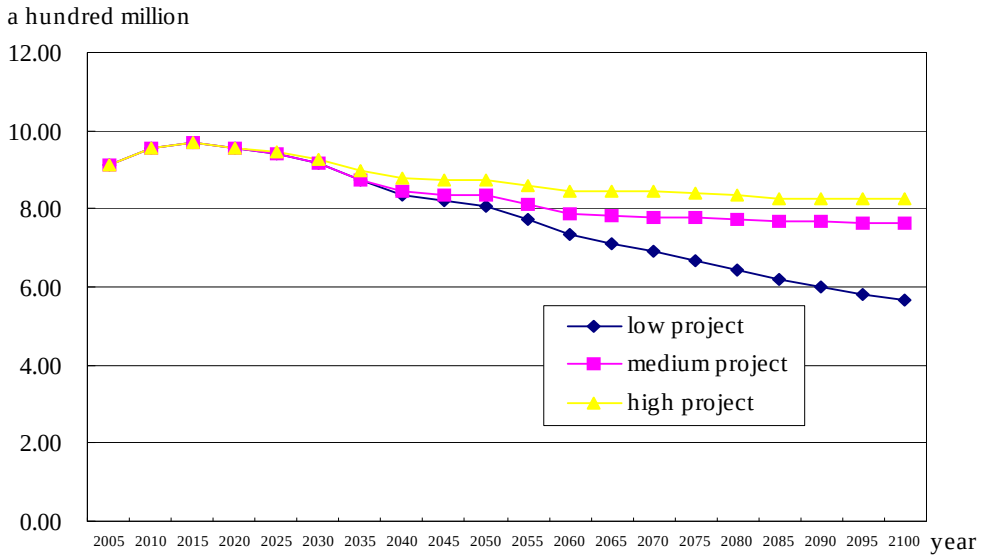

Chart 3-6 Population of the Labor Force Aged 15-64 Projection

3.3.5 total dependency ratio

Under the scenario of low project, the result shows that the total dependency ratio was 42.83% in 2005, and it will rapidly increase to 49.94% in 2020 and 58.66% in 2030, and it will reach the hypo-peak (70.20%) of the total dependency ratio in 2045; after a short-term decrease it will rapidly increase again, the total dependency ratio will increase to 79.69% in 2070 and reach the highest peak (82.99%) in 2090, and it will decrease to 82.19% in 2100. By then, 100 labor force-age populations will support about 83 the elderly and children, much larger than the ratio of 48%~55% attained by developed countries, and it will be a heavy dependency responsibility for the whole society and a big challenge for the construction and improvement of the social security system. Under this scenario, we will have the highest and longest total dependency ratio, which is unfavorable for the sustainable development of society and economy. So, this project is inadvisable.

Under the scenario of medium project, the results show that the total dependency ratio was 42.83% in 2005, and it will rapidly increase to 49.94% in 2020 and 60.61% in 2030, and it will reach the hypo-peak (74.05%) of the total dependency ratio in 2040;

after a short-term decrease it will rapidly increase again, the total dependency ratio will reach the highest peak (79.88%) in 2065, that means 100 labor force-age populations will support about 80 the elderly and children much larger than the ratio of 48%~55% attained by developed countries. After the peak it will slowly decrease to 76.85% in 2085 and 75.70% in 2100. During the period of 2060~2085, the total dependency ratio will stay the range of 76.85~79.88%, and it will exert a certain pressure on the development of society and economy. Compared with the high project, this project is the second best choice of fertility level for the adjustment of fertility policy.

Under the scenario of high project, the results show that the total dependency ratio was 42.83% in 2005, and it will rapidly increase to 52.83% in 2020, 62.00% in 2030 and 73.57% in 2045, 76.00% in 2065, and it will reach the highest peak (76.10%) of the total dependency ratio in 2085. By then, 100 labor force-age populations will support about 76 the elderly and children, much larger than the ratio of 48%~55% attained by developed countries, it will be a heavy dependency for the society. The total dependency ratio will decrease to 74.48% in 2010. During the period of 2060~2100, the total dependency ratio will stay the range of 74.48~76.10%, and it exert a certain pressure on the development of. society and economy. Compared with the medium project, this project is the best choice of fertility level by the adjustment of fertility policy.

Making a comparative analysis of assumptions, the results show that China will face a heavy dependency burden in the 21st century whatever project we choose. So we should take positive measures and improve in an all-round manner our social security system to reduce the total dependency ratio and promote the sustainable development of society and economy.

Table 3-12　Projected China's total dependency ratio development trend

（%）

Year	Low Project	Medium Project	High Project
2005	42.83	42.83	42.83
2010	41.34	41.34	41.81
2015	44.06	44.06	45.49
2020	49.94	49.94	52.83
2025	53.86	54.52	57.36
2030	58.66	60.61	62.00
2035	65.36	68.69	67.96
2040	70.50	74.05	72.86
2045	71.20	73.96	73.57
2050	69.98	72.46	71.97
2055	73.28	75.67	73.82
2060	77.28	79.23	75.84
2065	79.05	79.88	76.00
2070	79.69	78.98	75.24
2075	79.77	77.58	74.49
2080	81.02	77.22	74.98
2085	82.53	76.85	76.10
2090	82.99	76.50	76.06
2095	82.57	76.22	75.21
2100	82.19	75.70	74.48

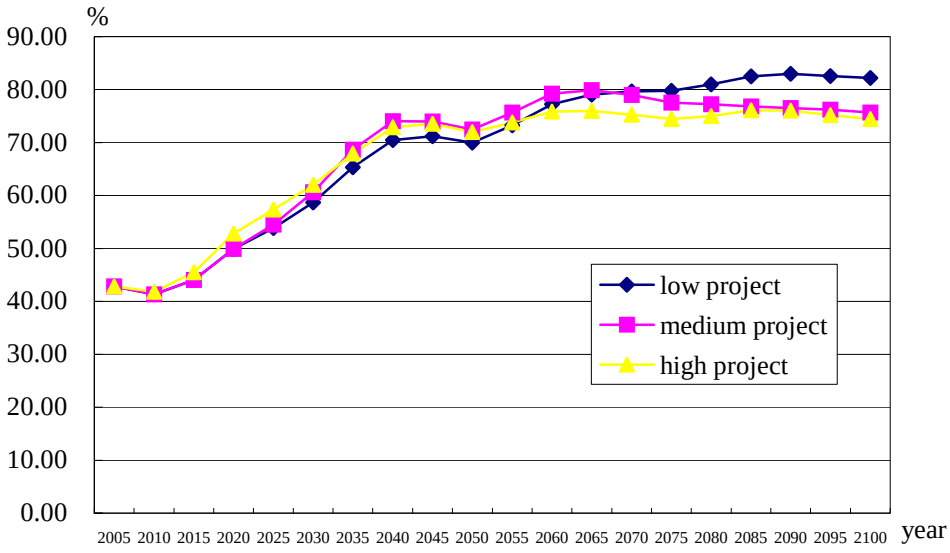

Chart 3-7 Total Dependency Ratio Projection

According to the simulation of the long-term population development trend of China under the different scenario which is make adjustment on total fertility rate, the population dynamics of China is rather grave in 21st century. Due to the momentum effect of population growth, China will undergo three peaks in population size, the proportion of elderly aged 65+ and the labor force resource by the middle of this century; the pressure of population on resource and environment will aggravate in the decades of years in the future. To relieve the pressure of population on resource and environment, taking the strategy of negative population growth is the only way. So, it's the primary problem for the population development of China in 21st century to seek a moderate population size, make the reasonable population structure, coordinate the population layout and improve the population quality, which decides the necessity and urgency for adjusting fertility policy.

Comparison of three scenario simulations demonstrates that the Medium Project is the best choice of China in the future, which will adjust TFR in 2020 to the replacement level in 2030. The Medium Project will be of benefit to control population growth and alleviate the pressures on resources and environment, ease the degree of ageing and depress the pace of ageing, optimize the age structure of population and equipoise the population distribution, reduce the total coefficient of dependency and form a period of "population bonus" up to 15 years, ease the tension between the cadre and the masses and strengthen the work of population and family planning; present the spirit of "people-oriented" and meet with the fertility desire of resident', implement the long-term, comprehensive, co-coordinated, complete and sustainable development strategies of population in China.

Chapter 4 The optimal opportunity of the fertility level choice in china

During the 11th Five-Year Plan Period, population and family planning programme has entered a new era, which focuses on stabilizing the low fertility level, addressing population issues in a comprehensive way, and promoting all-round human

development. It is imperative to fully implement the scientific development concept, prioritize investment in all-round human development, stabilize the low fertility level, upgrade population quality in terms of health and education, perfect population structure, guide rational geographical distribution of population, ensure population security, promote the transformation of China from a populous country to a country competitive in human capital and facilitate coordinated and sustainable development between population on the one side, and economy, society, resources and environment on the other side. This is of great practical significance and far-reaching historical significance to comprehensively build well-off and harmonious socialist society, and this is also a request of the future development of population and of the adjustment of family planning policy.

4.1 the urgency and necessity of adjustment

In the course of world's population transition, previous studies and practices on high fertility level have provided people with profound knowledge about its influence factors and consequences and the mechanism which urges declining of fertility. They have even improved the countermeasures and reached more and more significant purpose[114]. However, when nearly all countries in the world enter the period of post-demographic transition, their fertility rates begin to fall due to the influence of global low fertility rate. Most of their rates have dropped below replacement level, and even some countries have fallen to ultra-low fertility level. Faced with low fertility level, people become panic. What are the law and the characteristics of the development of low fertility rate? What are their influence factors and social consequences? What is the difference in their trends between the developed and developing countries? Can their trend be reversed? If so, what power can do it and what is the best time to do it? With these series of questions, demographers of the world fall into profound reflection, and thereafter, low fertility rate studies once again become the world’s "focus". It is hoped that the experiences from France and Sweden in Europe and South Korea in Asia will provide valuable suggestions to China in the

adjustment of fertility level[115].

The choice of fertility level in China needs to be oriented on the steady socio-economic development and policy environment and abided by the requirements for the sustainable development strategy. Not only the demands for population quality in the context of knowledge economy and the masses' fertility desire, but also the capacity restriction on resources and environment and the laws of population development should be taken full account of in the adjustment. And the last but not least, successful experience in the adjustment of birth policy in developed countries and domestic areas where are adopting "two children" policy must be learned from.

4.1.1 nonpersistent population development situation

In view of the law on the development of population, the long-term low fertility rate is not conducive to the continuation and development of mankind. Once the inertia of negative population growth forms, the total population will be continuing to reduce[116]. China's low fertility rate is determined together by socio-economic development and a variety of controlling mechanisms, so it is greatly instable and unbalanced. In the beginning of 1990s, China's Total Fertility Rate (TFR) dropped to below replacement level, and in the 21st century it continues to decrease with typical "dual structure" characteristics[117]. The long-term low fertility rate leads to a series of problems: "aging before getting rich", a heavy burden of old support; imbalance in labor supply, a serious employment pressure; severe imbalance in sex ratio at birth, a future pressure of marriage market squeeze; producing more "421" families and risks for the one-child families, etc. It is concluded that the sustained low fertility rate is not conducive to the sustainable development of population, society and economy. It is generally agreed in the world that when TFR is lower than 1.5 it will be labeled as ultra-low fertility rate. Suppose it fails not rise up, it will bring about disastrous consequences to the continuation and development of society. Nevertheless, facts have proven that there are, by far, no countries except Sweden and France successful

in elevating the low fertility rate to 1.5 from the ultra-low fertility rate, let alone to the replacement level 2.1[114]. In China, fertility rates vary greatly in different regions. For example, fertility rates in big cities like Shanghai and eastern developed areas remain at ultra-low level fertility for decades, whereas in western poor region areas and minority areas TFR stands above replacement level. Thus, in view of the current low fertility rate, ultra-low fertility rate and the different fertility rates between regions, the Chinese government should choose as soon as possible the right time to adjust TFR to replacement level so as to ensure the sustainable development between population, society and economy.

4.1.2 nonpersistent current fertility policy

Differences in China's current fertility policy between regions and urban-rural areas cause differences in reproductive rights and responsibilities between citizens. For example, second births are generally allowed in minorities and rural areas, whereas one-child fertility policy is strictly implemented in the developed regions and cities. It is obvious that this will result in unfairness in the same generation. In the aspect of family, China's current fertility policy has also caused inequalities in reproductive rights and responsibilities between different families, resulting in inter-generational inequality. For example, most families in cities have only one child, who has rights to have two children when he or she will get marry. Assuming that other conditions remain unchanged, these only children will take more responsibilities and obligations than their children. Furthermore, families with only one child will encounter more vulnerability and risks of being disaggregated, impeding the sustainability of inter-generations.

In addition, the diverse fertility policies between regions, urban and rural areas give rise to different fertility rates, leading to different survival and development environment for the whole population. This makes population quality different from each other, against the overall and sustainable development of population and unable

to meet with the development requirements of knowledge economy. The above analysis proves that China's current fertility policy will inevitably bring about problems of equality and equity, affecting the implementation of fertility policy adjustment. Things will become hard to control if no positive attitudes are timely taken to adjust fertility policy. In all, it is necessary to adjust the current fertility policy in order to achieve intra-generational and inter-generational equities and integrate fertility policies between urban, rural, regional and ethnic areas.

4.2 the optimal occasion of choice on adjustment

People's fertility concept has tremendously changed as the level of socio-economic development is rising, urbanization is accelerating, floating population is becoming popular, and inter-regional population movement is speeding up. The changes include that people continue to postpone marriage and childbearing, and more and more people begin to emphasize opportunity costs rather than the costs and benefits of raising children. The result is obvious that more people tend to have fewer or no children. The women's fertility rate has declined continuously in a growing number of large cities and developed areas in China, and it even reaches or maintains the ultra-low fertility level in some cities. The fertility rates of Shanghai in 1974, Beijing in 1990 reached the ultra-low fertility level, and TFR declined below 1 in 2000. TFR of Hong Kong and Macao Special Administrative Regions declined below 1 in 2005. These above four districts have been the lowest fertility rate districts all over the world (Chen Wei, 2008[118]). Up-growing economy and long-term low fertility rate have made women’s fertility rate of these places becoming inflexible. This indicates that increasing socio-economic development is more effective than policy factors in influencing people’s childbearing behavior. In addition, the role of marriage and childbearing’s attitude should not be overlooked because the desire and behavior of childbearing are always coming to meet each other. Changes in Japan's fertility rate have proven that when a country's economy develops to a very high level the low birth rate can not be reversed even if the government implements polices of

encouraging childbearing. It can be seen that it is urgent for China to intervene people’s childbearing behavior effectively by adjusting the birth control policy as soon as possible.

Fertility policy should be adjusted at right time. It is a prerequisite that fertility policy should be adjusted before the fertility is flexible and low-birth rate culture has not yet been formed, because at this time the low fertility is not yet stable and people's concept on birth giving and childbearing behavior have also not been consolidated, fertility policy can still influence people's fertility desire and childbearing behavior. Therefore, fertility policy adjustment will interven people's childbearing behavior and be likely effective in adjusting fertility level[105]. It can be seen that the adjustment of fertility policy must choose the exact time when the fertility rate are flexible. Otherwise, the government will not achieve the goal of adjusting people’s fertility level by adjusting fertility policy. For instance, in some developed countries of Europe, although the governments have tried every means to raise people’s feitility level through a variety of measures of encouraging birth giving, few of them succeeded except for those of France and Sweden. This proves that it is very difficult to break the solidification mode characterized by women’s inflexible fertility rate and consolidated fertility desire of less or no birth giving in short term, and that deliberate intervening people’s desire of birth giving will be doomed to fail in inversing the tendency of declining fertility rate. For China, this is a lesson which must be learned. The adjustment of China's fertility policy must be carried out before the flexible fertility exists so as to effectively intervene in people's fertility concept and childbearing behavior and then break down the barrier between fertility desire and childbearing behavior. The result from the 2002 National Survey of Urban and Rural Residents’ Fertility Desire shows that two children are most parents’ expectation and one son and one daughter are their ideal sex structure. It tells us that on the one hand there is a gap between fertility desire and current fertility policy, but on the other hand women’s fertility rate is flexible so the adjustment of fertility policy can bring about a rebound in fertility rate and achieve the goal of adjusting fertility level effectively. As

previous forecast, it is the best time to adjust fertility level in the beginning 2020 to make TFR advance to the replacement level (in the medium project) in 2030 gradually. In other words, 2020-2030 is the best time of adjusting fertility level.

4.3 feasible project implemented

The choice of fertility level is actualized by fertility policy adjustment in China. The regional differences in China's fertility policy have led to the regional differences of fertility level, however, the complexity of fertility policy adjustment should be conducted by the diverse fertility levels. The diverse fertility levels in China, hence, have caused complexity in adjusting fertility policy. The adjustment of China's fertility policy should be firstly carried out in ultra-low fertility areas in order to narrow the gap between regional fertility level and the replacement level. These areas have the most developed social economy, powerful population control, and early and complete change on fertility culture. So in these areas fertility policy has been loosing its effect on people’s childbearing behavior, the negative effect brought by over-control on population is becoming apparent, and women's fertility rate is gradually inflexible. It is, hence, urgent to adjust fertility policy. To take low-fertility areas as the initiative of fertility policy adjustment has strategic significance, but there is one point which should be noted that people’s fertility culture has greatly or even fundamentally changed thanks to the rapid socio-economic development, so bringing about one scenario that some couples, particularly the couples who are both one-child will give up voluntarily their right for a second birth although the fertility policy empowers them to have. Recently, a scholar said that the fertility policy of Shanghai should be adjusted according to the law in order to relieving population ageing and labour force shortage will be faced (Zuo Xuejin, 2009[119]). Accordingly, effective measures of encouraging birth giving should be implemented in ultra-low fertility areas. As for the west poverty-stricken areas and ethnic minority areas where the fertility goes above the replacement level, the adjustment of fertility policy will bring unsubstantial effect on fertility levels. As a matter of fact, the meaning of fertility

policy adjustment in these areas is totally different from the adjustment in ultra-low fertility areas, because the fertility level is stable rather than from a low level to a high level. In these areas, fertility policy is so relaxed that most families have two children. The demand for high living standards has surpassed the demand for more children. In addition, people's fertility culture has taken tremendous changes with the development of modernization, and the purpose of adjusting fertility level is to continue to control the population growth in these regions, stabilizing TFR around the replacement level. In short, the adjustment of fertility policy should be carried out in a way of "soft-landing"[120] in timely and reasonably stable conditions. The principles of realizing "urban-rural integrative" fertility pattern are as follows: undertake in line with local conditions, obey an order and advance step by step to stably transfer to a new fertility policy level.

4.4 indispensable context guaranteed

The adjustment of fertility policy is to ensure the choice of fertility level realized. In the course of of fertility policy adjustment, the work of population and family planning should be comprehensively strengthened. The persons charging the CPC and government need to undertake themselves the work and take the overall responsibility besides of stabilizing working institutions and personnel. Also, the grass-roots work should be consolidated to form a scientific administrating pattern characterized by same goal, interaction, information sharing and efficient running between administrative departments, service agencies, autonomous organizations and the masses by establishing and improving the long-term working mechanism of "managing in line with law, self-governing, quality of care, policies advancing and comprehensive governing". it is necessary to establish new working mechanism, new ways and methods characterized by public education, comprehensive servicing and scientific management to achieve "two transformations" (i.e. the transformation from simply controlling the birth number to comprehensively resolving population issues in population and family planning work ways, and the transformation from

administrative constraints to managing in accordance with the law, the quality of care and integrated treatment in population and family planning work methods) and "four innovation" (i.e. theoretical innovation, institutional innovation, management innovation and technological innovation) in order to connect with national guidance and the masses' voluntary, public education and interests-oriented, government administration and the masses, and the overall promotion with classified guidance. Adhere to the principles of carrying out family planning work scientifically, legally, standardized and institutionalized, administer in accordance with law, and obey local conditions, and guide by classification. All of these works can lead to diverse family planning functions and working mechanism, highlighting the functions of controlling, servicing, educating and compensating. [121] It is also stressed to further enhance service concept, perfect servicing networks, enhance servicing capabilities, improve servicing levels, carry out "the quality of care of family planning", gradually boost the quality of family planning and reproductive health service, and meet the growing needs of diverse different groups. To set up and perfect multi-level mechanism of family planning interest guidance and integrated social security system in urban and rural areas. To have the families carrying out family planning policy enjoy primarily the fruits of reform and attract the masses to accept the concept of family planning and consciously practice family planning policy by setting up a variety of family planning incentives, actively implementing the project of "few birth giving and getting rich quickly", etc. [122]

The adjustment of fertility policy and the choice of future fertility level should be required to choose a certain objective conditions. It needs the transition from traditional reproductive culture to modern reproductive culture as its prerequisite, a certain level of socio-economic development as its basis, broad masses' acceptance and support as its guarantee, people-oriented concept of development as its key, and fair and just society environment as its safeguard. The adjustment of fertility policy should be adhered to the principle of controlling, improving, optimizing and guiding to achieve the unity of quantity, quality, structure and distribution. Here, "controlling"

means to control population growth, moderate population quantity and maintain an appropriate population size which suits the needs of economic and social development in order to make population size coordinate with the carrying capacity of resources and environment. This is requirements of the family planning policy as well as the conditions for the sustainable development. "Improving" refers to the improvement in population quality, achieving the transformation[123] of health mode of "pre-natal to peri-natal" to the mode of "pre-pregnancy [124]P306～314 to peri-pregnancy[125] "（"ACI"[126]P1~5）and carrying out the strategy of "three-rank prevention" focused on "one-rank prevention"[127] To decrease the incidence of birth defects and improve the birth quality are important measures to enhance the health reserves of population[128], as well as the basic conditions to improve the quality of population and the prerequisite to enhance human capital. To vigorously develop education and improve the stock of human capital, actively carry out the strategies of developing country through science and education, strengthen country with talents and explore comprehensively human resources, enhance the capability of independent innovation, achieve all-round development of people, and promote the transition from large country with human resources to powerful country with human capital, are inevitable requirement by international competition in the era of high-tech information, core of the construction and development of socialist modernization, and only choice of implementing people-centered idea and promoting the overall development of people. All of these are related to the rise and fall of the entire Chinese nation. "Optimization" refers to adjusting and optimizing constantly the age and sex structure of population, coordinating education level, actively dealing with aging, effectively curbing of rising sex ratio at birth, and avoiding or delaying the negative effects on socio-economic development brought by so rapid structural changes in population. "Guiding" means to guide rational and orderly flow of population so as to achieve a reasonable distribution of population. This will require deepening the mechanism reform of floating population management services, establishing new management mechanism of the family planning and the quality of care for the floating population, perfecting the new management and servicing system of the floating population family planning

which are focused on major residence place, and including the management of floating population family planning into the work of inflow places. It also requires reforming the household registration management system, eliminating institutional and policy barriers, establishing unified, open, competitive and orderly labor market, and promoting the rational flow and distribution of population in urban and rural and regional areas.

The adjustment of China's fertility policy and the choice of fertility level should be adhered to the comprehensive, coordinated and sustainable scientific development concept, to the people-centered values and to the strategy of coordinating population and resources, establishing fair and just living environment, achieving the overall coordinative development of population, economy and society, and realizing the harmony between man and nature. It also needs to completely strengthen the work of population and family planning, establish and perfect the system of universal social security and pension insurance system, resolve comprehensively population issues, establish resource-saving and environment-friendly well-off society, strive to create "three-win" situation in economy, society and ecological benefits, build comprehensively a harmonious socialist society, promote the coordinative and sustainable development of population and economy, society, resources and environment, and ultimately achieve the strategy of long-term, sustainable development of population.

Conclusion and Discussion

The choice of fertility level will be realized by the fertility policy adjustment. The adjustment of China's fertility policy needs to be oriented on the in-depth analysis of causes, trends and characteristics of low birth rate in post population transition, and on the thorough consideration of direct and indirect consequences brought by long-term decline in fertility. Also, it needs to continuously explore the experience of developed countries, combine with China’s actual situation, take measures in accord

with local conditions, smoothly adjust fertility policy, pay attention to all-round improvement of the quality of population, and summarize experiences [129]. The adjustment of fertility policy is a major decision affecting the overall situation, so it must be based on large substantial scientific empirical researches and thought carefully before taking measures[69]P257.

The study introduces the background of current low fertility and reflects the difference between fertility desire and fertility level. According to the negative effects of low fertility under the current fertility control policy, the study points out that the choice of fertility level should be conducted by the requirement of sustainable population conditions and sustainable fertility policy. The study makes an analysis on fertility desire used 2002 national fertility desire of urban-rural residents, and displays the gap between people's fertility desire and fertility level under the current fertility policy. The study also makes a feasible analysis on elevating the low fertility used 2006 the revelation of "Two-children Policy" areas for reference. Based on 2005 National 1% Sample Survey Data, the study designs three TFR projects to make a scientific population projection on China's population trend in the future. Comparison of three scenario simulations demonstrates that the Medium Project is the best choice of low fertility in the future, which will adjust TFR in 2020 to the replacement level in 2030. The choice of low fertility will be in favor of the implementation of long-term, comprehensive, co-coordinated, complete and sustainable development strategies of population.

Gradually adjusting fertility policy will do well in the following fields: control population growth and ease the pressures on resources and environment; form a reasonable age structure of population and avoid or delay the impact on socio-economic development brought by the rapid changes of population structure[130]; enrich labor resources and promote the rapid development of economy; guide orderly flow and reasonable distribution of population and coordinate regional development; invest primarily on the whole development of population, improve the quality of

population, and promote the transition from a country with large population to a country with powerful human capital; avoid family risk and safeguard population security; ease the tension between carders and the masses and strengthen the work of population and family planning; present the spirit of "people-oriented" and meet with the fertility desire of the masses; adhere to the concept of scientific development, completely strengthen the work of population and family planning and resolve comprehensively population issues; build a well-off, harmonious socialist society and promote the sustainable development between population and economy, society, resources and environment.

Appendix

Appendix 1 Abridged Life Table of National Male Population in 2000

Age (year)	Death Rate (‰) m_x	Constant a_x	Death Probability (‰) q_x	Number of survivors (person) l_x	Number of Death (person) d_x	Number of person-year lived (person·year) L_x	Cumulated Number of person-year lived (person·year) T_x	Average life expectancy at birth (year) e_x^o
0	22.56	0.33	22.56	100000	2256	98488	7057069	70.57
1～4	1.48	1.59	5.88	97744	575	389587	6958580	71.19
5～9	0.65	2.50	3.25	97169	315	485056	6568993	67.60
10～14	0.50	2.50	2.50	96854	242	483664	6083937	62.82
15～19	0.77	2.31	3.84	96612	371	482062	5600273	57.97
20～24	1.21	2.38	6.03	96241	580	479682	5118211	53.18
25～29	1.36	2.43	6.78	95660	648	476636	4638529	48.49
30～34	1.66	2.40	8.26	95012	785	473019	4161893	43.80
35～39	2.15	2.37	10.69	94227	1007	468484	3688874	39.15
40～44	3.05	2.35	15.13	93220	1410	462358	3220390	34.55
45～49	4.33	2.33	21.40	91809	1965	453794	2758033	30.04
50～54	6.71	2.30	32.95	89844	2961	441229	2304239	25.65
55～59	10.57	2.27	51.37	86884	4463	422249	1863010	21.44
60～64	17.92	2.25	85.39	82421	7038	392736	1440761	17.48
65～69	29.59	2.22	136.71	75383	10305	348269	1048025	13.90
70～74	51.03	2.19	223.12	65077	14520	284539	699756	10.75
75～79	79.89	2.13	325.02	50557	16432	205685	415217	8.21
80～84	133.28	2.03	477.27	34125	16287	122201	209532	6.14
85^+	204.26	4.90	1000.00	17838	17838	87331	87331	4.90

Appendix 2 Abridged Life Table of National Female Population in 2000

Age (year)	Death Rate (‰) m_x	Constant a_x	Death Probability (‰) q_x	Number of survivors (person) l_x	Number of Death (person) d_x	Number of person-year lived (person • year) L_x	Cumulated Number of person-year lived (person • year) T_x	Average life expectancy at birth (year) $\overset{o}{e}_x$
0	32.10	0.35	32.10	100000	3210	97914	7432228	74.32
1～4	1.49	1.47	5.94	96790	575	385707	7334315	75.78
5～9	0.44	2.50	2.20	96215	211	480549	6948607	72.22
10～14	0.33	2.50	1.65	96004	158	479624	6468059	67.37
15～19	0.47	2.34	2.35	95846	225	478629	5988434	62.48
20～24	0.72	2.38	3.59	95621	344	477203	5509805	57.62
25～29	0.84	2.43	4.19	95277	399	475361	5032602	52.82
30～34	0.98	2.43	4.89	94878	464	473196	4557241	48.03
35～39	1.18	2.38	5.88	94414	555	470617	4084045	43.26
40～44	1.70	2.33	8.46	93859	794	467177	3613427	38.50
45～49	2.57	2.31	12.76	93065	1188	462124	3146250	33.81
50～54	4.19	2.29	20.72	91877	1903	454234	2684126	29.21
55～59	6.63	2.28	32.56	89974	2930	441891	2229891	24.78
60～64	11.43	2.26	55.41	87044	4823	421986	1788000	20.54
65～69	19.06	2.23	90.53	82221	7443	390505	1366015	16.61
70～74	34.11	2.21	155.71	74778	11643	341351	975510	13.05
75～79	55.70	2.17	240.52	63134	15185	272624	634159	10.04
80～84	97.48	2.06	378.96	47949	18171	186404	361535	7.54
85^+	170.03	5.88	1000.00	29778	29778	175131	175131	5.88

Appendix 3 Abridged Life Table of National Male Population in 2005

Age (year)	Death Rate (‰) m_x	Constant a_x	Death Probability (‰) q_x	Number of survivors (person) l_x	Number of Death (person) d_x	Number of person-year lived (person • year) L_x	Cumulated Number of person-year lived (person • year) T_x	Average life expectancy at birth (year) $\overset{o}{e}_x$
0	11.50	0.33	11.50	100000	1150	99230	7346877	73.47
1～4	0.82	1.62	3.29	98850	325	394625	7247647	73.32
5～9	0.53	2.50	2.65	98525	261	491971	6853022	69.56
10～14	0.49	2.50	2.45	98264	240	490718	6361051	64.73
15～19	0.87	2.30	4.34	98023	425	488969	5870332	59.89
20～24	1.26	2.40	6.28	97598	613	486395	5381363	55.14
25～29	1.41	2.43	7.02	96985	681	483176	4894968	50.47
30～34	1.73	2.41	8.61	96304	829	479368	4411792	45.81
35～39	2.18	2.38	10.84	95475	1035	474664	3932424	41.19
40～44	2.98	2.35	14.78	94440	1396	468501	3457759	36.61
45～49	4.32	2.35	21.36	93044	1987	459953	2989258	32.13
50～54	5.86	2.34	28.85	91057	2627	448292	2529305	27.78
55～59	8.85	2.30	43.22	88430	3822	431815	2081013	23.53
60～64	14.29	2.27	68.76	84608	5818	407129	1649199	19.49
65～69	23.70	2.24	111.23	78790	8764	369768	1242069	15.76
70～74	39.19	2.21	176.67	70027	12371	315675	872301	12.46
75～79	63.02	2.18	267.44	57655	15420	244677	556626	9.65
80～84	100.56	2.08	388.65	42236	16415	163237	311949	7.39
85^{+}	173.63	5.76	1000.00	25821	25821	148712	148712	5.76

Appendix 4 Abridged Life Table of National Female Population in 2005

Age (year)	Death Rate (‰) m_x	Constant a_x	Death Probability (‰) q_x	Number of survivors (person) l_x	Number of Death (person) d_x	Number of person-year lived (person • year) L_x	Cumulated Number of person-year lived (person • year) T_x	Average life expectancy at birth (year) $\overset{o}{e}_x$
0	14.41	0.35	14.41	100000	1441	99063	7843602	78.44
1～4	0.83	1.50	3.32	98559	328	393417	7744539	78.58
5～9	0.29	2.50	1.45	98231	142	490801	7351121	74.83
10～14	0.27	2.50	1.35	98089	132	490115	6860320	69.94
15～19	0.44	2.37	2.20	97957	215	489217	6370205	65.03
20～24	0.51	2.43	2.55	97742	249	488069	5880988	60.17
25～29	0.60	2.41	2.99	97493	292	486706	5392919	55.32
30～34	0.79	2.38	3.94	97201	383	484999	4906213	50.48
35～39	1.06	2.40	5.29	96817	512	482755	4421214	45.67
40～44	1.29	2.35	6.43	96306	619	479885	3938460	40.90
45～49	2.20	2.30	10.94	95687	1046	475610	3458575	36.14
50～54	3.27	2.31	16.21	94640	1534	469082	2982965	31.52
55～59	5.20	2.28	25.64	93106	2387	459038	2513883	27.00
60～64	8.95	2.26	43.68	90719	3962	442735	2054845	22.65
65～69	15.14	2.25	72.67	86757	6305	416420	1612110	18.58
70～74	26.07	2.22	121.53	80452	9778	375053	1195690	14.86
75～79	45.33	2.18	200.98	70675	14204	313357	820637	11.61
80～84	75.95	2.11	311.31	56470	17580	231464	507280	8.98
85^{+}	141.00	7.09	1000.00	38891	38891	275816	275816	7.09

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