Population Aging and Fiscal Sustainability of Social Security in China
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3.2.1 Assumptions

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References
Preface

China’s social security reform has been going on for nearly 30 years. In the era of planned economy, people enjoyed social security according to their work units. By now the social security system has been increasingly adapted to the development of market economy, establishing a new social security system framework based on social assistance and social insurance. This system has played a huge role in ensuring the basic life of the people, especially the elderly. China's social security system has developed rapidly, but there are some obvious institutional defects and operational problems. These problems are further highlighted in the context of the accelerating global population aging. In China's social security system, the governments bear most of the expenditure responsibilities, so the most serious problem is that the financial sustainability of social security is challenged.

With the socialism with Chinese characteristics entering a new era, the major social contradictions in China have been transformed into “the contradictions between the people's ever-growing needs for a better life and the unbalanced and uneven development.”, which implies that the level of social security needs to be further improved. The aging of the population structure is prominent, the proportion of the elderly and the number of the elderly is rising, and the subsidized population covered by pensions and medical systems is rapidly expanding. The expansion of coverage and the increase in the level of treatment have placed the governments under enormous financial pressure and the fiscal sustainability has been challenged. If no appropriate measures are taken, China's social security system will be unsustainable, which will have an immeasurable impact on social stability. Therefore, based on the status quo to analyze the problems and challenges that may be faced in the future, it is of great significance for China to find solutions and ideas to ease or even solve the problems as early as possible.

This paper is based on the background of China’s aging population and the financial status of the current social security system. It combines existing studies and authoritative data to establish a simulation prediction model to calculate the financial sustainability of China’s social security system in the future. Through the analysis of the results, we will further discuss the effects of existing measures and provide an important reference for the implementation of corresponding reforms.

Based on this background, the paper is structured as follows.

The first part presents the current situation and trend of China's population ageing. It focuses on the evolution of the age structure of the Chinese population and the status and characteristics of population aging, and uses the data of the United Nations Population Division to forecast and analyze the indicators of population ageing.
The second part introduces the financial responsibility and current situation in China's social security system. It focuses on the overall structure of China's current social security system and the financial burden of the government in each sub-system including the pension system, the medical system and the social assistance system, and analyzes the government's fiscal expenditure in the social security system through historical data.

The third part is to forecast the financial burden of China's social security system from 2018 to 2050, including pension insurance, medical insurance, social assistance and the overall financial burden of these three sub-systems.

The fourth part analyzes the existing measures which could improve the sustainability of the social security system. These measures includes reform of the contribution collection and management system, progressively delaying retirement, promoting the development of the third pillar pension, controlling medical insurance costs, and abolishing the “one-child policy” to encourage fertility.

The main data sources for this report are:

1. National Population Census Data from 1953 to 2010;
3. Official data of the Ministry of Finance of China
6. Data from the Department of Economy and society Affairs, United Nations.
1 The Status and Trend of Population Aging in China

Population ageing is an important trend in the development of the whole world. Changes of the population age structure affect every aspect of human’s life extensively and profoundly, and population ageing has increasingly become a major population problem affecting numerous countries. As the world's largest developing country, China has become a population aging when its economic development level was relatively low, which will not only have a profound impact on China's population and labor structure, but will also cause enormous financial pressure on China's social security system.

1.1 The current situation of China's population structure

1.1.1 The scale and proportion of old-age population grow fast

The population age structure of China has been changing since the 1950s due to the changes of the birth and death rates. The data of the six censuses show that the quantity and percentage of elderly has been increasing very rapidly. The percentage of population aged 60 and above was 7.32% in 1953 and rose to 13.26% in 2010; the percentage of population aged 65 and above was 4.41% in 1953 and rose to 8.87% in 2010. According to the UN, in 2000 the proportion of the population aged 60 and above was 10.33%, which indicated that China had become an aging society.

From the point of an ageing population development speed, China spent only 18 years in changing the population age structure from the adult structure to an older structure, while France took 115 years, Switzerland 85 years, the United States 60 years, and even Japan took 25 years. The speed of China's population aging development is very fast.1

![Figure 1-1 The proportion of the population aged 60 & 65 and above in China, 1953-2010](image)

The proportion of the population aged 60 & 65 and above in China, 1953-2010

Sources: National Census Data

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At the same time, China’s elderly population is huge, the quantity of old people being equal to 1/5 of the world elderly population.\textsuperscript{2} China is the only country where the elderly are more than one hundred million.

At the same time, people's living standard is rising and especially due to the improvement of medical and health conditions, life expectancy has increased. In 2000, the number of people aged 65 and above was 88 million, and their percentage 6.96%. By the end of 2017, the number has reached 158 million, and the percentage 11.39%.

![Figure 1-2 The quantity and proportion of population aged 65+ in China, 2000-2017](image)

Sources: The annual data from National Bureau of Statistics, People's Republic of China, whereby, data of 2000 and 2010 are based on the census data, the other data are calculated according to the annual population sampling survey.

1.1.2 The bottom of the population pyramid is shrinking, the structure of population is becoming older and older

Great changes of the population age structure have taken place since the founding of the People's Republic of China. The number of people aged 60 and above rose from 41.5 million in the first national census in 1953 to 177 million in the sixth national census in 2010.

Scholars have provided different interpretation of the changes of the population age structure in China. Generally, the changes of the population age structure are summarized as a three phase shift. The first phase is characterized by a high birthrate and a high mortality rate, and a low natural growth rate; the second phase by a high birth rate, a low death rate and a high natural growth rate; the third phase by a low birth rate, a high death rate and a low natural growth rate.

\textsuperscript{2} The national working committee office on aging. China's ageing population trend prediction research report [R]. 2006.
growth rate; the third phase by a low birth, a low mortality rate and a low natural growth rate. These phases are reflected by the evolution of the age pyramid.

Figure 1-3 The population pyramid of China, 1953-2010

Sources: National Census Data
Comparing the age pyramids from the six censuses, we can see that in 1953, the population age structure presented a standard pyramid shape and the population was still young. After that, along with the rapid rise of fertility and the decline of mortality, the population age structure became even younger. However, China began to implement family planning starting in the 1970s, and the fertility rate fell sharply. The birth rate decreased from 34.11 ‰ to 17.82 ‰ from 1969 to 1979, and the number of births fell rapidly, so that the bottom of the pyramid is shrank, while the middle and top of the pyramid expanded.

### Table 1-1 Total Population and Percentage of Population by Age Groups

<table>
<thead>
<tr>
<th>Year</th>
<th>Total population (million)</th>
<th>Percentage of population by age groups (%)</th>
<th>0-14</th>
<th>15-64</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>594.35</td>
<td></td>
<td>36.28</td>
<td>59.31</td>
<td>4.41</td>
</tr>
<tr>
<td>1964</td>
<td>694.58</td>
<td></td>
<td>40.69</td>
<td>55.75</td>
<td>3.56</td>
</tr>
<tr>
<td>1982</td>
<td>1008.18</td>
<td></td>
<td>33.59</td>
<td>61.5</td>
<td>4.91</td>
</tr>
<tr>
<td>1990</td>
<td>1133.68</td>
<td></td>
<td>27.69</td>
<td>66.74</td>
<td>5.57</td>
</tr>
<tr>
<td>2000</td>
<td>1265.83</td>
<td></td>
<td>22.89</td>
<td>70.15</td>
<td>6.96</td>
</tr>
<tr>
<td>2010</td>
<td>1332.81</td>
<td></td>
<td>17.12</td>
<td>73.6</td>
<td>8.87</td>
</tr>
</tbody>
</table>

Sources: National Census Data

Moreover, all censuses showed that the percentage of population 0-14 decreased by more than half, from 36.28% in 1953 to 17.12% in 2010.

### 1.1.3 The life expectancy is becoming longer, the median age is rising

Life expectancy is an important indicator of a population health level, but it is also an important cause of population aging. Along with the gradual improvement of the economy and society development as well as of the medical and health care system, life expectancy has increased from 43.83 years in the 1950s to the present 75.67 years. The extension of life expectancy increased the number of elderly people to a certain extent and deepen the process of population aging.
The median age is also a key indicator of population age structure. The upward moving trajectory of the median age can reflect the population ageing process as a whole. In the early days after the foundation of the People's Republic of China, as a result of a rapidly rising birth rate, and declining mortality, the median age experienced a period of decline. In the 1970s, along with the carrying out of the family planning policy, the new born population began to decline, and the median age increased year by year and it has risen to a present value of 37 year. According to international practice, the median age indicators is a standard for defining the of dividing the population age structure: a population is young when the median age is under 20; it is an adult when the median age is between 20-30; it is elderly when the median age is over 30. According to this standard, by now China has an elderly population structure.

Figure 1-4 The change of life expectancy in China, 1950-2015

1.1.4 The proportion of labor population decreases and the old-age dependency ratio rises

Another intuitive consequence of population aging is the decline of the percentage of working age population, which implies a reduction of labor supply. During the "Twelfth five-year" period (2011-2015), the percentage of working age population 15-64 registered began inflection point from up to down and the demographic dividend gradually disappeared. In 2017, the proportion of working age population labor population (15-64) fell to 71.68%, and that of working age population (15-59) fell to 66.08%.

Another implication of the decline of the percentage of working age population is the increase of the population dependency ratio, especially of the elderly dependency ratio. There are two ways to calculate the old-age dependency ratio. Based on the data from the United Nations Population Division, taking population aged 15-59 as the standard, the old-age dependency ratio grew from 15.57% in 2000 to 24.57% in 2017. Taking the population aged 15-64 as the standard, the old-age dependency ratio grew from 10.09% in 2000 to 14.85% in 2017. It means, aging leads to the increase of the old-age dependency ratio.
Figure 1-6 The proportion of labor population, 2000-2017


Figure 1-7 The old-age dependency ratio, 2000-2017

1.2 The trend of China’s population ageing

1.2.1 The trend of the whole population and the aged population in China

The future population trend of China will impact on the population policy of our country on the one hand, and on its economic and social development goals on the other. Different organizations and scholars have produced forecast of population aging in China. The future population trends are influenced mainly by fertility and mortality. However, mortality is relatively stable, and it is often not included in the assumptions of different prediction schemes; the differences among forecasts mainly reflect the data and assumptions on fertility.

Table 1-2 Prediction of the population age structure of China in the future by different organizations and scholars

<table>
<thead>
<tr>
<th>Year</th>
<th>Zeng Yi population</th>
<th>Guo Zhigang population</th>
<th>Du Peng Population</th>
<th>Li Jianxin Population</th>
<th>UN population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65+ whole</td>
<td>65+ whole</td>
<td>65+ whole</td>
<td>65+ whole</td>
<td>65+ whole</td>
</tr>
<tr>
<td>2000</td>
<td>12.71 6.8</td>
<td>12.69 7.1</td>
<td>12.74 6.9</td>
<td>12.88 7.0</td>
<td>12.70 6.8</td>
</tr>
<tr>
<td>2010</td>
<td>13.56 8.4</td>
<td>13.35 8.4</td>
<td>13.61 8.5</td>
<td>13.76 8.4</td>
<td>13.52 8.4</td>
</tr>
<tr>
<td>2040</td>
<td>14.81 22.4</td>
<td>14.62 20.4</td>
<td>14.29 21.9</td>
<td>14.70 22.0</td>
<td>14.48 22.2</td>
</tr>
<tr>
<td>2050</td>
<td>14.60 24.1</td>
<td>14.45 20.6</td>
<td>13.38 23.2</td>
<td>14.27 23.8</td>
<td>14.09 23.7</td>
</tr>
</tbody>
</table>


The predictions of the population quantity and structure of China’s population are quite consistent. All scholars predict that population will peak between the 30s and the 40s, and the speed of population ageing will increased in the next thirty or forty years. Around 2040, the percentage of the population aged 65 and above will be more than 20%, and it will continue to increase to be 20% to 24% in 2050.

The United Nations Population Division produces comprehensive population forecasts for all countries of the world every two years, based on the national population register data, census data and some important survey. The most important factors that influence these predictions are the birth and mortality rates.
China's has experienced a quick rise of fertility from 1950 to 1970, then the fertility rate began to fall under the influence of the family planning policy and it has been basically stable at about 1.5 from the beginning of the 21st century until now. Forecasts show that China's fertility rate will rise in the next future from 1.5 children per women to 1.75 also due to the policy of second child. From the perspective of China's birth rate, the overall trend is basically the same as that of the total fertility rate, which has dropped rapidly from the peak of around 40‰ before 1970 to 13.5‰ at the end of the 20th century. The birth rate is in a stable downward trend in the 21st century. Although the second child policy at the end of 2015 has a certain effect on the increase of the total fertility rate China, the inertia of the old policy and the change in the concept of fertility make it difficult for the birth rate to rise in the short term, and it is predicted that it will remain at the level of 9‰-10‰ by 2050.

In the aspect of mortality, it decreased from 23 ‰ at the beginning of the founding of PRC to 6 ‰ in the 1980s, then it has remained in 6 ‰–7 ‰ till now, but from now on, China's population mortality rates will rise from the current 7.4 ‰ to 13.2‰ in 2050.

The total population of China will reach its peak around 2028. Then the total population will begin to gradually decline, while population aged 65+ and above continuously increases. This number is expected to reach 359 million in 2050, and the proportion also rises, reaching 26.3% in 2050. It is noticeable that the trend is just predicted until 2050. Due to “two-child” policy
resulting in an increase of TFR (Total fertility rate), some experts predict that this proportion will exceed 30%, and stay on this level for a long time.³

![The Trend of Total Population and Old-Age Population, 2016-2050](image)

**Figure 1-9** The Trend of Total Population and Old-Age Population, 2016-2050


### 1.2.2 The trend of China’s population age pyramid

According to prediction of the United Nations Population Division, the shape of the population age pyramid will further change in the following 30-40 years, the bottom of the pyramid will be continuously shrinking and the aging problem will be increasingly severe.

Influenced by two baby booms during 1953-1957 and 1962-1973, a majority of population will reach the age of 60 in 2013-2017 or 2022-2033. Besides, under the inertia effect of the second population boom, the third birth boom formed in 1985-1991, and this population will go into the age of 60 before, during, and after 2045-2050, when population aging will reach its peak. Along with the decrease of the total population, the proportion of elderly population will continue rising, the proportion of the population aged 60 and above will constitute more than 26% of the total population. It is speculated that it will exceed 30% in the future and will remain at this level for a

long time.

China's population age pyramid in 2015

China's population age pyramid in 2020

China's population age pyramid in 2025

China's population age pyramid in 2030

China's population age pyramid in 2035

China's population age pyramid in 2040
1.2.3 The prediction of the life expectancy in China

As an important factor affecting population aging, life expectancy will be further enhanced along with economic and social development and the advance of medical technology.

The United Nations Population division predicts in the following 30 to 40 years, the life expectancy in China will increase from 76.5 currently to 81.1 years in 2050. The scale of aged population will be widened owing to longer life expectancy.

Table 1-3 The Trend of Life Expectancy, 2015-2050

<table>
<thead>
<tr>
<th>Year</th>
<th>Life expectancy (Year)</th>
<th>Year</th>
<th>Life expectancy (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 - 2020</td>
<td>76.48</td>
<td>2035 - 2040</td>
<td>79.58</td>
</tr>
<tr>
<td>2020 - 2025</td>
<td>77.28</td>
<td>2040 - 2045</td>
<td>80.34</td>
</tr>
<tr>
<td>2025 - 2030</td>
<td>78.06</td>
<td>2045 - 2050</td>
<td>81.07</td>
</tr>
<tr>
<td>2030 - 2035</td>
<td>78.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


1.2.4 The prediction of trend of the advanced ages in China

With the extension of life expectancy, the quantity and scale of the population aged 80 and above will keep expanding. The data of the United Nations Population division illustrate that the population aged 80 and above in China will be more than 120 million in the coming decades.
Besides, the population aged 80 and above will grow much faster than the population aged 60. The proportion of the population aged 80 and above will reach 23.18% of the population aged 60 and above by 2050, which means that there will be one person aged 80 and above in every 4 elderly people.

![Graph showing the trend of advanced age population (80+), 2016-2050](image)

**Figure 1-11** The trend of advanced age population (80+), 2016-2050

**Sources:** United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, custom data acquired via website.

### 1.3 The trend of China’s labor population

#### 1.3.1 The scale of China’s labor population

The intensification of population aging in China will lead to continued shrinkage of the overall working-age population in the future. On the one hand, the quantity of labor population will keep falling in the future. The quantities of the labor population aged 15-59 and 15-64 are projected to fall to around 690 million and 810 million respectively, by more than 20%. On the other hand, the proportion of labor population will successively descend from 2015 to 2050. After a long-term decrease, the proportions of labor population aged 15-59 and 15-64 are predicted to be 51% and 60% respectively.
The continuous decline in the total working-age population and its proportion in the future will cause insufficient supply in the labor market and higher labor costs, which will affect China’s economic development potential and ultimately hinder its economic growth.

1.3.2 The trend of the old-age dependency ratio

The increase of the old-age dependency ratio, comprehensively influenced by the increase of the aged population and the decrease of working age population, typically reflects the phenomenon of population aging. According to the division standard of demographic dividend and population debt, if the people aged 60 and above are regarded as the elderly, the old-age dependency ratio in China will increase from 33.31% in 2015 to 42.15% in 2050, during which the population will achieve a transition from demographic dividend period to population debt period. Then it will maintain in a period of population debt for a long time. In 2050, the old-age dependency ratio will reach 68.91%. If those aged 65 and above are regarded as the elderly, the old-age dependency ratio in China will reach 25% by 2030, in which the population will achieve a balanced state. However, the old-age dependency ratio will still accelerate in the following few decades and the ratio will rise to 47% by 2050. It shows that China will be in a long-term population debt period. No matter which standard will be applied, the labor population will be faced with enormous pressure because of the heavy burden of supporting the aged.

Figure 1-12 The Trend of Labor Population, 2015-2050

Figure 1-13 The Trend of the Old-Age Dependency Ratio, 2015-2050

2 Fiscal Responsibility and Status of China’s Social Security

2.1 China’s social security system and fiscal responsibility

China's current social security system is mainly composed of social assistance and social insurance. China's social assistance system includes a minimum living security system, a support system for special hardships, and a medical assistance system. It plays an important role in safeguarding the bottom line, and promoting fairness. China's social insurance consists of pension insurance, medical insurance, work injury insurance, unemployment insurance and maternity insurance. Among them, pension insurance and medical insurance are the main parts, which play a primary security function. The healthy operation of the social security system is inseparable from the financial support of the government. In other words, the two are closely related. There are diverse forms and supports of financial responsibility in China’s social security system, which is designed in accordance with the characteristics of different systems. The following is a detailed introduction to the institutional composition and financial responsibility of China's pension insurance system, medical insurance system and social assistance system.

2.1.1 The composition and financial responsibility of the pension insurance system

China's pension insurance system can be divided to three levels: the first level is the state-led basic pension insurance system, including the basic pension insurance system for urban enterprise employees, the basic pension insurance system for government and institution employees, and basic pension insurance for urban and rural residents; the second level is the unit-led occupational pension system, including the enterprise annuity system and the occupational annuity system; the third level is the individual-led individual voluntary savings-type pension insurance system. These three levels correspond to the first, second and third pillars of the international common three-pillar pension system. Here we mainly discuss the basic pension system of the first level (pillar).

As far as the basic pension insurance system is concerned, the present three types of basic pension insurance systems adopt an institutional model combining social pooling and individual accounts. The basic pension insurance for urban enterprise employees and the basic pension insurance for institutions are collectively referred to basic pension insurance for urban employees, which is funded by enterprises and individuals, while the basic pension insurance for urban and rural residents is funded by individual contributions and fiscal subsidies. The basic conception of this system is that the basic pension system of social pooling implements the pay-as-you-go system,
Table 2-1 Current Pension System in China

<table>
<thead>
<tr>
<th>Pillar</th>
<th>Category</th>
<th>Participant</th>
<th>Coerciveness</th>
<th>Account Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The first pillar</strong></td>
<td>Basic Pension Insurance for the Urban Enterprise Employees</td>
<td>Urban enterprise employees</td>
<td>compulsive</td>
<td>Social pooling and individual account</td>
</tr>
<tr>
<td></td>
<td>Basic Pension Insurance for the Government and Institutions Employees</td>
<td>Government and institutions employees</td>
<td>compulsive</td>
<td>Social pooling and individual account</td>
</tr>
<tr>
<td></td>
<td>Basic Pension Insurance for Urban and Rural Residents</td>
<td>Urban and Rural Residents</td>
<td>voluntary</td>
<td>Social pooling and individual account</td>
</tr>
<tr>
<td><strong>The second pillar</strong></td>
<td>Enterprise Annuity</td>
<td>Urban enterprise employees</td>
<td>voluntary</td>
<td>individual account</td>
</tr>
<tr>
<td></td>
<td>Occupational Annuity</td>
<td>Government and institutions employees</td>
<td>compulsive</td>
<td>individual account</td>
</tr>
<tr>
<td><strong>The third pillar</strong></td>
<td>Personal Voluntary Savings Pension (In experiment)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2-2 Fiscal Responsibility of Basic Pension Insurance

<table>
<thead>
<tr>
<th>Category</th>
<th>Account Mode</th>
<th>Contribution</th>
<th>Benefit</th>
<th>Fiscal Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Pension Insurance for the Urban Employees</td>
<td>Social pooling and individual account</td>
<td>20%(Employers) + 8%(Employees)</td>
<td>Basic pension + individual account pension</td>
<td>government undertaking tactics + historical debt</td>
</tr>
<tr>
<td>Basic Pension Insurance for Urban and Rural Residents</td>
<td>Social pooling and individual account</td>
<td>Individual payment + government subsidies</td>
<td>Basic pension + individual account pension</td>
<td>government subsidies in fund collection + basic pension</td>
</tr>
</tbody>
</table>

that is, laborers pay the pension for retirees, realizes the intergenerational transfer payment and the income redistribution; the individual account implements the fund accumulation system. It is intended to motivate individuals to take responsibility and mitigate the pension crisis brought
about by the aging population. In addition, the basic pension insurance for urban employees is enforced through relevant policies, laws and regulations, and is legally binding; the basic pension insurance for urban and rural residents is encouraged and guided by the government, and it stimulated the residents to actively participate by giving fiscal subsidies.

The fund of basic pension insurance for urban employees consists of individual contributions, employer contributions, and government subsidies. Individual contributions all enter into individual accounts, and all employer contributions enter into the pool account. The government's fiscal responsibility includes two major parts: First, it is treated as contribution subsidies. Before the reform of state-owned enterprises and institutions, individuals and institutions did not pay fees. This part of the expenses, the so-called historical debts, was borne by the government. Second, it is treated as fund subsidies. When the fund is underpaid, the government pays the subsidy. For the basic pension insurance for urban and rural residents, the government assumes the fiscal responsibility of “two-head supplement”, that is, subsidies are provided in both the system financing and distribution: In the fund-raising process, the insurance is burdened by both the individual contributions and fiscal subsidies. In the issuance process, the pension is divided into two parts: individual account pension and basic pension - the individual account's pension comes from the individual account's storage, and the basic pension is paid entirely by the government’s finance.

2.1.2 The composition and financial responsibility of the medical insurance system

China's current basic medical insurance system is mainly composed of three basic systems: basic medical insurance for urban employees, basic medical insurance for urban residents and new rural cooperative medical care. The basic medical insurance for urban employees covers all employing units in cities and towns, including all kinds of enterprises, institutions, social organizations, private non-enterprise organizations and their employees. The basic medical insurance for urban employees adopts the institutional model of social pooling plus individual accounts, and the funds for medical insurance premiums are paid by employers and employees. The employer contribution rate is not less than 6% of the total wages of the employees, and the employee contribution rate is 2% of the salary of the employees. The retirees do not pay. According to relevant regulations, the government has no financial support responsibility in the basic medical insurance for urban employees.

The main coverage of urban residents' basic medical insurance includes three types of people: firstly, the elderly who have not participated in the basic medical insurance for urban workers or who have not yet participated in public medical care; secondly, students who have not participated in basic medical insurance for urban employees or public medical care; thirdly, those who have not participated in the basic medical insurance for urban employees or the unemployed
medical personnel. The system adopts the mode of local government co-ordination. Local governments can set reasonable payment grades based on the economic and social conditions, and individuals pay according to the selected grades. At the same time, the government finances subsidies for all insured residents and increases subsidies for special hardship groups in cities and towns. Personal contributions plus government subsidies form a medical insurance fund.

The new type of rural cooperative medical care is a peasant medical mutual aid and mutual aid system mainly based on major illnesses, organized, guided and supported by the government, voluntarily participated in by farmers, with funds raised in through individual, collective and government channels. In this way, it makes up for the basic medical security of the rural social security system. The new rural cooperative medical care system also adopts the institutional model of local government coordination. The personal contribution grades can be flexibly set according to the actual situation of the region. The fund consists of three parts: individual payment, township and village collective economic fund support and government subsidy. The government finance takes the subsidy responsibility during the payment.

Table 2-3 Fiscal Responsibility of Basic Medical Insurance

<table>
<thead>
<tr>
<th>Category</th>
<th>Account Mode</th>
<th>Contribution</th>
<th>Fiscal Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Medical Insurance for the Urban Employees</td>
<td>Social pooling and individual account</td>
<td>Employers + Employees</td>
<td></td>
</tr>
<tr>
<td>Urban Residents Basic Medical Insurance</td>
<td>Social pooling</td>
<td>Individual payment + government subsidies</td>
<td>government subsidies</td>
</tr>
<tr>
<td>New Rural Cooperative Medical System</td>
<td>Social pooling</td>
<td>Individual payment + government subsidies</td>
<td>government subsidies</td>
</tr>
</tbody>
</table>

2.1.3 The composition and financial responsibility of the social assistance system

After more than 20 years of reform and development, China’s social assistance system has gradually formed a relatively stable basic framework. The minimum living security system for urban and rural residents is the core content and main system of social assistance in China. In 1999, in order to solve the problem that the large number of unemployed people emerged in the transformation of state-owned enterprises and social reforms, the State Council promulgated the "Regulations on Minimum Living Security for Urban Residents" and formally established a minimum living security system for urban residents. Eight years later, in order to effectively solve the problem of lack of food and clothing for some impoverished rural residents, the State Council issued the "Notice on Establishing a Rural Minimum Living Security System in the Country" in
July 2007, and decided to establish a minimum living security system in rural areas to protect the basic life of the people. With the continuous development and improvement of the minimum living security for urban and rural residents, some special assistance systems and temporary assistance systems have been gradually established, such as education assistance, housing assistance and disaster relief. In order to effectively integrate these rescue projects and better protect the basic life of the people, the State Council promulgated the "Interim Measures for Social Assistance" on February 21, 2014, which made a comprehensive study of the specific contents and related issues of China’s social assistance system. It mainly includes the following eight items.

First, the minimum living guarantee is mainly for the urban and rural poor who have lower per capita net income than the minimum living security standards promulgated by the local government. Second, the poor people are supported, mainly to protect the elderly, minors and the disabled who are helpless. The basic survival of human beings is rescued through the form of decentralized support of the family and centralized support of the institutions. Third, the rescue of the victims is mainly to provide life assistance to the victims who cannot guarantee basic living due to natural disasters. Fourth, medical assistance mainly gives allowances or subsidies to the medical service of the poor population in urban and rural areas. The fifth is education assistance, which is mainly to provide fee reduction and grant scholarships for the children from urban and rural poor families. Sixth, housing assistance is mainly to provide low-cost housing, housing subsidies and renovation of dangerous houses to poor urban and rural people. The seventh is employment assistance, mainly to help the unemployed people with working ability in poor urban and rural families to achieve re-employment. The eighth is temporary assistance, mainly offered to the families living under basic life standard caused by natural disasters and man-made disasters and vagrants and beggars.

The social assistance funds are all derived from the government's finance. At the same time, the state encourages social forces such as employers and individuals to participate in social assistance through donations, setting up assistance projects, establishing service agencies, and providing volunteer services. In addition, people and institutions participating in social assistance will enjoy financial subsidies, tax incentives, fee reduction and other policies in accordance with relevant state regulations.
2.2 Current status of financial support for China's social security system

2.2.1 Financial status of basic pension insurance

The basic pension insurance includes basic pension insurance for urban workers and basic pension insurance for urban and rural residents. According to the China Statistical Yearbook, the number of participants in the basic pension insurance for urban workers in the 21st century has risen rapidly. As of 2016, it has reached 379 million people. In 2010, the basic pension insurance for urban and rural residents was officially established. The number of participants in insurance has doubled in the 2 years and continued rising steadily, reaching 508 million in 2016.

Through the operation of the fund for basic pension insurance in China since 2002, we can see that the fiscal expenditure for the basic pension insurance for urban employees increased year by year, reaching 615.1 billion yuan in 2016. Although the fund balance is 4.4 trillion yuan, all of them actually come from the sum of fiscal subsidies over the years, individual accounts are run in a long-term state of “empty accounts”, and there is much fund self-balancing pressure. On the other hand, the basic pension insurance for urban and rural residents completed in 2010 relied on government financial support in the design of the system. The amount of subsidies increased from 21.7 billion yuan in 2010 to 220.1 billion yuan in 2016. Fiscal subsidies have long occupied more than 70% of the fund income.
Figure 2-2 Participation of basic pension insurance, 2000-2016

Sources: *China Statistical Yearbook*

Table 2-4 Revenue, Expenditure and Fiscal Subsidies of Basic Pension Insurance Fund

<table>
<thead>
<tr>
<th>Year</th>
<th>Basic Pension Insurance for the Urban Employees (billion)</th>
<th></th>
<th>Basic Pension Insurance for Urban and Rural Residents (billion)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>Expenditure</td>
<td>Balance</td>
<td>Subsidies</td>
</tr>
<tr>
<td>2002</td>
<td>317</td>
<td>284</td>
<td>161</td>
<td>41</td>
</tr>
<tr>
<td>2003</td>
<td>368</td>
<td>312</td>
<td>221</td>
<td>53</td>
</tr>
<tr>
<td>2004</td>
<td>426</td>
<td>350</td>
<td>298</td>
<td>61</td>
</tr>
<tr>
<td>2005</td>
<td>509</td>
<td>404</td>
<td>404</td>
<td>65</td>
</tr>
<tr>
<td>2006</td>
<td>631</td>
<td>490</td>
<td>549</td>
<td>97</td>
</tr>
<tr>
<td>2007</td>
<td>783</td>
<td>596</td>
<td>739</td>
<td>116</td>
</tr>
<tr>
<td>2008</td>
<td>974</td>
<td>739</td>
<td>993</td>
<td>144</td>
</tr>
<tr>
<td>2009</td>
<td>1149</td>
<td>889</td>
<td>1253</td>
<td>165</td>
</tr>
<tr>
<td>2010</td>
<td>1342</td>
<td>1055</td>
<td>1537</td>
<td>195</td>
</tr>
<tr>
<td>2011</td>
<td>1689</td>
<td>1276</td>
<td>1950</td>
<td>227</td>
</tr>
<tr>
<td>2012</td>
<td>2000</td>
<td>1556</td>
<td>2394</td>
<td>265</td>
</tr>
<tr>
<td>2013</td>
<td>2268</td>
<td>1847</td>
<td>2827</td>
<td>302</td>
</tr>
</tbody>
</table>
From the perspective of the proportion of financial subsidies for basic pension insurance, the
fiscal subsidies of urban employees’ basic pension insurance accounted for the same proportion to fund income as the proportion to the total fiscal expenditures. Before 2012, they showed a slight fluctuation, and then quickly rose to a new high level. As of 2016, fiscal subsidies accounted for 18.57% of the fund’s income and 3.47% of the total fiscal expenditures. The proportion of financial subsidies for basic pension insurance for urban and rural residents is basically in a monotonous upward trend. The proportion of fund income gradually increased from 47.86% in 2010 to 75.04% in 2016, and the proportion of total fiscal expenditure has risen rapidly from 0.24% to 1.23% in 2015. In 2016, it fell slightly to 1.17%.

2.2.2 Financial status of basic medical insurance

The basic medical insurance was first basic medical insurance for urban employees. Since 2000, the number of participants has increased steadily. At the end of 2016, there were nearly 300 million people. The number of people participating in the new rural cooperatives increased rapidly and then gradually decreased. The participation rate has basically reached 100% as of 2016, and the corresponding basic medical insurance for urban residents has been rising rapidly since 2007, which is in line with China's urbanization process. It is notable that at the beginning of 2016, the State Council issued the “Opinions of the State Council on Integrating the Basic Medical Insurance System for Urban and Rural Residents”. The governments, in some areas, merged the new rural cooperative medical insurance into the urban residents' medical insurance, resulting in a rapid decline in the number of participants in 2016. In addition, due to the poor standardization of the dual-track system, some insured people participated in two medical insurance systems. These people were regulated after the systems were merged, which reduced the total number of people participating in residents’ medical insurance.
In addition to basic medical insurance, there are also medical insurance for civil servants and public institutions. The total expenditure on medical insurance steadily increased year by year. In 2016, it exceeded 600 billion yuan, accounting for 3.31% of total fiscal expenditures. Among them, the new rural cooperative medical care has the largest proportion of fiscal expenditures, accounting for half of the total medical expenditure. Plus the financial subsidies for urban residents’ basic medical insurance, the two medical insurances account for more than 70% of the total medical expenditure.

Figure 2-6 The proportion of medical expenditure in fiscal expenditure, 2008-2016

Sources: Annual Data From Ministry of Finance of China.

2.2.3 Financial situation of social assistance

The current social assistance system contains eight relief contents. Here are several major rescue projects as examples. The minimum number of people living in urban and rural areas generally shows a trend of increasing first and then decreasing. According to the historical data, farmers are still the mainstay of minimum living security. With the development of economy and society, the scale of the population guaranteed will further narrow down.
Figure 2-7 The expenditure and proportion of the two basic medical insurances, 2010-2016


Figure 2-8 Population below minimum living standard, 2000-2016

Sources: *China Statistical Yearbook*.

Urban and rural minimum living security, support for special hardships, medical assistance, employment subsidies, and natural disaster living allowances constitute the main expenditures for social assistance. As shown in Figure 2-9, due to the differences in types of assistance, there are differences in the scale and changes of these rescue expenditures. Among them, rural and urban minimum living security and employment subsidies have the highest expenditures, reaching 94.13 billion yuan, 71.63 billion yuan and 78.5 billion yuan in 2016 respectively.

As shown in Figure 2-10, the sum of the six social assistance expenditures has increased year
by year, and stabilized from 2015 to 2016, reaching a level of 320 billion yuan. In addition, the proportion of total social assistance expenditure to total fiscal expenditure experienced a process of rising first and then falling. 2016, it fell to 1.71%, down from 1.95% in 2007.

Figure 2-9 Fiscal expenditure of social assistance, 2007-2016

Sources: Finance Yearbook of China.

Figure 2-10 Whole expenditure of social assistance and its proportion in total fiscal expenditure, 2007-2016

Sources: Finance Yearbook of China.
3 The Trend of Fiscal Sustainability of China’s Social Security

3.1 The trend of fiscal Burden of Basic Pension Insurance

3.1.1 Assumptions

The situation of basic pension insurance is very complicated. On the one hand, the system itself is very complicated; on the other hand, there are many problems in the actual operation process. In order to make the predicted results more scientific, it is necessary to make some assumptions about the prediction model:

1. The model only predicts the “pooling part” of basic pension insurance, namely the fiscal burden of basic pension. In theory, individual accounts are independent and not require fiscal support.
2. Based on the statistical data of 2016, the model predicts the revenue and expenditure situation and the trend of fiscal burden of basic pension insurance from 2018 to 2050.
3. The model assumes that the “pooling account” has realized the national pooling without considering the imbalance of basic pension revenue and expenditure in different regions.
4. In reality, social pension is paid and received by the month. In this case, it is assumed that social basic pension is paid and received by the year, which happen at the beginning of the year.
5. The model assumes that the existing accumulated fund of pension fund is zero.
6. The model is based on China’s population trend data released by the United Nations Population Division.

3.1.2 Parameters determination

Table 3-1 Parameters Determination

<table>
<thead>
<tr>
<th>Name</th>
<th>Details of Parameters</th>
<th>Name</th>
<th>Details of Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age of retirement</td>
<td>55 years old</td>
<td>Compliance rate of enterprise employees</td>
<td>80.3% in 2016, and increases 1% per year, finally achieves 100%</td>
</tr>
<tr>
<td>The base of employed population</td>
<td>The population aged 20-54</td>
<td>GDP growth</td>
<td>6.7% in 2016, and slow down after, 6% in 2021-2030, 5% in 2031-2040, and 4% in 2041-2050</td>
</tr>
<tr>
<td>Urban employment population/Employment base</td>
<td>historical data for 2007-2016, and data of 2016-2050 is calculated according to the urbanization rate</td>
<td>Average wage growth</td>
<td>In line with GDP growth</td>
</tr>
<tr>
<td>Urbanization Rate</td>
<td>57% in 2016, will reach 70% in 2030, and will reach 80% in 2050</td>
<td>Compliance rate of pension for urban employees</td>
<td>16%</td>
</tr>
<tr>
<td>Employment population of government institutions</td>
<td>3.5% of total population</td>
<td>Average replacement rate of pension for urban employees</td>
<td>35%</td>
</tr>
<tr>
<td>Enterprise employee participation rate</td>
<td>70% in 2016 and increases year by year, will reach 90% in 2020 and slowly increases and stays 95%</td>
<td>Basic level of pension for urban and rural residents</td>
<td>According to the research results of Bian Shu (2017), it is divided into three grades: low, medium and high</td>
</tr>
</tbody>
</table>
a) Assume that the labor population of 20-54 years old is the base of the total employed population
Judging from the actual years of education in China, young people often enter the labor market after 20 years of age. Therefore, the conservative way is to use 20 years old as the lower age limit for the base of the contributors. As to the upper age limit, according to the information provided by the Ministry of Human Resources and Social Security, the average retirement age in China is 55 years old in 2017. Therefore, it is reasonable to use 54 years old as the upper age limit.

b) Assume that the proportion of the labor population aged 20-54 participating in pension insurance for urban employees is consistent with the urbanization process
It can be considered that part of the labor population aged 20-54 participate in the pension insurance for urban employee, and the other part participate in the pension insurance for urban and rural residents. The process of urbanization can be understood as the transfer of rural labor population to urban labor population. Therefore, it is reasonable to believe that the trend of urbanization rate is basically consistent with the trend of this transfer. Based on the historical data and the trend of urbanization rate from 2018 to 2050, we find that the ratio of urban employed population to whole employed population is 4 percentage points lower than the urbanization rate. According to this, combined with the data for the labor population aged 20-54 in each year, the base of the contributor of pension insurance for urban employees and the base of the contributor of pension insurance for urban and rural residents can be calculated.

c) Assume that the base of contributors of pension insurance for the government and institutions employees accounts for 3.5% of the whole population in China
According to the data since 2003, the proportion of government and institutions employees to whole population in China had increased slightly, and reached 1% and 2.4% respectively in 2014. Thus, it is simply assumed that the proportion of government employees to whole population is 1% and the proportion of institutions employees to whole population is 2.5%, which means this number (3.5% of the whole population) is the base of contributors of pension insurance for the government and institutions employees.

d) Assume that the participation rate of pension insurance for urban enterprise employees has gradually increased to 95% year by year
According to the requirements of the 13th Five-Year Plan, the participation rate of basic pension insurance would reach 90% in 2020. Therefore, it is assumed that the growth rate will be around 4% per year starting in 2016, reaching 90% by 2020, and then increasing by 1% per year, finally maintaining this level after reaching 95%. The reasons why the participation rate is not assumed to be 100% are that some SMEs do not obey the rules, and some self-employed and flexible workers are insufficiently motivated to participate in the insurance. In addition, the unemployment rate is also taken into account.

e) Assume that the compliance rate of pension insurance for urban enterprise employees has gradually increased to 100% year by year
In fact, not only is the participation rate of pension insurance low, but some insured people do not pay or are unwilling to pay the fees, resulting in a rising participation rate but a declining contribution rate. Nowadays, the state is reforming the collection and management system for social security contribution. In the meanwhile, it is gradually promoting the social pooling at national level. Based on this, we assume that the compliance rate of urban enterprise employees starting from 80.3% of 2015, would increase by 1% every year until 100% in 2050.

f) Assume that the actual growth rate of the average salary of employees is compatible with the growth rate of GDP
Because of the long-term forecast, we use real growth rates to compare so as to eliminate the effects of inflation. In 2016, China's GDP growth rate was 6.7%, and the GDP growth rate in 2017 was 6.9%, better than

5 Data from Human Resources and Social Security Yearbook.
expected. However, in the long run, according to the predictions of many organizations such as the World Bank, IMF, and PricewaterhouseCoopers, China’s real GDP growth rate will gradually decline. Combining these factors above, without considering the fluctuation of the annual growth rate during the economic cycle and referring to the characteristics of the historical GDP growth rate of developed countries, we assume that the trend of China’s GDP would be divided into three phases in the future. Phase one (2017-2030): GDP would drop by 0.1% from 6.7% per year, gradually to 6%, and then would remain until 2030. Phase two (2031-2040): The real GDP growth rate would remain at 5% during this period. Phase three (2041-2050): The real GDP growth rate would remain at 4% during this period. Further, based on the correlation between the real growth rate of average wages in China and the real growth rate of GDP in 2010, we assume that they would be equal in each year in the future.

g) **Assume that the real contribution rate of pension insurance for urban employees is 16%**

The establishment of China’s basic pension insurance system began with local areas. Today, the social pooling at national level has not yet been achieved. Although the State Council set 20% of an enterprise’s whole wages as the national standard of contribution rate, it varies greatly from region to region. Because the local governments have rights to make appropriate adjustments based on local conditions. It means that the real contribution base is less than 20% in many districts. In the context above, we assume that the real contribution rate is 16% of the average real wage of urban employees.

h) **Assume that the average replacement rate of basic pension (social pooling part) for urban employees is 35%**

According to the formula for calculating the basic pension (social pooling part) for urban employees, people who start working at 20 years old and retire at 55 years old, will receive 35% of their wages for one year before retirement as their basic pension. Therefore, we assume that the average replacement rate of basic pension (social pooling part) for urban employees is 35%.

i) **Assume that the benefit of pension insurance for urban and rural residents is set to three grades: low, medium and high**

According to the current policy of basic pension insurance for urban and rural residents, the social pooling part is fully subsidized by governments, and the insured has no payment responsibility but rights to enjoy benefits. This is actually a form of universal benefits pension, called zero pillar. It is assumed that this system will remain unchanged in the future, and according to the research results of Bian Shu (2017), the benefit is divided into three grades: low, medium and high.  

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3.1.3 Fiscal burden forecast of basic pension insurance

Based on the forecasting model and statistical software, we forecast the revenue, expenditure and balance of China’s basic pension insurance fund from 2018 to 2050, including pension for urban employees and pension for urban and rural residents.

Figure 3-1 and Figure 3-2 show the forecast results of basic pension for urban employees. It is predicted that in 2018 the balance of basic pension for urban employees will be RMB -109.4 billion, then the difference continues expanding. By 2050, then revenue will reach RMB 22 trillion, and the expenditure will reach RMB 51 trillion, thus, the gap will be RMB 29 trillion, 7% of GDP, and the accumulated gap will reach an all-time high of nearly RMB 326 trillion, 79% of GDP.

The basic pension of urban and rural residents is completely borne by the government, and the insured does not need to pay any fees, so the expenditure scale corresponds to the fiscal burden scale. According to the forecast,
since 2018, the year when the basic pension expenditure scale showed a trend of steady rise, low, medium and high types of treatment standard has reached RMB1.35 trillion, RMB 2.26 trillion and RMB 4.61 trillion respectively. By 2050, the cumulative expenditure of the three types will reach RMB 31 trillion, RMB 50 trillion and RMB102 trillion respectively, accounting for 8%, 12% and 25% of GDP that year.

Combining the financial burden of pension for urban employees and pension for urban and rural residents, we will calculate the general financial burden trend of basic pension insurance.
Definition: Total fiscal burden for basic pension insurance = The absolute value of the gap between revenue and expenditure of pension for urban employees + High standard expenditure of pension for urban and rural residents.

The results are displayed in Figure 3-5. From the perspective of the fiscal burden of basic pension insurance in the current year, the amount of expenditure that the government should bear in 2018-2050 will be on a rapid rise, reaching RMB 34 trillion in 2050, accounting for 8.19% of GDP that year. In terms of the accumulated fiscal burden, the accumulated pension expenditure that the government needs to bear will reach a staggering RMB 428 trillion in 2050, exceeding the total GDP of that year, accounting for 104%.

Figure 3-5 2018-2050 Fiscal burden of basic pension insurance, 2018-2050

3.2 The trend of fiscal burden for basic medical insurance

3.2.1 Assumptions

The prediction model used here refers to the actuarial model of Li Yaqing (2015). The establishment and derivation of the actuarial model are not described in detail here. The premise hypothesis of model establishment will be explained as follow:

① Take only the national average level into account, ignoring differences in medical insurance systems across the country.

② Focus only on funding per capita, without differentiating sources of funding.

③ The maximum age of survival for the insured is 100 years.

④ Regardless of the starting line, the proportion of fund payment and the maximum limit of payment, only the actual compensation ratio which comprehensively reflects the above factors is investigated.

⑤ The probability of population migration is only related to age.

⑥ The pooling fund's operation and management costs are zero.
Before reaching the target level of security, the actual compensation of the new rural cooperative and residents' medical insurance is adjusted once a year compared with the beginning of the year.

### 3.2.2 Parameters determination

#### a) The weight of medical expenses by age groups

The weight of medical expenses reflects the relative difference in medical expenses of different age groups. Table 3-1 reflects that the older the individual becomes, the higher the level of medical expenses is, reaching the peak at 80-84 years old. Therefore, aging will seriously affect the expenditures of basic medical insurance.

#### Table 3-1 Per capita medical cost and its weights by age groups

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Per capita medical cost (RMB)</th>
<th>Weights</th>
<th>Age groups</th>
<th>Per capita medical cost (RMB)</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>146.21</td>
<td>0.465</td>
<td>50–54</td>
<td>472.80</td>
<td>1.505</td>
</tr>
<tr>
<td>5–9</td>
<td>75.36</td>
<td>0.24</td>
<td>55–59</td>
<td>602.09</td>
<td>1.917</td>
</tr>
<tr>
<td>10–14</td>
<td>54.36</td>
<td>0.173</td>
<td>60–64</td>
<td>767.84</td>
<td>2.444</td>
</tr>
<tr>
<td>15–19</td>
<td>86.29</td>
<td>0.275</td>
<td>65–69</td>
<td>1051.79</td>
<td>3.348</td>
</tr>
<tr>
<td>20–24</td>
<td>1139.64</td>
<td>0.444</td>
<td>70–74</td>
<td>1317.10</td>
<td>4.193</td>
</tr>
<tr>
<td>25–29</td>
<td>186.46</td>
<td>0.594</td>
<td>75–79</td>
<td>1360.53</td>
<td>4.331</td>
</tr>
<tr>
<td>30–34</td>
<td>161.77</td>
<td>0.515</td>
<td>80–84</td>
<td>1408.71</td>
<td>4.484</td>
</tr>
<tr>
<td>35–39</td>
<td>231.19</td>
<td>0.736</td>
<td>85–89</td>
<td>1245.98</td>
<td>3.966</td>
</tr>
<tr>
<td>40–44</td>
<td>268.52</td>
<td>0.855</td>
<td>90+</td>
<td>1299.92</td>
<td>4.138</td>
</tr>
<tr>
<td>45–49</td>
<td>376.30</td>
<td>1.198</td>
<td>Average</td>
<td>314.15</td>
<td>1</td>
</tr>
</tbody>
</table>


#### b) Growth rate of medical expenses

According to relevant researches, the income elasticity of Chinese farmers' health expenditure is close to 1.  

Referring to the average annual growth rate of hospitalization expenses in 2008-2012, which is 8%, this model sets the income elasticity of China's medical expenses to 1 and assumes that the future medical expenses growth rate is 8%, 7% and 6%.

#### c) Insurance factor

The insurance factor is a sensitive indicator that reflects the change in medical expenses with the level of protection (compensation ratio), that is, the degree of increase in the medical expenses caused by the increase in the compensation ratio. The formula is $f(U) = 1 + \beta (U - U_0)$, in which $U$ is compensation ratio, $U_0$ is contrast compensation ratio, and $\beta$ is undetermined coefficient. However, accurate estimates of insurance factors, which

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require natural experiments or advanced models, are very difficult. Limited by the data available, we refer to the insurance factor estimation table of Song Shibin (2009)⁹

3.2.3 The trend of fiscal subsidies of basic medical insurance

With the actuarial model and statistical software, we predict the change trend of the fiscal subsidies of China's basic medical insurance system from 2018 to 2050. Since the government has no subsidy responsibility for medical insurance for urban employees, the financial subsidies of medical insurance for urban and rural residents represent the financial subsidies of the whole basic medical insurance system.

Figure 3-6 and Figure 3-7 show the subsidies of medical insurance for rural residents from 2018-2050. Overall fiscal subsidies for medical insurance for rural residents will rise year by year. In 2050, under 3 medical expense growth rates - 6%, 7%, 8%, the subsidies will reach RMB 1.04 trillion, RMB 1.47 trillion and RMB 2.06 trillion respectively. In 2050, three medical expense growth rates under the scale of accumulated fiscal subsidies for medical insurance for rural residents will reach RMB 11.29 trillion, RMB 14.12 trillion, and RMB 17.73 trillion, accounting for 4.3%, 3.4% and 2.7% of GDP.

Figure 3-8 and Figure 3-9 show the subsidies of medical insurance for urban residents from 2018-2050. Fiscal subsidies on medical insurance for urban residents will also rise year by year. In 2050, under 3 medical expense growth rates - 6%, 7%, 8%, the subsidies will reach RMB 2.08 trillion, RMB 2.91 trillion and RMB 4.05 trillion respectively. In 2050, three medical expense growth rates under the scale of accumulated fiscal subsidies for medical insurance for urban residents will reach RMB 15.74 trillion, RMB 20.03 trillion, and RMB 25.53 trillion, accounting for 3.8%, 4.9% and 6.2% of GDP.

Figure 3-10 and Figure 3-11 show the total fiscal burden of basic medical insurance from 2018-2050. In the forecast period, the total fiscal burden on basic medical insurance will also grow rapidly. In 2050, under 3 medical expense growth rates - 6%, 7%, 8%, the fiscal burden will reach RMB 3.12 trillion, RMB 4.38 trillion and RMB 6.12 trillion respectively. In 2050, three medical expense growth rates under the scale of accumulated fiscal burden for basic medical insurance will reach RMB 52.52 trillion, RMB 65.82 trillion, and RMB 83.16 trillion, accounting for 12.71%, 16.02% and 20.25% of GDP.

Figure 3-7 Accumulated subsidies for medical insurance for rural residents, 2018-2050

Figure 3-8 Subsidies for medical insurance for urban residents, 2018-2050
Figure 3-9 Accumulated subsidies for medical insurance for urban residents, 2018-2050

Figure 3-10 Subsidies for basic medical insurance, 2018-2050
3.3 The trend of fiscal burden of social assistance

3.3.1 Model and assumptions

Different from pension and medical insurance, there is no obvious rules on the financial expenditure of the social assistance system. In addition, the target group and standard are also complicated. Therefore, it is impossible to construct an accurate forecasting model. Here, a simpler model is used to reflect the general trend of social assistance expenditures.

It is projected that absolute poverty will be solved in 2020, but relative poverty will remain for a long time. In this way, the trend of social aid expenditure is designed as follows:

1. According to the total social assistance expenditure in 2016 and the population of the poor in that year, the per capita assistance amount of the poor is obtained.

\[ \text{The population of the poor} = \text{Whole population} \times \text{Poverty incidence rate} \]

2. Based on the proportion of the relatively poor in major countries, the three levels of 8%, 10% and 12% are set for the estimation.

3. Assuming that the level of assistance is consistent with the national economic development trend, the growth rate of per capita assistance is set as the GDP growth rate.
3.3.2 The forecasting results of fiscal expenditure of social assistance

In 2016, the expenditure of social assistance was around RMB 320 billion, and the poverty incidence rate was 4.5% in that year. It can be calculated that the per capita poverty relief amount of 2016 was RMB 5,168.

According to Figure 3-12, the expenditure of social assistance from 2018 to 2050 will steadily rise, under the three kinds of relative poverty incidence rate - 8%, 10%, 12%, and the assistance expenditure in 2050 will reach RMB 3.07 trillion, RMB 3.83 trillion and RMB 4.6 trillion respectively.

![Fiscal expenditure of social assistance, 2018-2050](image)

3.4 The trend of total fiscal burden of social security system

Basic pension insurance, basic medical insurance and social assistance constitute the core part of China's social security system. With the advent of the aging population, the proportion of elderly people aged 60+ or 65+ is rising, and the labor population are shrinking sharply. The result is that the fiscal expenditures to maintain the sustainable running of the social security system.

Figure 3-12 shows the trend of total fiscal burden of social security system from 2018 to 2050. We define that the fiscal burden of social security equals to the sum of pension insurance, medical insurance (8%) and social assistance (12%). From the perspective of the general social security system, when the fiscal burden in 2018 was 2.96 trillion yuan and 3.51% of GDP, it will quickly grow to 44,036 million in 2050 and 10.8% of GDP, with an average growth rate of 18%. With regard to accumulated fiscal burden, as of 2050, it will reach an unprecedented number of 596 trillion yuan, accounting for 145% of GDP, with an average growth rate of 39%.
Figure 3-13 Fiscal burden of social security, 2018-2050
4 Measures to Improve the Fiscal Sustainability of Social Security

At present, there are two main ideas for Chinese society to deal with the financial crisis of social security brought about by the aging of population. The first one is to improve population structure. It is hoped that the population structure will be gradually adjusted by adjusting the birth policy and increasing the total fertility rate; thereby, the problem of aging can be alleviated and finally solved. The existing measure is “two-child’ Policy”, which was adopted by the Fifth Plenary Session of the 18th CPC Central Committee and officially implemented in 2016. Many experts believe that the next step will be to encourage fertility.

The second is to reform China’s social security system. The development of China's pension system is relatively lagging, which is reflected in many aspects such as poor system standardization, weak binding force, obvious regional differences, and unclear subject rights and responsibilities. The government has to bear a huge financial responsibility. It can also be seen from the forecast results that the gap between income and expenditure of the basic pension fund is the main threat to the future social security sustainability. The main problem in medical insurance is the increase in medical expenses caused by the expansion of the elderly population and the unreasonable increase in medical fee. Therefore, the Chinese government and experts are working hard to improve China’s pension insurance and medical insurance systems. Some effective measures have been proposed or taken to clarify the government’s expenditure responsibilities and ease the pressure on fiscal expenditures.

4.1 To establish a unified tax and fees collection system

After the Third Plenary Session of the 19th CPC Central Committee, the CPC Central Committee issued the "Deepening Party and State Institutional Reform Plan”. It mentioned that “In order to reduce the cost of collecting, rationalize the relationship of duties, improve the efficiency of collection and management, and provide taxpayers with high quality and efficient services, the sub-national taxation agencies will be merged and responsible for the taxation and non-tax revenue collection and management in the region. In order to improve the efficiency of social insurance fund collection and management, various social insurance premiums such as basic old-age insurance premiums, basic medical insurance premiums, and unemployment insurance premiums are paid to the taxation agencies for unified collection.” In the past, the department responsible for social security fees was determined by the local authorities at the provincial level. It could be a tax department or a social security department. There were large differences among the regions, and the abilities to collect and manage the fees were not strong enough to meet the needs.

The loss of social security contribution is mainly reflected in two aspects. The first is the low compliance rate. According to the payment rate of social security insurance for urban employees issued by the Ministry of Human Resources and Social Security, the contribution rate in 2006 was 90%, and in 2015 it was 80.3%. In the decade, there was even a decrease of 10 percentage points. In 2014, 1/5 employees in China interrupted capture to expend. The second is the unclear contribution base. The documents promulgated by the State Council basically set 60% of the average salary of urban workers in the previous year as the lower limit of the contribution base of pension insurance for urban employees. However, even in economically developed areas like Beijing, when the contribution base of pension insurance for urban employees is calculated, the contribution base is further reduced to 40% of the average salary of urban workers in the previous year. In addition, the enthusiasm of small and medium enterprises for payment is not high, and state-owned enterprises also have deficits or arrears.

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Social insurance premiums are collected by the tax authorities. After the unified tax and levy system formed, the capability of collection and administration is improved significantly, which is expected to fundamentally solve the two big problems—low payment rate and untrue payment base. It is assumed that after the unified collection of social insurance premiums by tax authorities, the compliance rate is 100%, and the average payment rate reaches 20% of the system design. Based on this, the fund revenues, expenditures and balance of basic pension insurance for urban employees in 2018-2050 are predicted in Figure 4-1. The figure compares the revenues collected in the current year before and after the reform of tax and fees collection system. It can be seen that after the reform the revenues collected in 2050 will reach RMB 27.93 trillion, with 5.5 trillion more than that before the reform. The figure 4-2 shows that after levy reform, the balance of pension for urban employees will be positive until 2026. And the balance in 2050 is RMB -23.44 trillion, accounting for 5.71% of GDP, which is obvious lower than RMB -29 trillion balance and 7.07% before the levy reform. There will be more obvious impacts which the reform has on the accumulated balance. The accumulated balance of pension for urban employees will be positive until 2032. And the accumulated balance in 2050 will be RMB -212 trillion (114 trillion less than that before reform), accounting for 51.58% of GDP (28% lower than that before reform).

In conclusion, the reform of the taxes and fees collection system and the adjustment of the collection agency have a good effect. It is urgent to quickly promote the merger process of the national and sub-national taxation agencies, integrating the social security contribution into the existing tax collection system, and to implement new program as early as possible to ease the financial pressure.
4.2 To implement incremental delaying retirement policy

Retirement age is closely related to the contribution and benefits of pension for urban employees, which has a significant impact on the balance of social security funds. If the retirement age is low, the base of the contributor will be low, and the population base for receiving pensions will be high; vice versa. The incremental delaying retirement age and flexible retirement system have always been the hotspots in the field of social security. Scholars generally believe that China’s retirement age is significantly lower than the international average. In the context of per capita life expectancy increasing and population aging, delayed retirement is an inevitable trend.

The Ministry of Human Resources and Social Security has publicly stated that, a delayed retirement plan would be introduced at the end of 2017, and will be officially implemented in 2022. During the transition period, there is still a difference in the age of delayed retirement between men and women, but this age gap will be gradually narrowed, and eventually the retirement age for men and women will be the same. Based on the implementation of reformed taxes and fees collection system and the delaying retirement policy above, it is assumed that incremental delaying retirement policy will come into force in 2022. It means increasing 1 year old every four years from the current hypothesis of social average retirement age 55, that is, the retirement will get delayed three months per year, until the end of 2050. Meanwhile the average replacement rate has also risen from 35%, and will increase 1% when the retirement age is delayed 1 year.

The forecast results (Figure 4-3) show that raising the retirement age can significantly alleviate the expansion of the pension funding gap. The balance in current year, after the reform, the pension will continue to receive more than it needs to spend by 2029, and then there will be a deficit of RMB 10 trillion in 2050 (RMB 29 trillion at the beginning), accounting for 2.47% of GDP in that year (7.07% at the beginning).

As to Accumulated balance, after the reform, the accumulated balance of the fund will be positive by 2038, and then there will be a cumulative deficit, which will reach RMB 71 trillion in 2050 (RMB 326 trillion at the beginning), accounting for 17.31% (80% at the beginning) of the GDP.

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12 Beijing Youth Daily, March 1, 2016.
It can be seen that the incremental delaying retirement policy effectively increases the contributor base of the pension insurance for urban employees and reduces the population base for receiving pensions. Such two-way adjustment has greatly alleviated the problem of pension funding gap brought about by aging, and all sectors of society have given high attention to rising retirement age. Although the policy of delaying retirement is more beneficial rather than harmful to the whole society, it will inevitably damage some people's interests. The government still needs to carefully design the program to implement the delaying retirement policy with the minimal cost to cope with the challenge from population aging.

4.3 Advancing the development of the third pillar

In April 2018, the Ministry of Finance and other five departments issued the “Notice on Launching a Pilot Program for Personal Tax Deferred Commercial Pension Insurance”, which declared that the personal tax deferred commercial pension insurance pilots would be implemented in Shanghai, Fujian (including Xiamen) and Suzhou Industrial Park in May 1, 2018. It implies that the Chinese government is actively exploring the third pillar of pension insurance, hoping to build a multi-level pension insurance system to ease fiscal pressure and ensure the long-term sustainability of the pension system.

In fact, China has not established the third pillar pension insurance for various reasons. Now we are actively exploring the construction of the third pillar of pension insurance, which mainly has the following three factors:

First, China’s first pillar of basic pension insurance has been unable to meet the needs of the elderly. Over the years, despite of the great progress made in the reform of the pension system, the basic pension insurance for urban employees is still a pay-as-you-go system in actual operation. With population aging speeding up, the proportion of China’s old-age population (60+ or 65+) expands rapidly. Correspondingly, the number of labor population has shrunk sharply. It has resulted in the decline of the number of contributors compared to the rise of the number of people receiving pension. According to the report of the 19th National Congress, the main contradiction in Chinese society has been transformed into “the contradictions between the people's ever-growing needs for a better life and the unbalanced and uneven development.” In order to alleviate the social contradictions of the "new era", there is a need for further improvement of the basic pension benefits. However, it is very difficult to raise the level of benefits considering the current conditions.

Second, from the perspective of establishing a multi-pillar pension system, the second pillar, enterprise annuity, is difficult to expand rapidly in the short term. Since the implementation of the enterprise annuity system in 2004, less than 10% of the employees have got enterprise annuities. Therefore, we cannot put our hopes of
establishing a multi-pillar pension system on a large number of companies to establish enterprise annuities. The contribution rate of the first pillar basic pension is too high, and the enterprises has no enthusiasm to establish the second pillar. Therefore, there is no way for enterprise employees to enjoy tax benefits. But if there is a third pillar, employees can reserve pensions by themselves for their future.

Third, with the economic transformation, small and medium-sized enterprises have become the main force to attract labor population. There are still a large number of rural migrant workers, flexible workers and part-time workers in China. It is crucial to consider how to cover these workers. Not the second pillar but the third pillar can allow the workers in small and medium-sized enterprises or self-employed workers to enjoy pension tax incentives.

There are three key points in advancing the establishment of the third pillar. The first is that the system model must center on “individual account”, which means to set up individual account with unique identification, rely on multiple carriers to increase the coverage of the third pillar personal pension, and rely on social security card to establish the 3rd pillar individual account information platform, etc.

The second is to design reasonable tax preference model. The tips are reasonably using the tax extension model of EET or TEE, setting a reasonable preferential tax rate or quota, and considering to open the 2nd and 3rd pillar tax incentives, etc.

The third is the diversified participation in product and investment channels. Banks, funds, insurance and other types of pension financial products should be considered into the selection range, and consider to establish a product access system and a default investment vehicle mechanism.

4.4 Reasonable control of medical expenditure

Unlike the severe situation of the pension insurance system, the financial burden of the medical insurance system is still acceptable. However, while the national health expenditures and the medical insurance expenditures continue to increase, inpatient or outpatient services, total medical expenses, per capita medical expenses, and medical expenses all have increased at a high rate in recent years. Among them, there are both “reasonable growth” caused by the rise of medical technology level, and “unreasonable growth” caused by various reasons, especially the “profit-seeking mechanism” of the hospital. Therefore, to control the unreasonable growth of medical expenses is one of the important tasks of the reform and development of China's medical insurance system.

Although the government plays a pivotal role in the design of the institutional framework and the supervision and management mechanism, it does not rule out that the market and social forces play a unique role in controlling medical expenses. For the monitoring and management of medical expenses, local governments can actively explore the specific form of Public-Private Partnership (PPP), which can timely detect and process the abnormal changes in medical expenses to control moral hazard in medical needs and medical behavior with the help of third-party information platform and intelligent monitoring platform.

In addition, the function of the medical insurance system will inevitably lead to an increase in medical expenses to a certain extent. In view of the diversity and complexity of medical needs, the government should play a major role in the four aspects including legislation, planning, investment and supervision. Under this premise, the market mechanism should be introduced vigorously, which will not only improve the fairness of medical insurance but improve the quality and efficiency of medical services. In terms of macroeconomic regulation and control, medical insurance should fairly treat public and private medical institutions, public and private rehabilitation institutions, public and private nutrition institutions, and other health service institutions; should eliminate discrimination, and meet the health needs of different individuals at different levels.
In addition to the above points, it is necessary to vigorously encourage the development of commercial medical insurance. The government promotes the development of commercial medical insurance by providing tax incentives, and lays a foundation for the establishment of a multi-level medical insurance system in the future. In this respect, China still has great potential.

4.5 Gradually relaxing the family planning policy

China’s “two-child” policy was put forward in 2015 and implemented officially in 2016. Its purpose is to adjust the age structure of the population and meet the challenges of aging. In fact, since the implementation of the “two-child” policy, the effect is not as expected. 2017 is the second year of the implementation of the “two-child” policy. According to the hysteresis effect, it is generally judged that the number of people born in 2017 will be significantly higher than that of 2016. However, the data from the National Bureau of Statistics shows that the number of births in 2017 fell by 630,000 from 17.86 million in 2016. The birth rate in 2016 was 12.95 per thousand. It fell to 12.43 per thousand in 2017.

Health and Family Planning Commission explained in 2015: “There are about 90 million couples eligible for the policy, and the birth population is expected to exceed 20 million.” But in reality, the birth population never exceeded 18 million, lower than the national health and family planning commission's forecast for 2017-2021.

The reason why the effect of the “two-child” policy is not good is that the Chinese people's fertility desires are not strong; as a result, the increase in total fertility rate is not significant. Just cancelling restrictions cannot solve this problem. There are two main factors leading to the reduction of Chinese fertility desires. Firstly, for individuals, the era when marriage and childbirth is a family obligation and responsibility has passed. With the development of urbanization, personal choice has replaced family responsibility. Secondly, China’s high housing prices, high childcare costs, and fierce social competition cause a problem that having more children means more pressure.

There are many experts predicting the effects of the “two-child” policy on the future population structure of China and the pension income and expenditure. Gu Hejun & Li Qing (2017) combined the data of the fifth and sixth census data with the annual statistical yearbooks to estimate the new birth population after the implementation of the “two-child” policy. They found that the implementation of the “two-child” policy could not change the overall downward trend of the total labor population and the upward trend of the proportion of the elderly population, but only slightly reduced the rate of decline in the labor population. Gu Hejun et al. (2018) examined the impact of the “two-child” policy on China's long-term economic growth and found that this policy will not create new “demographic dividends” by the middle of the 21st century, and it is impossible to reverse the trend of increasing aging. Sui Lei (2017) established a generational overlap model to study the impact of the “two-child” policy on basic pension. He believes that the “two-child” policy can only improve the financial sustainability of the pension system to a certain extent in the future, and the effect on the growth rate of the birth rate is not significant. Some scholars further explored the effect of completely relaxing the family planning policy. Zhu Jianping (2017), based on the data from the sixth census, found that the effect of abolishing the birth restriction completely is very close to the “two-child” policy, and the elderly dependency ratio will gradually increase. Therefore, he suggested that the government not only completely abolish the birth restriction, but also encourage birth.

The birth policy has a significant lag on the adjustment of China’s current population structure, it cannot be achieved immediately. Therefore, it is necessary to comprehensively consider these factors and promote to completely relax the family planning policy as soon as possible. In addition, we must learn from the practices of some developed countries, to encourage fertility, and to improve the total fertility rate.
References


