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ISBN 978-981-19-8890-5 ISBN 978-981-19-8891-2 (eBook)
https://doi.org/10.1007/978-981-19-8891-2

Jointly published with The Commercial Press, Ltd.
The print edition is not for sale in China (Mainland). Customers from China (Mainland) please order the print book from: The Commercial Press, Ltd.
ISBN of the China (Mainland) edition: 978-7-100-16637-9

Translation from the Chinese Simplified language edition: "中国道路与人口老龄化" by Yining Li et al., © 商务印书馆 2018. Published by 商务印书馆. All Rights Reserved.


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The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Contents

# Preface

# China's Road and the Employment Strategy of Population Aging


**Yining Li**

## 1 The Population Aging of China Has Become a Practical Problem That Merits Attention

In the 1980s and 1990s, when the reform and opening-up policy just came into effect, almost all economists, sociologists, and demographers held the view that with the abundant labor resources in rural areas, China would not be short of the labor force in the process of industrialization, as long as the peasant workers who egress from the countryside were fully mobilized. According to the standard formulated at the Vienna World Congress on the aging Problem in 1982, the percentage of old people aged 60 and above making up more than 10% of the total population marks the entry of the aging process. The aging population of China occupied 5% of the total population in 1982, which meant it was still an adult society.

However, the growth of the percentage of the aging population of China is alarming. This is probably, on the one hand, because of the omission in the demographic statistics in 1982; on the other hand, with the improvement of health care conditions in rural areas after the reform and opening up, the number of the aging population increased very fast; consequently, the percentage of the aging population continues to rise. According to the statistics, the percentage of the aging population amounted to 10% in 1999, marking the arrival of the aging society.

Furthermore, as the percentage of the aging population continues to increase, the increase in the number of older people aged 65 and above is growing faster after 1999. According to the statistics, by the end of 2015, the number of elderly people aged 60 and above was 222 million, which accounted for 16.1% of the total population, among which the number of elderly people aged 65 and above was 144 million, which accounted for 10.5% of the total population. This growth rate was very small across the whole world.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_1

Why is the growth rate of the aging population in China higher than that of most countries in the world? Almost all economists, sociologists, and demographers have pointed out that, the implemented population policy and its natural result, the "4–2-1" family mode, must be reformed. This family mode is one of the causes of aging. If the population policy is not adjusted appropriately, we can hardly meet the huge requirements of the labor supply or improve the living standard of the people. This is bound to be a huge obstacle to the realization of a moderately prosperous society and the building of a prosperous and strong China. The aging population has increasingly become an urgent problem for Chinese social and economic development and social stability.

## 2 Characteristics of Population Aging in China

One fact must be taken into account when we think of the countermeasures for the aging population of China, and that is, the characteristics of it reflect the status quo of China. These characteristics can be roughly concluded by the following five aspects.

First, rural areas have a higher proportion of an aging population than urban areas. According to the survey, this phenomenon was directly related to young and middle-aged migrant workers in rural areas from the 1980s to the first decade of the twenty-first century. These migrant workers would bring their spouses and children into cities when their working and living conditions improved. Thus, the number of young and middle-aged laborers and children in rural areas decreased. The old people were left behind, with some "left-behind women" and "left-behind children". Consequently, the percentage of old people out of the total "left-behind" people has increased significantly (Jiang Chunli 2016).

Second, on the basis of region, the degree of aging population in the eastern regions is higher than that in the western regions. According to the survey, there are two main reasons. The first is health care services. The health care services in the eastern regions is, whether it is urban or rural areas, better than that in the western regions as a whole, which means that the old people in the eastern regions can have early treatment if they are sick and maintain health if they are not; hence, the long life population is larger. The second reason is that migrant workers are from the western regions. Although there are some young and middle-aged workers from the eastern regions migrating to work in the western regions, the number is much less than the number of young and middle-aged workers migrating from west to east. The natural result of this tendency is that the number of young and middle-aged workers in the eastern regions is larger than that in the western regions. In addition, when the working and living conditions of these young and middle-aged workers migrating from the west to the east improve, they tend to bring their family, including the old people, their spouses and children, together into the eastern cities; hence, their houses in the west become empty. In our investigations of Jiangsu, Zhejiang, Guangdong, Gansu, and Shaanxi Provinces, there are many migrant worker families migrating from west to east, but families seldom migrate from east to west.

Third, from the perspective of gender, the female aging population is larger than the male aging population. This is probably a universal situation. One reason is that male laborers, who shoulder much of the manual labor, are more easily injured or have accidents and tend to lead an irregular life. If they make wrong friends, they would even fall into bad habits such as excessive drinking, gamble, prostitution, and drug taking, which might render them weak and sick when they are old or even die early, leaving their spouses alone. In such cases, it is understandable that the female aging population is larger than the male aging population. What are the Chinese characteristics of the female aging population? According to investigations in some cities and towns in Shanxi Province, there were few opportunities for women to have education for a long time (including the Period of the Republic of China and the early period of the People's Republic of China); therefore, many women are illiterate, and they seldom participate in the activities conducted by the women organizations. This is very different from the old women in the southern Yangtze River regions.

Fourth, in terms of the health conditions of old people, the urban area is better than the rural area, and the plain area is better than the mountainous area, especially better than the remote mountainous area. Specifically, if we measure the health conditions of old people by city size, megapolis is the best, followed by medium-sized cities and small towns, and rural areas are the worst. Likewise, the health conditions of old people in rural areas depend on the levels of affluence in that area. This is understandable because this distinction is not only related to family income, the convenience of transportation of the family residence, and the convenience of hospitals but also related to the facilities and skills of medical workers in hospitals or clinics. Although the income of rural and urban residents is increasing and the medical conditions at the grassroots level are improving, the elimination of this distinction is a gradual and long process.

Fifth, as the total number of "empty-nest" families is increasing, the number of "empty-nest" families in rural areas is also increasing, although with less momentum than the increasing speed of "empty-nest" families in cities. Two reasons account for this phenomenon.

Reason One: The emergence of the "empty-nest" family is probably due to the large number of migrant workers, especially those migrant workers sent by enterprises who undertake construction projects in foreign countries; among them, many are unskilled workers, skilled workers, and technical and administrative staff. Very few of them bring their families along. If the send-away worker is the only child of the family, then there would form an "empty nest" family, namely, a family with the so-called "left-behind elderly", "left-behind women" and the "left-behind children". However, this situation is only temporary; once the contract expires or the projects finish on time, the workers come back home, and the "empty nest" family becomes normal again. If the enterprises sign a new contract and send more work force to foreign countries, a new circle of the "empty nest" family will appear again. Among the expatriate workers, skilled workers and technical and administrative staff are mainly recruited in urban areas; they usually take positions that require skills and expertise because unskilled workers can be recruited in foreign lands. The foreign side sometimes requests recruiting their local workers. Thus, enterprises sometimes

try their best to recruit local workers when the contract for outsourcing work is accepted and signed.

Reason Two: The emergence of the "empty-nest" family is also related to undergraduates and graduates who study abroad. Many of them would stay abroad when finishing their studies, whether it is to continue their studies or take positions in companies or universities. Thus, the older generation of the family becomes the only residents in the "empty-nest" family. Maybe after a short time, after retirement, they will emigrate abroad too. If they do not transfer possession of their houses in their homeland and come back home after spending a short time abroad, then they would form an "empty-nest" family again. Most of this kind of "empty nest" family are city residents. There are also students from rural areas who emigrate to live abroad, but the number is much less than those from cities.

In summary, the number of "empty nest" families with urban residency is doubtlessly much larger than that with rural residency.

## 3 A New Trend: The Improvement of Population Quality in the Process of Population Aging

How to deal with the advent of population aging is an issue of common interest in the fields of economics, sociology and demography. Before discussing the specific strategies, a new trend that emerged in the process of population aging merits our attention, that is, the improvement of population quality.

In the past ten years, the process of population aging and the general improvement of population quality have been parallel new trends since 2000. On the one hand, the number of elderly people continues to increase; on the other hand, there has been a fever for vocational and technical education, technical and management training classes, computers and surfing the Internet from cities to rural areas, from coastal to inland provinces. Many laborers and entrepreneurs are striving to learn more knowledge and advance their cultural and technical level. A revolution is taking place in the area of human resources in China; not only young people but also middle-aged people and even the elderly are involved in this revolution. This is a quiet revolution, and people who advance their cultural and technological knowledge are millions of different age groups, which is unexpected by many academics, but everyone is excited, feeling that the human capital revolution has come.

In rural areas, the revolution should be attributed to land right confirmation and land transfer. Because of the reform of the land confirmation right, the courtyard farm appeared, and the farmers felt satisfied and fulfilled, full of energy and motivated to turn the farmland into a high-yield and high-income farm; or step on the road of scale operation, of industrialization of agriculture and animal husbandry, through land transfer. Age is no longer a restriction for farmers to learn new knowledge and technology; some of them are old in age but have a high spirit of learning. They go to training classes, send their children to learn the techniques of farming, learn how to

surf online, how to improve varieties, how to be environmentally friendly, and how to sell homemade products. Age is no longer a restriction, but vigorous has become a new fashion.

Because of land transfer, some farmers leave the countryside to operate business in cities. The farms are either merged into a new type of cooperative organization, distributing dividends based on shares, or leased to other family farms to obtain rent. These farmers who are engaged in commercial and service industries have embarked on the road of self-management and increased their income. The land would not be deserted, farmers from other provinces would subcontracted the land and became tenant farmers.

A new name of "city returnees" has emerged in some cities and rural areas, which refers to the group of people migrating to work outside for several years and then returning to hometown. These people have been outside for years; they have learned technology, made friends and are sophisticated enough to understand the market rules and business practices; they have also accumulated some funds. However, years of migration and separation have produced "left-behind elderly", "left-behind women" and "left-behind children". Will this abnormal phenomenon continue? The wave of "returning to the hometown to start a business" hence came into being. These migrant workers are called "city returnees". We conducted investigations on the entrepreneurs of the "city returnees" in Hanzhong, Ankang, and Bijie in Guizhou Province and made some new findings.

First, each region has its own characteristics. For example, in Hanzhong Xixiang County of Shaanxi Province, the local "city returnees" are busy with their tea gardens that produce tea with rich selenium, by which the pollution problem of local farmland is resolved. Xixiang is located on the south bank of the Han River, where the planting areas are formed. Since the South-to-North Water Diversion Project, Danjiangkou Reservoir has been built in the lower reaches of the Han River as the beginning of the South-to-North Water Diversion Project. To ensure clean water sources, chemical fertilizers and pesticides are prohibited in all rice fields along the Han River. Instead, tea trees that require not of chemical fertilizers or pesticides but farmyard manure are planted, and the produced tea is well-sold. In this way, the "city returnees" not only helped to solve the big problem of maintaining the water quality of the Han River, but also reunited with their families, thus creating the opportunity of both making a living and getting rich.

The famous scenic spot in Bijie, Guizhou Province, "Baili Rhododendron", is a tourist attraction with beautiful scenery. Here, the business of "city returnees" is becoming increasingly prosperous, with "Farmhouse Accommodation" and "Farm Restaurants" everywhere. In addition, there are also groups of migrated workers setting up microenterprises after returning to their hometowns. We went to a microenterprise entrepreneurship park in Qixingguan District of Bijie, which is full of microenterprises established by migrant workers, including garment shops, fashion production factories and bakery. The owners were very excited and told us, "no one cared about us in the past. After the establishment of the microenterprise entrepreneurship park, the management committee is the organization that helps

us, they help us to develop and organize learning activities.This park is like a home for us."

Some auto repair shops and motorcycle repair shops operated by the "city returnees" have been built on both sides of the roads in Bijie. Since cars and motorcycles are constantly increasing, the car repair business is booming, and it is common for mechanic masters to lead apprentices. This is also a new phenomenon, from which we can see changes and development of cities and towns in outlying provinces in recent years.

There are articles and opinions in foreign countries holding that the "reform dividend" and the human capital of China have been exhausted, or declaring that China is a so-called "getting old before getting rich" country. In fact, these are superficial talks made without understanding the reality of China. China is a developing country, and the reform and opening-up policy has implemented nearly forty years since the 3rd Plenary Session of the 11th CPC Central Committee (1978), without which, China would not enjoy the current situation of a good economy and a stable society.

China has always insisted on the reform and opening up. The "reform dividends" of China are not exhausted and are constantly springing up with the deepening of reforms.

Population aging and the decrease in the number of "migrant workers" in China do not mean the exhaustion of human capital dividends. Practices has clearly told people that elderly human resource dividends still exist and that human capital is undergoing a huge revolution in cities and rural areas, coastal areas and inland provinces, which will eventually complete the transformation of human capital, and the new human capital will surely bring new human capital dividends.

The comment of "getting old before getting rich" also originated from knowing too little about the national conditions of China. "Not getting rich" is a fact, and there is no need to defend against it, because China has a large population. Despite the increased force for poverty alleviation, the growth of GDP per capita is difficult to raise because of the weak foundation and the expanding poverty-stricken areas. With the hard work of the past 40 years, China has finally developed into a country with middle- and upper-middle income. This is already a very incredible achievement, and the whole nation has the determination to work harder and strive to become stronger, and achieve the goal of making China become a high-income country in the near future.

"Getting old first" is variable. If the aging population is only regarded as a heavy burden and the effectiveness of the human capital revolution is overlooked, pessimism will easily prevail, and people will only feel the pressure brought about by population aging. In fact, from the conditions mentioned above, the elderly are still active and helpful in the establishment of family farms, microenterprises, family business workshops, etc., they are often a component of productivity that cannot be ignored. For example, after the establishment of a family farm, the elderly over 60 years old could play the role of technical guide in farming, breeding and gardening, helping the younger generation become wealthy. In workshops for repairing cars and motorcycles, we often see retired elderly still helping with the work. Therefore, the comments such as "getting old before getting rich" are not in line with the status quo of China.

## 4 Rediscussion on Population Aging, Technological Innovation, and Industrial Upgrading

As mentioned above, elderly parents usually contribute to the family farm (or cooperative farm) to perform their duties if health conditions are allowed; even if the elderly no longer hold specific positions in the family-run businesses, they still offer advice and suggestions and help younger generations run the family business well, as long as they feel healthy.

Next, the issue of the role of specialized technical personnel in the aging population will be explained.

Economic transformation is the focus of the economy of China in the new stage, and the most important reform measure in economic transformation is to accelerate the establishment of industrial entities with clear property rights and protected property rights. Reform is unstoppable, and technological innovation and industrial upgrading are driving forces for growth and necessary measures to open up new markets. Specifically, technological innovation and industry upgrading can alleviate the problems caused by the aging, alleviate the shortage of labor supply, and especially alleviate the shortage of research talent in technical sciences. Judging from international experiences, outstanding achievements in technological innovation and industrial upgrading can effectively help the economy continue to grow, the market continue to expand, and China stand at the forefront of the world as a powerful country, despite the pressure of the aging population at this stage.

It can be concluded that the key is not the increase in the supply of labor but increase in the talent in the scope of scientific and technological research and increase in the skilled workers. This is the effect that has been played in terms of talent supply in developed countries around the world. In other words, the key is not the supply of general labor but the supply of scientific and technical personnel and skilled technical personnel.

The supply of scientific and technical personnel depends on the quality and quantity of higher education and the development of scientific research institutions. To this end, we must vigorously cultivate scientific and technical personnel and make good use of them. The admitting, gathering and employing of talent are inseparable. Therefore, it is necessary to increase research and development funding and to implement a talent incentive system, a means to mobilize the enthusiasm of scientific and technological researchers, which has been proven effective by the experiences of some foreign developed countries.

On the national scale, the rule of retirement at the age of 60 is in urgent need of adjustment. For experts and scholars who are in better physical condition, the retirement age can be extended appropriately with consultation of their opinions. It is a blessing and beneficial to the nation if experts and scholars can work until the age of 70; the retirement age for the leaders of scientific research institutions can be extended to at least 65 years old; he or she will not be the leaders after 65, but can still serve as consultants and still be able to guide graduate students. In this way, the strength of the scientific research team will be improved.

Extensive recruitment of experts and scholars from all over the world is an urgent policy for China to open up new disciplines and new fields. Introducing outstanding talent, including PhD graduates, teachers, experts and scholars who work in foreign research institutions or universities, is important for the domestic development and acceleration of new disciplines and fields. There are many good experiences, which should be carefully summarized.

Skilled craftsmen and technicians should also be included in the scope of specialized talent. The shortage of workers and technicians in China makes it necessary to discover talent in practice and let them continue to improve. Compliments should be paid to those "great country craftsmen" who have devoted themselves to industries and have worked hard and made achievements for decades. The retirement age of skilled craftsmen and technicians should also be extended appropriately. If they are willing to work until the age of 70 in enterprises that are in great need of them, the rules for the extension of scientific and technological researchers with expertise can be referred to. This is a good thing that will help alleviate the shortage of skilled workers and technicians.

A question arises here: Would the extension of the retirement age of experts and craftsmen hinder the employment of young people? If it would, how can we solve it?

This issue can be viewed from three different perspectives.

First, young people are unable to replace the positions of experts and academics who have strong academic skills and considerable experiences in scientific research and development, whose efforts will contribute to the advancement of research institutions, and produce more positions for young people.

Second, experts and scholars who are willing to retire when they reach retirement age may choose to put their professional into entrepreneurship; they could build independent enterprises and become entrepreneurs of newly established technology companies; as well as those skilled craftsmen and technicians who have reached retirement age and are willing to start their own businesses and as business owners in an industry that they are familiar with. In this way, more opportunities are created for young people to be employed.

Third, employment opportunities for young people will be increased with the development of scientific research institutions and the increase in independent scientific research enterprises. According to employment theory, employment depends on economic expansion; the more active the economy is, the more employment opportunities, which is the law of employment. Therefore, for the employment prospects of China, the extension of retirement age will not reduce the employment opportunities of young people; in contrast, it will create more employment opportunities for society. Perhaps in the near future, China will see new employment climax one after another.

It is foreseeable that the aging population will bring new employment opportunities.

## 5 Issues Concerning the Development of Social Enterprises

Further analysis on the prospect of employment can be made based on the foreign experiences of social enterprises.

Social enterprises first appeared in the UK around the 1840s, and it has gone through approximately 70 years since the industrial revolution. As the first country embarking on the road of industrialization, the benefits of industrialization to the UK are obvious, and the problems it brings about are ever more prominent. Social enterprises have emerged under such circumstances.

What kind of enterprise is called a social enterprise? Generally, it is defined as follows: It is a socially owned enterprise, serving the interests of society and adopting corporate management; social enterprise is allowed to have small profits but there is no shareholders and no tax burden; it hires people to do some management work, with a relatively moderate salary.

Social enterprise are not profit organizations but public welfare enterprises. Their profits all go to the enterprises and then invest in social welfare undertakings. The enterprises may grow larger, but the beneficiaries are the whole society.

The form of social enterprise began to be imitated and was followed by other Western European countries and the United States after the mid-twentieth century. Social enterprises are mainly distributed in industries such as pension, medical care, health care and nursing. From the perspective of organizational formation, social enterprises in European countries and the United States after the mid-century have the following three differences from those in the past in the UK.

First, in America and European countries, the newly established social enterprise can raise funds from society when reaching a certain scale, in spite of its aim of public welfare undertakings with social-investment or government-investment. In this way, the scale and economic strength of the enterprise will be enhanced, so that more public welfare investments can be made.

Second, an increasing number of social enterprises tend to give up the subsidies from the government after reaching a certain scale, and rely on their own accumulation and self-development. In doing so, they may attract more funds from private sectors, which is more beneficial to the development.

Third, from the practice of the economic development of Western countries, there are three ways for social enterprises to raise funds: social donations, including initial construction funds; government subsidies, which for social enterprises is a combination of pros and cons, pros refer to subsidies from the government, cons include more inspections by the government and less autonomy and fewer social donations; the last way is to make social enterprises become a listed company and receive the attention of society through the capital market in the name of public welfare. Demutualization has become a self-seeking development of social enterprises. This is also the biggest difference between current social enterprises and past social enterprises.

The experiences of social enterprises in European countries and America can be used as references for China. Since the goal of social enterprises is not to make profit but to public welfare, they can receive funds donated by society and rely on

government subsidies; it can also be restructured into a shareholding system and listed based on certain performance and scale. These are all feasible options.

At present, fund raising can refer to foreign practices in the elderly care, medical and nursing industries. This will help reduce the pressure of the aging population. More significantly, the development of social enterprises is, after all, a new way to increase employment and is helpful in coping with employment pressure in urban and rural areas, as the development of the pension, medical and nursing industries will require different workers and broaden employment. Moreover, with the refinement of service work and the expansion of the scale of social enterprises, more staff will be needed. The employment potential in the medical, health care, and nursing industries means that the service scale of these industries will expand as the services expand.

In China, social enterprises shoulder the responsibility of inheriting the excellence of Chinese culture in the process of investing in public welfare undertakings, such as respecting and honoring the elderly, and helping and supporting elderly. Both the community and the family can play a better role in helping the sound development of service undertakings such as elderly care, medical treatment, health care, and nursing. If the service work of social enterprises can further integrate with the cultural industry to the achievement of "care for the elderly" (referring to the good care of the elderly), "support for the elderly" (referring to accomplishing worthy work of the elderly), and "recreation for the elderly" (referring to the possibility of family reunion and cultural enjoyment for the elderly), then family harmony, community harmony, urban and rural harmony, and ultimately social harmony and social employment, can be realized.

In short, population aging itself is indeed a practical issue in social and economic life of China at this stage. We must, on the one hand, see the pressure or disadvantages it will bring on the economy; but on the other hand, it also should be understood that we should find effective countermeasures to it, changing the negative to the positive, and grasping the opportunities provided by it.

This article starts with the opportunities population aging has brought about; the parallelism of population aging and the human capital revolution is one of the opportunities currently facing China, and the urgency of improving the knowledge and technology of workers has been recognized by the whole society.

This article also discusses the problems caused by the insufficient supply of senior talent (including experts, scholars, craftsmen and technicians engaged in scientific and technological innovation and entrepreneurship research). It is recommended that the retirement age should be extended, as to the promotion of talent supply and the relieve of the pressure of aging. Meanwhile, it is also recommended that senior talent who are willing to retire to start their own businesses and operate independently to promote economic development should be encouraged and supported.

The employment of young people in China is also an unavoidable issue in the process of population aging. Starting from modern employment theory, this article adheres to the law of "increasing employment by employment" to alleviate social employment pressure. In this way, employment problems will be gradually solved through economic development, thus proving that population aging does not necessarily lead to uncontrollable unemployment. Human effort is the decisive factor.

The last part of this article expounds the importance of strengthening national cultural and moral qualities in the process of population aging. The largest dividend in a society is the social harmony dividend, that is, the dividend from social harmony. We must attach importance to the role of the cultural industry and pay attention to the improvement of the moral quality of the whole population. When an increasing number of people in the society understand the far-reaching significance of respecting and honoring elderly, helping and supporting elderly, when "care for the elderly", "support for the elderly" and "recreation for the elderly" are realized, the national moral quality will be transformed into a harmonious social atmosphere, and the aging will no longer be social pressure but will be transformed into a new fruit of social construction, economic construction, and cultural construction.

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# Theoretical Volume

# The Evolution and Strategies of Population Aging in China: Forty-Years' Experience of the Reform and Opening up


**Zhiqiang Cheng**

## 1 Introduction

The stable demographic structure that has been maintained for many years in industrialized countries has been broken since the beginning of the twentieth century. Afterwards, the developing countries underwent similar changes. Caused by the decline in the population growth rate and the increase in life expectancy, population aging has become a worldwide phenomenon. China has completed the transformation of population reproduction and population structure and entered the rank of countries with low fertility level in only forty years of reform and opening up, while the developed countries took one century and ever longer to undergo the same process.

Population aging refers to the aging state of the social demographic structure with the increasing proportion of the elderly in the total population. According to the classification criteria in *The Aging of Populations and its Economic and Social Implications* established by the United Nations, when the population aged 60 and above accounts for 10% or the population aged 65 and above accounts for 7% of the total population in a country or region, the country or region has entered the stage of population aging. The third census of China in 1982 showed that the proportion of the population aged 0–14 was 34%, the population aged 15–64 was 61%, and the elderly aged 65 and above was 5%; the fourth census in 1990 showed that the proportion of the population aged 0–14 was 28%, the population aged 15–64 was 67%, and the elderly aged 65 and above was 5.6%; the fifth census in 2000 showed that the proportion of the population aged 0–14 was 22.89%, the population aged 15–64 was 70.15%, and the elderly aged 65 and above was 6.96%; the sixth population census in 2010 showed that the proportion of the population aged 0–14 was 16.60%, the population aged 15–64 was 74.53%, and the elderly aged 65 and above was 8.87%. It is easily seen from the results of these censuses that after the reform and opening up,

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_2

**Table 1** Age distribution of the six censuses

| Year | 0–14 years old (%) | 15–64 years old (%) | 60 years old and above (%) | 65 years old and above (%) |
|---|---|---|---|---|
| 1953 | 36.28 | 59.31 | 7.15 | 4.41 |
| 1964 | 40.69 | 49.17 | 6.08 | 3.56 |
| 1982 | 33.59 | 61 | 7.63 | 4.91 |
| 1990 | 27.69 | 67 | 8.58 | 5.57 |
| 2000 | 22.89 | 70.15 | 10.47 | 6.96 |
| 2010 | 16.60 | 74.53 | 13.4 | 8.87 |

*Source* National Bureau of Statistics of the People's Republic of China (PRC), *China Census Data*

the population structure of China has changed greatly, and the speed of population aging continues to accelerate and deepen (Table 1).

Since the reform and opening up, China has achieved tremendous success in economic development, and both economic growth and economic aggregates have created miracles in the history of the world. The structure of the population and social economy have also undergone fundamental changes, exerting significant and far-reaching impacts on this critical moment of transforming social structures and deepening reforms, presenting challenges to economic growth, labor supply, social medical security systems and inter-generational relations, as well as providing opportunities for the reform of social medical security system, the development of aging industries and the change of the domestic consumption structure. On the occasion of the 40th anniversary of reform and opening up and comprehensively deepening reform, this paper aims to accomplish a systematic analysis of population aging, including the status quo, characteristics and trends, reasons for its rapid development, and a comprehensive investigation into the effects of population aging on the economy and society and its mechanisms; then it proposes corresponding strategies to deal with the aging society that has already arrived and keeps deepening, which will be of great significance to the sustainable development of the population, society, economy, resources and environment of China.

## 2 The Status Quo, Characteristics and Trends of Population Aging in China

### *2.1 Evolution Phases*

During the forty years of reform and opening up, China experienced population growth peaks in the early and late 1980s. The birth rate and natural growth rate have continued to decline since then, and the population structure has changed from the adult stage to the aged stage. Figure 1 below shows this process. The population

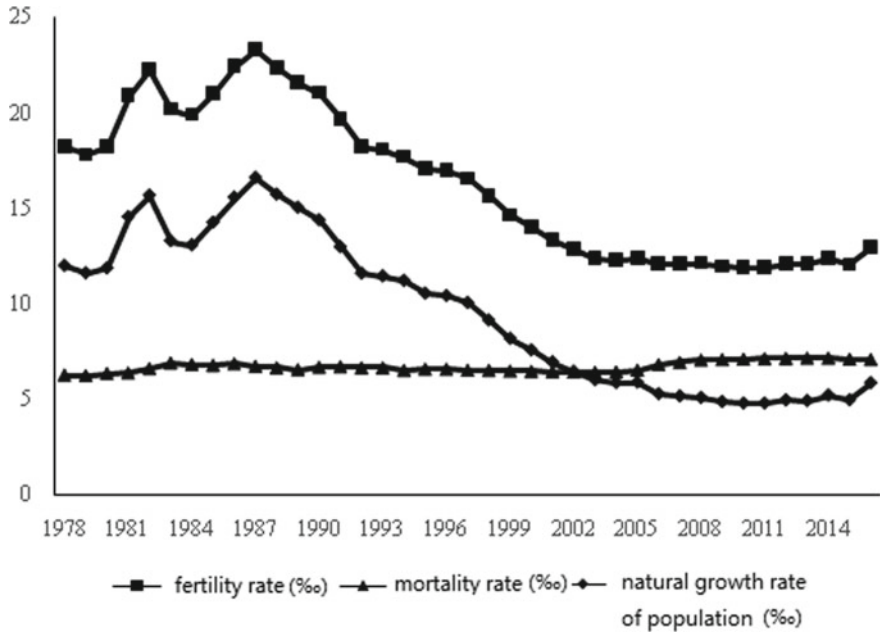


**Fig. 1** Birth rate, mortality rate and natural growth rate. *Source* National Bureau of Statistics of the PRC, *China Statistical Yearbook*

birth rate and natural growth rate continued to decline after two birth peaks in the 1980s due to population inertia; meanwhile, the mortality rate remained at a low level; consequently, the population structure has transformed dramatically.

Figure 2 shows the changes in the population dependency ratio. The number of elderly people above 65 years old and the dependency ratio of the elderly has been rising since the 1990s, while the dependency ratio of children has been declining.

(1) Adult phase (1970s–1980s)

To control population growth, China implemented the family planning policy in the early 1970s; since then, the fertility rate has undergone rapid changes. The total fertility rate was 5.44 in 1971 and dropped to 2.84 in 1977. From then on, the total fertility rate remained below 3 and kept falling downward. The decline in fertility rate means fewer children, whereas the population born before the 1970s, when the fertility rate was high, has become the main body of the working population; therefore, the population age structure has transformed into an adult phase. The third census in 1982 showed that, compared with 1964, the proportion of the population aged 0–14 fell by 7%, the population aged 15–64 increased by 11%, and the proportion aged above 65 years old increased by 1.3%. The fourth census in 1990 showed that, compared with 1982, the proportion of the population aged 0–14 fell by 5.9%, the population aged 15–64 increased by 6%, and the elderly aged above 65 increased to 5.6%. The gradual decrease in the proportion of children and the

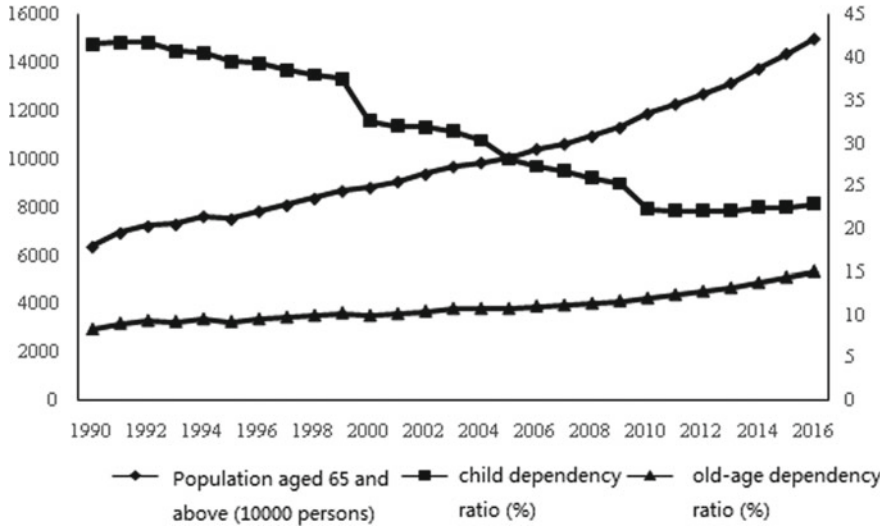


**Fig. 2** Change in the population dependency ratio. *Source* National Bureau of Statistics of the PRC, *China Statistical Yearbook*

gradual increase in the working-age population indicate the contracting bottom of the population pyramid and the entry of an adult phase.

(B) The phase of aging formation (1990s)

The total fertility rate of China has further declined since the 1990s, from 2.31 in 1990 to 1.99 in 1995 to approximately 1.8 in the mid-to-late 1990s, which was lower than 2.1, the fertility replacement level. The proportion of the children's population decreased, while the proportion of the working-age population and elderly population increased. The fifth census in 2000 showed that the proportion of children aged 0–14 decreased to 22.89%, the proportion of the working-age population aged 15–64 increased to 70.1%, the proportion of the population aged 60 and above exceeded 10%, the internationally accepted aging standard, and the proportion of elderly aged 65 and above was 6.96%, close to the internationally accepted aging standard 7%, and increased 1.4% compared with the fourth census in 1990. It is apparent that population aging has accelerated since the 1990s, and China has gradually entered an aging society.

(C) The phase of aging acceleration (early twenty-first century)

The total fertility rate has been declining since 2000, from 1.22 in 2000 to 1.34 in the 1% sampling survey in 2005, much lower than the replacement level of 2.1. The sixth census in 2010 showed that the proportion of children aged 0–14 was 16.6%, the proportion of the working-age population aged 15–64 was 74.53%, the proportion of the population aged 60 and above was 13.4%, the proportion of the population aged 65 and above was 8.87%, and the proportion of the population aged 65 and above

was increased 3% and 1.7%, respectively, compared with 2000. From then on, the growth speed of population aging and its proportion are faster than those in the first 30 years of reform and opening up. Population aging is accelerating.

(D) The phase of aging rapidly (since 2010)

The total fertility rate was 1.18 in 2010, of which urban areas were 0.88 and rural areas were 1.44. According to the statistical results of the *World Population Dashboard*, the global average fertility rate was 2.5 in 2010, 1.7 in developed countries, 2.7 in less developed countries, and 4.5 in the least developed countries. The total fertility rate of China was lower than half of the world average level and lower than the average level of developed countries. The 1% census in 2015 showed that the total fertility rate fell to 1.047, much lower than the government's encouragement level of 1.8, despite the introduction of the two-child policy for couples in which one partner is an only child in 2014. Lu Jiehua and Guo Ran (2016) divide the population aging of China into four phases: the fast development phase (2010–2022), rapid development phase (2023–2035), slow development phase (2036–2053) and peak platform phase (2054–2071). They believe that in the rapid development phase, the elderly will experience the first growth peak, with the population aging level rising to 18.5%, but it is still a mild aging phase; in the rapid development phase, the elderly will experience a second growth peak, with the aging level increasing to 29%, the elderly dependency ratio exceeding the child dependency ratio, which is a phase of moderate aging; in the slow development phase, the elderly will experience the third growth peak, and the aging level will rise to 35%, which is a severe aging phase, exceeding the average level of the developed countries; at the peak platform phase, the speed of aging will decrease and the level of aging will stabilize at approximately 34%, forming a stable state.

## *2.2 The Status Quo of Population Aging*

The basic characteristics of population aging in China are the declining of fertility level and the increasing of life expectancy. By the end of 2017, the elderly over 60 years old was 241 million, accounting for 17.3% of the total population, and the population over 65 years old was 158 million, accounting for 11.4% of the total population. China has become the country with the largest elderly population in the world. Here is an analysis of China's aging population from two aspects: life expectancy and the total fertility rate at the population level.

(1) Life expectancy

According to the estimation by the Population Division of the United Nations, life expectancy in China rose from approximately 66 years of age in the 1970s to approximately 76 years of age in 2016. With the economic development and the progress and improvement of medical and health services since the reform and opening up,

**Table 2** Life expectancy of the Chinese population

| Year | Life Expectancy | Year | Life Expectancy |
|---|---|---|---|
| 1950–1955 | 44.59 | 1985–1990 | 68.92 |
| 1955–1960 | 45.01 | 1990–1995 | 69.95 |
| 1960–1965 | 43.97 | 1995–20,001 | 70.86 |
| 1965–1970 | 59.42 | 2000–2005 | 73.41 |
| 1970–1975 | 64.58 | 2005–2010 | 74.44 |
| 1975–1980 | 66.29 | 2010–2015 | 75.68 |
| 1980–1985 | 67.71 | 2016 | 76.25 |

*Source* United Nations (Population Division, Department of Economics and Social Affairs), 2018, *World Population Prospects*, the 2017 Revision

life expectancy has continued to increase, adding to the proportion of the elderly population (Table 2).

(B) Total fertility rate

According to the estimation by the Population Division of the United Nations, the total fertility rate of China continued to decline from the 1970s to 2016, from 3.0 to 1.56 during the period of the reform and opening up until 2000, and has remained between 1.5 and 1.6 from 2000 to present, a relatively stable development. Due to the missing reports of the birth population in the statistics of China's census, the statistics from the Population Division of the United Nations are higher than the results of the sixth national census, but on the whole, China's total fertility rate is lower than the normal replacement rate and at a low level worldwide (Table 3).

**Table 3** The total fertility rate of China

| Year | Life Expectancy | Year | Life Expectancy |
|---|---|---|---|
| 1950–1955 | 6.11 | 1985–1990 | 2.87 |
| 1955–1960 | 5.48 | 1990–1995 | 2.05 |
| 1960–1965 | 6.11 | 1995–2000 | 1.56 |
| 1965–1970 | 5.94 | 2000–2005 | 1.55 |
| 1970–1975 | 4.77 | 2005–2010 | 1.63 |
| 1975–1980 | 3.01 | 2010–2015 | 1.60 |
| 1980–1985 | 2.69 | 2016 | 1.62 |

*Source* United Nations (Population Division, Department of Economics and Social Affairs), 2018, *World Population Prospects*, the 2017 Revision

## 2.3 Characteristics of Population Aging in China

(1) Large number and fast development

The first characteristic of population aging in China is large number and fast development. the elderly in China over 65 years old increased from 88.11 million to 158 million from 2000 to 2017, and the proportion increased from 6.96% to 11.4%. According to statistics, the speed of population aging in China is much faster than that of European countries, the United States and other countries. In China, the proportion of the elderly (over 65 years old) increased from 4.91% to 7.0% in only 18 years, while Sweden took 340 years for the proportion to increase from 5.2 to 8.4%, France took 115 years for the proportion to increase from 7 to 14%, and the United States took 66 years for the same increase. Table 4 shows that the proportion of China is rising from 7 to 14% at a rate similar to Japan, one of the most aging countries in the world.

(B) Advanced aging is prominent

In the 40 years of the reform and opening up, with the advancement of the population aging process, the degree of aging has also increased. The life expectancy was 67.77 in 1981 and 76.34 in 2015, with a nearly 10-year increase. According to the classification of the elderly population, 60–69 are young elderly people, 70–79 are middle-aged elderly people, and over 80 years old are advanced elderly people. According to the census, the number of advanced elderly aged over 80 was 5.05 million in 1982, accounting for 6.59% of the total aging population; 7.68 million in 1990, accounting for 7.92%; 11.99 million in 2000, accounting for 9.23%; and 20.99 million in 2010, accounting for 11.82%. When the baby boom population reaches 80 years old, the elderly will further increase, and China will face the trend of advanced aging of the

**Table 4** Speed of population aging in several countries

| Country | Time when the proportion of people aged 65 and above reached the standard | | Time required (year) |
|---|---|---|---|
| | 7% | 14% | |
| Japan | 1970 | 1996 | 26 |
| United Kingdom | 1930 | 1975 | 45 |
| Sweden | 1910 | 1975 | 66 |
| Germany | 1890 | 1975 | 85 |
| France | 1865 | 1980 | 115 |
| China | 2000 | 2025 | 25 |

*Source* Wu Cangping and others, *Social Gerontology*, Press of Renmin University of China (1999, p. 160)

aging population. Compared with the middle-to-low-aged population, the advanced elderly population has higher disease risks and higher social security and medical needs, which will bring severe challenges to China's pension security system and medical and health system.

(C) Getting old before getting rich

The aging population of China is the result of the implementation of the family planning policy in the 1970s with the aim of control population growth, and it has ushered in the aging in the context of an underdeveloped economy, making China a typical country of getting old before getting rich. In 2000, the per capita GDP of China was $856, while in some European countries and America, such as France, Germany, the United States and Sweden, the per capita GDP was $2849, $3134, $4096 and $2516, respectively, in 1900. The degree of population aging in China far exceeds the level of social and economic development. It can be seen from Table 5 that when China entered the aging society, the per capita GDP was only $1,749, while the population aging level in 2010 was equivalent to that of 1980 in Japan; China's per capita GDP level in 2010 was only half of Japan's level in 1980. If the aging phase is used as the comparison standard, China's economic development level is seriously lagging behind from the developed countries at the same aging phase.

(D) Remarkable difference between urban and rural areas

The economic development and medical and health conditions in urban areas are better than those in rural areas, and the life expectancy of the urban population is higher than that in rural areas. Generally, the degree of aging in cities should be higher than that of rural areas. However, the gap in economic development has not only caused the flow of the working-age population between urban and rural areas, but also resulted in the left-behind elderly in rural areas, rendering the decrease aging of the urban population and the increase aging in rural areas at the same time. From the comparison of the age structure of the urban and rural population in Table 6, it can be seen that the fertility rate of the urban population is lower than that of the

**Table 5** Comparison of the proportion of the elderly and per capita GDP in different countries

| Country | Proportion of the population aged 65 and over (%) | | | GDP per capita (2010 constant USD price) | | |
|---|---|---|---|---|---|---|
| | 1980 | 2000 | 2010 | 1980 | 2000 | 2010 |
| Japan | 8.91 | 17.2 | 23.0 | 9333 | 40,167 | 43,118 |
| Germany | 15.65 | 16.3 | 20.8 | 12,091 | 36,517 | 40,164 |
| France | 13.92 | 16.01 | 16.82 | 12,709 | 22,262 | 40,629 |
| Italy | 13.33 | 18.3 | 20.3 | 8431 | 34,832 | 33,761 |
| United States | 11.56 | 12.4 | 13.1 | 12,458 | 43,890 | 46,616 |
| China | 4.70 | 7.0 | 8.9 | 307 | 1740 | 4434 |

*Source* United Nations (Population Division, Department of Economics and Social Affairs), 2018, *World Population Prospects,* The 2017 Revision; World Bank Data

**Table 6** Comparison of the age structure of urban and rural populations

| Year | Proportion of population aged 0–14 (%) | | Proportion of population aged 15–64 (%) | | Proportion of population aged 65 and over (%) | |
|---|---|---|---|---|---|---|
| | Urban | Rural | Urban | Rural | Urban | Rural |
| 2000 | 18.42 | 25.52 | 75.16 | 66.98 | 6.42 | 7.50 |
| 2005 | 16.60 | 21.95 | 74.91 | 68.50 | 8.49 | 9.55 |
| 2010 | 14.08 | 19.16 | 78.12 | 70.78 | 7.80 | 10.06 |

*Source* The Fifth and Sixth National Population Census; 2005 National Survey of 1% Population Sample

rural areas, while the proportion of the working-age population is higher than that of the rural areas. The aging rate in urban areas is lower than that of rural areas. The aging rate in rural areas was 7.5% in 2000, 1.08 percentage points higher than that of urban areas, and 10.06% in 2010, 2.26 percentage points higher than that of urban areas, showing an ever-widening trend of aging gap between urban and rural areas.

(E) Unbalanced regional development

According to the sixth census, the five provinces with the deepest population aging in China in 2010 were Chongqing, Sichuan, Jiangsu, Liaoning and Anhui, and the rankings of these five provinces in the fifth census were 7th, 10th, 3rd, 8th and 9th, respectively, in terms of aging degree. With the exception of Jiangsu, the other four are all labor-exporting provinces after the reform and opening up. Labor migration has accelerated the aging degree. However, because of the absorption of a large number of migrant labor-age populations, the speed and degree of population aging in economically developed cities such as Beijing and Shanghai have decreased compared with the fourth census. The population aging rankings of Beijing, Shanghai, and Zhejiang in 2000 were 4th, 1st and 2nd, respectively, and dropped to 12th, 6th and 9th in 2010, which can be attributed to the inputs of working-age people who eased the aging of the local population.

(F) Apparent gender difference

The average life expectancy of female in China is longer than that of male, so the aging degree of female is also more severe than that of male. It can be seen from the comparison of the proportions of the elderly of different genders in Table 7 that in the 40 years since the reform and opening up, there are more female elderly population over 65 years old and over 80 years old than the male elderly population. Among the elderly over 65 years old, the proportion of the male aging population continues to increase, and the gender ratio gap continues to decrease, dropping from 11.36% in 1982 to only 3 percentage points in 2010. Among the elderly over 80 years old, the proportion of the male elderly population continues to rise, with the gender ratio still quite different.

**Table 7** Comparison of the proportions of the elderly of different sexes

| Year | Proportion of population over 65 years old(%) | | Proportion of population over 80 years old (%) | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 1982 | 44.38 | 55.62 | 34.97 | 65.03 |
| 1990 | 45.50 | 54.50 | 35.31 | 64.69 |
| 2000 | 47.25 | 52.75 | 37.92 | 62.08 |
| 2010 | 48.1 | 51.9 | 41.81 | 58.19 |

*Source* China's census data over time

**Table 8** The trend of population aging in China in the twenty-first century

| Time Period | Development stage | The highest point of the elderly population (million) | Population aged 80 and above (million) |
|---|---|---|---|
| 2001–2020 | Rapid aging | 248 | 30.67 |
| 2021–2050 | Accelerated aging | more than 400 | 94.48 |
| 2051–2100 | Severe aging | 437 | 75–120 |

*Source* Li Tongping, *Population Economics*, Tsinghua University Press (2008, p. 107)

### *2.4 The Trend of Population Aging in China*

The forecast report of the China National Committee on Aging divided the population aging into three stages of rapid aging, accelerated aging, and severe aging in the 100 years from 2001 to 2100. Table 8 shows that the future situation of China will be very severe, with huge challenges to the pension insurance system and various social management systems.

## 3 The Causes and Effects of the Aging Population in China

### *3.1 The Causes*

(1) Aging is the inevitable result of demographic transformation

It is an inevitable law that in the transformation of the population structure, affected by economic development, social culture, resources and the environment, the fertility rate and mortality rate will experience the trend of high to low level. With the improvement of living standards and medical technology, the mortality rate has decreased in the process of industrialization, and the population growth brought about by it will increase the pressure on survival and reduce fertility. Since the reform and opening up, the economic construction of China has made great progress, medical and health conditions have been greatly improved, and the death rate has continued to decline

and remained at a low level. The population born during the high fertility period in the early and late 1980s gradually entered old age after the period of low fertility. Consequently, both the size of the elderly and the top of the population pyramid expanded, further increasing the proportion of the elderly population.

(B) Family planning policy accelerates the speed of population aging

Although the change in the population fertility rate is the result of social and economic development, the particularity of China is that the implementation of the family planning policy has accelerated the arrival of aging population. After its implementation, China experienced a period of rapid decline in the birth rate of the population; from 1970 to 1979, the birth rate dropped from 33.43‰ to 17.82‰, and nearly 200 million fewer people were born. Tao Tao and Yang Fan's (2011) research demonstrates that, if the family planning policy was not enforced, the proportion of China's population over 60 years old in 2010 would be 11.39%, which is 1.87 percentage points lower than the actual proportion in 2010. This shows that family planning policy has accelerated the change in the age structure, shortened the time for the demographic transformation, and accelerated the pace of aging.

(C) The gender imbalance of the population promotes the aging of the population

According to census data, the gender ratio at birth in China was 108.47 in 1982, increased to 111.14 in 1990 and 116.86 in 2000, reached a record high of 121.18 in 2004, and decreased to 117.94 in 2010. The birth population in China is predominantly male, and the imbalance in gender structure of the population has made it difficult for some people of the right age to marry and have children, which has a promoting effect on the aging population.

## *3.2 The Effects*

(1) Population aging affects economic growth

The advancement of the aging population means that the labor-rich population dividend will gradually disappear, which will hinder the continued growth of the economy. The shortage of labor force will increase labor costs, and the increase in the elderly will reduce the total savings and investment level, affecting capital accumulation and economic growth potential. Lu Jiehua and Guo Ran (2016) believe that the aging population will affect the stability of the financial system and the potential for economic growth through the influence of labor supply patterns, economic operating costs, and consumer demand structures, which is not conducive to the stable and rapid growth of the macroeconomy. In light of the measurement of the potential impact of population aging on China's economic growth based on the per capita GDP decomposition method and counterfactual analysis method, Zheng Wei et al. (2014) have shown that the magnitude of the potential negative impact of China's aging on economic growth is much higher than the world average and the average level of OECD countries.

(B) Population aging affects the labor market

The impact of population aging on the labor market is mainly manifested in two aspects: the supply and labor productivity of the labor market and the demand for labor and labor costs. First, population aging reduces the amount of labor supply, resulting in a relatively insufficient or even shortage of labor supply; population aging raises the average age of the labor force, resulting in labor aging; and the impact of population aging on labor productivity is related to technological progress, industry classification and capital intensity. Second, population aging affects the labor demand structure by affecting consumption and industrial structure. On the one hand, it will increase the average social consumption propensity and promote the growth of total social consumption; on the other hand, it will bring new opportunities for the elderly industry, both of which will have an increased demand for labor. The aging of the population has changed the supply and demand structures of the labor market, thus affecting labor costs.

(C) Population aging affects the social security system

The increase in the level of population aging means that the proportion of the elderly in the total population is increasing, and the ratio of the retired population to the working population, that is, the pension support coefficient, is gradually increasing. The traditional pension insurance system adopts a pay-as-you-go system in terms of fund raising; that is, the amount of funds to be raised in the current year is determined according to the amount of pension required to be paid in that year. With this mode, there are no savings in individual accounts when pension funds are balanced. However, with the acceleration of the population aging process, the accumulation of funds in social pooling cannot meet the payment needs of pension insurance, which requires the current pay-as-you-go system to gradually change to a fund mode that combines social pooling and individual account accumulation. The aging of the population and the advanced aging of the aging population will exert great pressure on the medical security system and further increase the demand for medical services for elderly. The increase in the cost of medical treatments will generate higher demand for public medical health services, medical security funds and government public financial expenditure.

(D) Population aging affects the overall development of urban and rural areas

China's population is aging, and urbanization has alternated. Urbanization spurred the transfer of rural labor to cities, provided a large working-age population for the urban population, and raised the level of urban economic development. This in turn aggravates the aging of the rural population, further widening the gap between urban and rural population structure, social security level and economic development level, which is not conducive to the improvement of farmers' living conditions, the development of rural industries and the improvement of agricultural production efficiency, and hinders the overall development of urban and rural areas.

(E) Population aging affects family structure and inter-generational relationships

The family planning policy implemented in the 1970s changed the traditional family structure, making the average household size shrink into a "4–2-1" family mode. In this family mode, the number of members of the family who can provide care for the elderly is reduced, and the family's elderly care function is weakened; with the higher expense on living, medical services and education, the fertility rate of the younger generation decreases, and most of the young people choose fewer births or late births. With the family support structure changes, the working-age population faces a heavy burden of elderly care, which can easily lead to inter-generational conflicts and contradictions, affecting the stability of social structures and the harmony of inter-generational relationships.

## 4 Strategies for the Population Aging of China

With an increasing aging population and a declining child population and working-age population, the aging process of China's population is still in a dynamic process of change. Therefore, in view of its characteristics and the problems arising during its evolution, various strategies should be taken to actively and effectively respond to it.

### *4.1 Establish a Scientific Concept of Population Development and Formulate a Reasonable Population Development Plan*

At present, China has entered a stage of increasing population aging, with a low birth rate and a slow population growth rate. The establishment of a scientific concept of population development insists that the population quantity and structure are consistent with the stage of social and economic development. China should adjust the family planning policy in a timely manner, relax the strict control of population growth by conditionally implementing the second-child policy, and return the birth right to the family so that each family's birth decision-making meets its economic situation and needs, thus raising the fertility rate, further releasing the demographic dividend and easing the problem of population aging.

### *4.2 Establish and Improve the Elderly Security System and Medical Service System*

The social pension burden increases with the deepening of the aging population, and the pay-as-you-go pension system has difficulty meeting the needs of the current

pension. It is necessary to re-examine the scale of social security, establish and improve an elderly security system and an elderly service system covering urban and rural residents; the basic elderly insurance system combining social pooling and personal account should be gradually improved, and a multilevel urban elderly security system should be built in urban areas; it is also imperative to strengthen the investment management of pension funds, broaden the investment channels of the government, and gradually relax the restrictions on the investment and operation of social insurance funds so that pension insurance funds can be systematically and step-by-step invested in capital markets, especially stock markets, under the strict supervision of the government to achieve value preservation and appreciation, laying a good fund foundation for coping with the peak of population aging in the future. The function of elderly insurance for rural families has weakened and the elderly insurance system has not yet been fully established, while the aging has increased, therefore, the rural elderly insurance system needs to be established and improved to solve the rural elderly pension problem. In addition, the arrival of an aging society has led to a surge in the demand for medical services, while the medical service system is not yet perfect, and there are still large difference between urban and rural areas and among regions. Therefore, establishing a complete medical service system and reducing the regional gap and the urban–rural gap are important countermeasures to deal with the aging population.

## *4.3 Vigorously Develop the Aging Market and Aging Industry*

Population aging has created a series of challenges and brought new opportunities for China's economic development. The rise of the elderly entertainment, education, and healthcare industries can, to a large extent, further open up the domestic market, expand total consumer demand and stimulate economic vitality. In the provision of aging products and services, the principle of the market as the mainstay should be adhered to, and the effective regulation of the government and the active participation of the public should be fully implemented, thus vigorously developing the aging market while promoting the overall transformation and upgrading of the industrial structure of China.

## *4.4 Actively Develop and Utilize Elderly Labor Resources*

The average age of the working-age population continues to increase as the population ages, and there may be a structural shortage in the labor market. The development and utilization of elderly labor resources can be carried out from the following three aspects: first, postpone the retirement age, extend the working years, and gradually increase the retirement age of male from the current 60 years to 65 years, female from 55 to 60 years; second, implement a flexible retirement system, with strict control

on early retirement, encourage delayed retirement according to personal wishes, and accurately calculate the amount of pensions reduced by early retirement and delayed retirement and the amount of pensions received by delayed retirement, and support the young and healthy elderly population to carry out voluntary or operational elderly service activities, transforming them into community elderly service resources.

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# Population Aging and Establishment of the Social Security System


**Shangquan Gao**

International experience has shown that population aging will place heavy pressure on the social security system. With the gradual increase in the proportion of the aging population, social security expenditures also increase rapidly, such as medical insurance funds. This issue is particularly prominent in China, as China has a large population base. There are two main reasons for the increasing aging population of China: first, the average life expectancy has generally increased with the gradual improvement of medical standards and living standards; second, the fertility rate has decreased since the long-term implementation of family planning policy. With lower infant birth rate than the death rate, and the declining number of new laborers year by year, the proportion of the elderly gradual increases.

## 1 The Issue of Population Aging and Its Trends

According to the definitions of the United Nations, when the elderly aged 65 and over accounts for more than 7% of the total population, the median age of the population over 30, and the ratio of the elderly to the children's population above 30% in a country, the country has entered an aging society. From the data indicators, population aging is a dynamic concept (Table 1).

According to the fifth census in 2000, China has entered an aging society, and the issue of population aging is quite serious. Compared with other countries, the population aging of China has its own characteristics, which are mainly manifested in the following five aspects:

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_3

**Table 1** Classification standards of the United Nations for the age types of the population

| | Young | Adult | Old |
|---|---|---|---|
| Median age (years) | under 20 | 20–30 | above 30 |
| Proportion of population aged 65 and above (%) | under 4 | 4–7 | above 7 |
| Proportion of population aged 0–14 (%) | above 40 | 30–40 | under 30 |
| Ratio of young to old (%) | under 15 | 15–30 | above 30 |

*Data source* United Nations

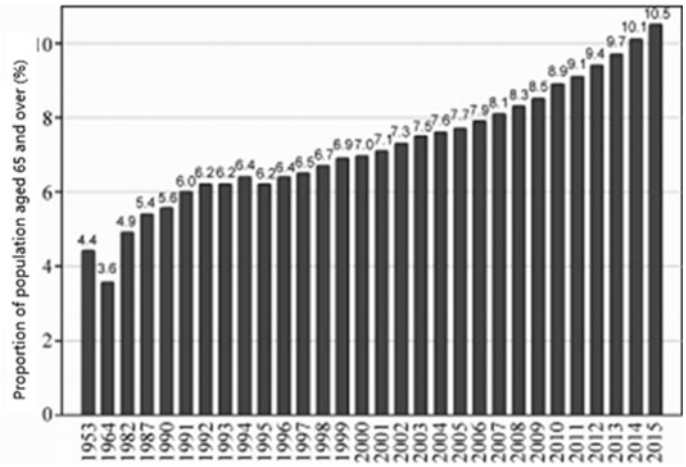


**Fig. 1** The trend of population aging: accelerating speed of the proportion of the elderly population. *Data source* China Statistical Yearbook

1. *Large base of elderly population.* There were 143 million elderly people over 60 years old in 2004, approximately 200 million in 2014, 300 million in 2026, and more than 400 million in 2037, which will reach the maximum in 2051. Therefore, China will be the country with the largest number of elderly people in the world.
2. *Accelerating speed of aging*. From 1953 to 1995, the average growth rate of the elderly was 0.04%; from 1996 to 2005, the rate was 0.14%; and from 2006 to 2015, the rate was 0.29%. It can be seen from the data that the growth rate of the proportion of the elderly over 65 and above in the total population is accelerating, which has led to the rapid expansion of the scale of the elderly and placed tremendous pressure on the social security system (Fig 1).
3. *Unbalanced area development*. Population aging in China is closely related to regional development, with a decreasing trend from east to west. In the developed eastern coastal areas, the degree is obviously deeper and the speed is faster than the economically underdeveloped areas in the western regions. This phenomenon is closely related to the concept of family and fertility. In developed areas, the cost of raising children is higher, the birth rate is lower, and the population is aging faster.

4. *Inverted trends in urban and rural areas.* international experiencehave shown that the aging level of the urban population is higher than that of rural areas, while the situation in China is the reverse. The aging proportion of rural areas is approximately 1.24% higher than that of urban areas. This is related to the dual economic structure of rural areas. As many young laborers migrate to work in urban cities, old people are left behind.
5. *Aging is faster than modernization.* Most Western developed countries entered an aging society after modernization, while China entered the aging stage before modernization.

The pressure of the aging population is gradually emerging, reflected first in the gradual increase in the burden of the pension system. The pension insurance expenditures of 2004 increased by 65.6% compared to 2000. The subsidies and expenditures from the central government for basic endowment insurance have gradually increased, as well as the burden on the government, enterprises, and society. Second, the pressure on medical and health expenditures for the elderly has also gradually increased. According to research data, medical and health resources for the elderly are 3 to 5 times more than other age groups. The gradual increase of the aging population brings about significant financial pressures, as the growth rate of support from basic medical insurance funds accelerating. Third, the demand for elderly care services has risen sharply. The service level for the elderly is relatively lagging compared with rapid economic development. A large amount of investment in beds and facilities is still wanted in nursing homes and other welfare institutions; meanwhile, the mental health of the elderly calls for attention. The weakening function and strengthening of social services for elderly care pose new challenges to the social security system. Finally, the social problems caused by aging in rural areas require more attention. Additionally, the elderly care system and facilities are relatively underdeveloped in rural areas, and services such as medical care and entertainment need to be improved; attention should also be paid to the health and living conditions of the elderly while helping the poor.

The severity of population aging has put forward higher requirements for the construction of a social security system, and it is of great significance to accelerate the reform of the social security system and improve relevant laws and regulations in addressing the problem of population aging.

## 2 The Significance and Necessity of the Reform of the Social Security System

1. The reform of the social security system is the requirement for the achievement of social stability and economic stability.

   The reform of the social security system is an important part of the reform of the economic system. It can promptly provide basic guarantees for those most

in need, such as elderly retirees, unemployed workers, disabled workers and the survivors of the deceased. Therefore, it functions as a strong social stabilizer.

2. The reform of the social security system is a requirement for alleviating the pressure of population aging.

   China is currently facing the increasingly severe challenge of an aging population. First, the aging speed is fast; second, the aging process is advanced compared with the level of economic development. China's economic development was still in a moderately prosperous stage by 2000 but had already entered the aging stage, and the number of elderly caregivers per worker had reached the level of developed countries in 1980. When China entered an aging society in 2000, retirement expenses alone reached more than ¥100 billion, which was unbearable for finance. The current retirement fund is a pay-as-you-go system, lacking long-term accumulation of reserve funds and cannot adapt to the needs of aging. Therefore, we must formulate an effective social security system as soon as possible and establish a pension reserve fund system to avoid or reduce the various social and economic problems caused by the rapid emergence of a large number of elderly people.

3. The reform of the social security system is the requirement for correct guidance for the consumption direction and an increase in investment in production and construction funds.

   According to the statistics of the Ministry of Human Resources and Social Security, at the end of 2017, the number of people participating in basic endowment insurance in China reached 915.48 million, and the accumulated pension balance at the end of the year was ¥5.0202 trillion. The raising and rational use of such a large amount of funds is of great practical significance for adjusting the consumption structure, delaying consumption expenditure, curbing inflation, alleviating the contradiction of insufficient construction funds, and increasing effective investment and effective supply.

4. The reform of the social security system is the requirement for the deepening of enterprise reform and adjustment of the industrial structure.

   The determination of enterprise management autonomy, the implementation of enterprise bankruptcy law, the existence and steady development of various economic components, the rational flow of labor and the advancement of governance and rectification, all these are in urgently requirement of establishing a social security system that accommodates issues such as pension, unemployment, medical treatment and work injury, and to adjust the the extremely irrational industrial structure, product structures and enterprise organization structures, and tackle the serious problems such as repeated construction and production of China. Without the reform of the social security, the adjustment is hard to be successful. For example, even though the bankruptcy law of enterprises has been promulgated and implemented, few enterprises have actually gone bankrupt, and the main reason is that employees' unemployment insurance has not kept up after bankruptcy.

# 3 The Status Quo and Major Problems of the Reform of the Social Security System

The reform of the social security system began with the social pooling of pension insurance for employees of state-owned enterprises in 1984. This kind of social pooling of retirement expenses for employees initially eased the contradiction between old and new enterprises, ensured the life of retired employees and promoted social stability and unity. Pilot programs for unemployed insurance and medical insurance have also been conducted in some places.

Rural pension insurance is still in the pilot stage and is only carried out within a very small range. The pension problem for elderly farmers who have participated in pension insurance was initially resolved. Not only has it played a positive role in guiding consumption and stabilizing, but it is also changing the traditional way of providing care for elderly.

However, overall, the current social security system is basically still the traditional one, and it fails to meet the requirements of reform and opening up, the development of a planned commodity economy and the pressure of aging. The main problems are as follows.

## *3.1 The Issue of Financing Mode*

The current fund-raising mode has the following characteristics: first, it is based on a fixed-payment, pay-as-you-go system; second, it is social pooling of different scopes, available at the provincial, prefecture, and county levels, and mostly at the last level; third, all the funds come from the state and enterprises, the insured individual generally does not have to pay, apart from the contractual workers paying a part of the insurance money.

Four questions must be considered in this financing mode: first, the pay-as-you-go system or the fund accumulation system? Second, social pooling insurance or statutory personal savings fund insurance, or a combination of both? Third, in terms of source of funds, should insured individual also pay a certain percentage of insurance money? Fourth, in what form is funding raised? Will it take the form of a social security tax, or will it still maintain the current form of payment?

Among the above four questions, some are relatively clear; for example, the third question of personal payment is now a matter of implementation form and time. However, regarding the first two questions, there is still much controversy, and we are facing a dilemma. For example, in terms of pension insurance, retirement pension insurance is actually a long-term payment project, and it is advisable to adopt a prefounding method to accumulate income, which will be beneficial to a long-term balanced burden for the country, thus alleviating the pressure of population aging. However, on the other hand, we have not fully prepared to meet the

prerequisites required by the prefunding accumulation system, including the affordability of all aspects, inflation, price and interest rate levels, investment markets, investment policies, management levels, etc.

Another difficulty in this financing mode is whether to implement integrated social pooling insurance, statutory personal savings fund insurance, or a combination of both, that is, combining social pooling insurance with statutory personal savings fund insurance. The main purpose of social security is to provide some income (monetary or non-monetary) to social workers who once had normal income but are currently temporarily or permanently incapacitated due to force majeure to ensure their basic survival needs. Therefore, the basic goal of social security are social stability and social equity, the main means to achieve which are fund-raising, income-adjusted social allocation, cost and risk sharing. Specifically speaking, both vertical and horizontal income adjustment and risk sharing are included, that is, the income adjustment and risk sharing of the entire income of the worker's entire life and the income adjustment and risk sharing among the social labor members. The social pooling insurance system is the traditional mode in Western countries, consistent with income regulation and risk sharing among horizontal social members, but has not yet found a way out in the face of aging. The pay-as-you-go system, raising the insurance premium from the income distribution of active employees, will gradually intensify social and economic conflicts, and it will be high social cost if we expand from pay-as-you-go coordination to fund accumulation coordination.

A typical example of statutory personal savings fund insurance is the central provident fund system, which originated in the developing countries in the east. The Singapore Central Provident Fund System was established in 1955, when its economy was very difficult. Both employers and employees paid and stored insurance funds in personal account. The employee, store part of the total income when he or she is young and then enjoy it when he or she retires. However, in this mode, the function of income regulation and risk sharing among social members, that is, mutual assistance and mutual aid, is weak. Personal savings fund insurance (Provident Fund) develops and accounts for a considerable proportion of the income of retired pension workers in some welfare countries, because social pooled pension insurance faces difficulties such as income disbursement and the threat of aging, and it is constrained by social and economic factors. The various types of private annuities of middle-income Americans constituted the majority of their retirement income, and the amount of private annuity storage in the United States for investment projects has exceeded $1 trillion.

Which financing mode China will choose is currently being explored. One opinion believes that a unified socially integrated basic insurance system should be established in our cities and towns; another opinion advocates the choice of a financing mode that combines a pay-as-you-go social pooling system with a statutory personal account savings fund system. They think that China has not yet met the conditions for the whole society to implement a unified social pool basic insurance. If we blindly seek to expand the coverage of social coordination without full preparation, it will be more haste and less speed. Moreover, welfare benefits are rigid; once they are established, it is difficult to retreat, and it is easy to fall into a dilemma. To choose

a financing mode that is currently feasible and has little long-term risk, it is necessary to maintain the advantages of social coordination and mutual assistance, but also to show enthusiasm for personal self-help, establishing the concept of "saving money for old age", and overcoming the disadvantages of total dependency on the nation. The financing of social security should be reasonably shared by the nation, enterprises, and individuals, breaking through the practice of individuals not paying premiums. Therefore, a savings fund system mode for personal account must be introduced, and Singapore's approach is worthy of study. Fujian Province has established a pilot system of a double-layer combination of basic pension insurance and savings accumulation supplementary pension insurance in collective ownership enterprises, which will soon be extended to 70% of the province's coverage. Therefore, it is conceivable to explore the combination of a pay-as-you-go social pooling system and a personal account storage fund system, which is more in line with China's national conditions and the basic principles of social security, and gives full play to the combination of personal self-help and social mutual assistance. In addition to the introduction of the supplementary pension insurance of the storage fund system on the basis of improving the social pooling system for employees of state-owned enterprises, the establishment of a double-layer pension insurance for the pooling and storage fund system in urban collective enterprises should also be encouraged, as well as the establishment of a pension fund insurance system and a mutual aid fund for the employees of foreign-invested enterprises.

## *3.2 The Issue of Preservation and Appreciation of Social Security Funds*

From international experiences, the preservation and appreciation of social security accumulation funds is a very difficult problem. This is because the investment of this fund is different from commercial investments. The purpose of social security decides that such investment be very safe and reliable and can maintain and increase value. This requires a series of social, political, and economic conditions as the prerequisite, including the level of the inflation rate, the development of the investment market, the sufficiency of the agency's investment autonomy and the level of investment management. Obviously, China has not yet reached a mature stage to meet all these requirements. Therefore, if the fund accumulation system or partial accumulation system is implemented, the issue of the preservation and appreciation of funds will continue to haunt us.

### *3.3 The Issue of the Management System of Social Security*

Currently, there are two major problems in the management system of social security. First, contradictions caused by multiple policies and management and the lack of a macro-coordination and balance mechanism. Second, confusion of political affairs and legislative supervision on the executive function, as there is no strong supervision and management mechanism. Therefore, it is necessary to strengthen leadership and straighten the management system, which is a key step in effectively promoting the reform of the social security system.

In addition to the above three major issues, we must also pay attention to the following three issues in the process of promoting the reform of the social security system: First, the choice of insurance system must be cautious. Before making a decision, be sure to listen to all opinions, especially opposite opinions. It is necessary to estimate all possible situations and difficulties. Second, the reform and improvement of the social security system is a long-term undertaking, and we must not rush to achieve success. Our ten years of reform experiences also warn us to be steady and steadier to gradually promote the reform of the social security system. Third, even if individual pilots are conducted, it is necessary to pay attention to the connection between the pilots and the future overall system. Judging from the current situation, China's social security system is unlikely to be a unified mode in the future, but the overall direction and objectives should be the same, and the differences between them should not be too large; otherwise, it is not conducive to the flow of labor.

## 4 Thoughts and Strategies for Reform of the Social Security System

1. Gradually expand the coverage of social security. At present, the coverage of the social security system is not sufficient. The retirement pension system has not yet been established for small collective enterprises in cities, districts, and counties, newly developed collective enterprises, foreign investment enterprises, private enterprises, individual workers, and employees of township and village enterprises. Elderly security has also been affected since the implementation of the household contract responsibility system in rural areas. Therefore, it is necessary to gradually include urban social workers with wage income as the main source of living in the scope of different forms of social security, including collective-owned employees, Chinese employees of foreign investment enterprises, private enterprises and urban individual businesses owners. Meanwhile, it is necessary to gradually establish a rural elderly security system, and it can be implemented first in a few wealthy rural areas.
2. The priority in the reform of the social security system. The priority should be the establishment of endowment insurance, medical insurance, unemployment

insurance, work-related injury insurance, etc., of which endowment insurance and unemployment insurance are the key points.

3. Implement a partially accumulated funding mode. From the perspective of the aging trend of the population, the reform of endowment insurance is the first item that should be carried out in social security reform. However, there are different views on what kind of endowment insurance system and fund-raising mode are more suitable for the national conditions of China and the commodity economy. Comparatively speaking, it is more advantageous to implement partial accumulation, a combination of a pay-as-you-go system and a statutory personal storage fund. This system could be piloted among social workers outside state-owned enterprises, including employees of foreign invested enterprises, employees of township and village enterprises, self-employed workers, and farmers in affluent coastal areas, which will not have much impact on finances. This system is more suitable for young people, as for the middle-aged and elderly employees, a separate transitional approach needs to be formulated. Regarding what kind of endowment insurance fund-raising mode is adopted by state-owned enterprises and how to convert it into a method of paying insurance premiums mainly by individuals and enterprises, further study and discussion will be needed. However, it should be clear that the current retirement coordination methods must be reformed and improved, including the gradual implementation of individual insurance payments.
4. Preservation and appreciation of the social security funds. At present, there is a lack of clear policy management and necessary measures and means for the preservation and appreciation of actual accumulated funds. If the fund accumulation system or partial fund accumulation system is implemented in the future, preservation and appreciation will be more urgent, especially in the cases of inflation, an underdeveloped domestic investment market, low economic affordability of all aspects, and a limited management level. Therefore, more attention should be given, and further study should be conducted on the proportion of social security funds withdrawn, the range of accumulation and a series of macro policies and measures of preservation and appreciation.
5. Attach great importance to the reform pilot projects. It has been decided that comprehensive pilot reforms of social insurance systems will be conducted in Shenzhen and Hainan, pilot reforms of medical insurance in Dandong and other places, and pilot rural endowment insurance in Dalian and other places. Efforts should be concentrated on data calculation, plan formulation, argumentation consultation and implementation, etc., and effectively promote the reform pilot work.
6. Organize various forms of personnel training. The training of personnel in system reform should be different from the training of functional departments. More emphasis should be placed on the macroscopic and policy management capabilities.

7. Strengthen leadership and reform the management system of social security. It is necessary to separate the functions of legislation, law enforcement and supervision of social security, form a management mechanism that supports, supervises and restricts each other, and establish a suitable management organization.

# Building the "Third Pillar" of the Pension Security System: Policy Options of Commercial Endowment Insurance


**Tuo Zheng and Wei Liu**

The population structure of China will age rapidly from the present to the mid-twenty-first century. Estimated by average conditions, the measuring indicators for the aging of the population structure will rise sharply: the proportion of the population aged 65 and above will rise from 8.8% in 2010 to more than 28% in 2055; the elderly dependency ratio will rise from 11.9% in 2010 to 50% in 2055; and the median age will rise from 34.6 in 2010 to over 45 in 2037. Moreover, the aging trend of the population will continue for a long time.

The aging of the population will inevitably have a huge impact on the pension security system. According to the current institutional framework, under the assumptions of the benchmark scenario, the pay-as-you-go endowment insurance for urban employees will face the dilemma of unsustainability and a declining replacement rate. The dependency ratio of the current system of China is 3:1, and it will drop to 2:1 in the 2030s and to 1:1 by the middle of this century. Such a demographic structure will render the pay-as-you-go system—the current pension security mode of China—out of balance.

In fact, among the developed countries (China is already a middle-income country and is moving toward a high-income country), only a few, such as the United States and France, have maintained the substitution level because of their immigrants and the high fertility rate (total fertility rate of 2.1) among immigrants. With the decline in fertility and the extension of life expectancy, the issue of an aging population has emerged in most developed countries. This forced them to reform and reconstruct a multi-pillar pension security system, as the pay-as-you-go pension security system is facing the challenge of sustainability.

The challenges of the pension security system faced by China are more severe than those in the developed countries. On the one hand, China is still a developing country, and the income per capita is still lower than that of developed countries; on the other hand, China's population structure ages more rapidly than other countries.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_4

Although current social pension insurance nominally adopts the "combined account" mode of social pooling and individual account, the individual account operates as an "empty account" for historical liabilities in the early stage of the establishment of the system. Hence, it is essentially a pay-as-you-go system.

When the population is rapidly aging and the pay-as-you-go system is unsustainable, the transition to a fund accumulation system is an inevitable path, and it requires huge cost, which will be unbearable by our generation if it cannot be dispersed over a long time span.

Therefore, it is imperative to transform China's pension security system from a "single pillar" to "multiple pillars". For a long period of time in the future, the pension security of China will still rely mainly on the "first pillar", i.e., social endowment insurance. The core of system reform is to disperse the impact of the transition as smoothly as possible, and the policy path can adopt the "nominal account" system (NDC) advocated by Zheng Bingwen and other scholars. In this way, the replacement rate of social endowment insurance will inevitably drop, and offset by the "second pillar" and "third pillar".

China has established a multilevel pension security system: the "second pillar" is enterprise annuities and occupational annuities, and the "third pillar" is commercial endowment insurance. While in reality, the current pension insurance is almost entirely dependent on pay-as-you-go social insurance, occupational annuities are limited to groups working for the government, enterprise annuities have stagnated, and preferential tax policies for commercial endowment insurance have not been implemented for many years.

In early April 2018, the Ministry of Finance and other departments jointly issued the Notice on Launching the Pilot of Individual Tax Deferred Commercial Endowment Insurance (hereinafter referred to as the Pilot Notice), which was launched in Shanghai and two other cities, marking the exploration and construction of the "third pillar".

With the practical problems of China's pension security system in view, combined with the experience and lessons of the development of commercial endowment insurance in developed countries, this article analyses the possible policy path options for the development of commercial endowment insurance and provides suggestions for policy formulation and system design.

## 1 International Comparison of Commercial Endowment Insurance Systems

The theories and policies of modern pension security systems continue developing and reforming. Since the establishment of the Disability and Aging Insurance Act (Gesetz Betreffend Die Invaliditatsund Altersversicherung) in 1889 by Germany, the theoretical dispute between state interventionism and liberalism began, and then both

sides reached a consensus on the social security system and on the adaptation of the new economic, social and institutional factors.

However, developed countries have gradually experienced the pressure of continued operation of pension security since the 1970s. The pressure mainly comes from two sources. One of them is the issue of population aging that China is also experiencing. After the Second World War, the main developed countries generally ushered in a baby boom. However, with the passage of time and the improvement of living standards, the fertility rate has gradually declined, and the dependency ratio has gradually decreased. The World Bank predicts that in OECD countries, the population aged 60 and above will account for 16% of their total population in 2030,[1] further exacerbating the problem of pension imbalances. The other source is the internal crisis brought about by the capitalist mode of production. After experiencing the golden age of capitalism, western countries gradually fell into the crisis of stagflation since the 1970s: profit margins continued to decline, ford-based production methods were eliminated, government and market failed at the same time. The contradiction between the growth of trade unions and the weak profitability of enterprises has exploded, forcing the pension security mechanism to carry out market-oriented and privatized reforms. The government-led national pension security system has gradually formed, supplemented by government-led enterprise annuities, and personally participated in commercial endowment insurance as an additional three-leveled "three-pillar" insurance system.

The social security system, especially the pension security system, will also play a huge role in promoting economic development and increasing labor productivity. Many research results show that if the social security system can function healthily and be maintained at an optimal level, it can significantly promote labor productivity and sustainable economic development. The report of the 89th Meeting of the International Labor Organization points out that pension insurance guarantees the healthy development of the labor market, with which older employees can retire without any worries, and the orderly entry of young labor into the labor market can keep labor productivity at a high level.

The third pillar, namely, commercial endowment insurance, play a more unique role in the prosperity of the labor market. Currently, the payment of national pension insurance and enterprise annuity insurance in China is usually based on the labor contract signed by the employee and the employer. When the employee changes jobs or relocates, the problem of transfer and continuation of insurance has never been resolved. Commercial endowment insurance is significantly different in that it is essentially a kind of savings insurance that has an inherent fund accumulation system, and the portability of the individual account is fully guaranteed. Therefore, the development of the third pillar could activate the labor market.

The pension security systems in western developed countries, such as the United States, Germany and Japan, especially their third-pillar commercial endowment insurance system, are worthy of our reference.

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[1] World Bank, *Averting the Old Age Crisis*, p. 10.

## 1.1 Commercial Endowment Insurance of the United States

Among many Western developed capitalist countries, the United States has the largest pension insurance and the highest degree of marketization. Commercial endowment insurance occupies an important position. Among them, annuity insurance has grown rapidly in recent years, and individual retirement accounts have developed steadily, covering 34% of American households and owning 30% of pension security assets, forming the three parts of American insurance, together with social insurance and individual savings. By the end of 2016, the total size of the pension security assets reached $24.7 trillion.[2] In the process of implementing individual tax-dependent commercial endowment insurance, the experience of the United States in efficiently and safely managing huge insurance assets and reasonably and appropriately promoting the development and activity of commercial endowment insurance products is worthy of our reference.

The latest official data released by the United States Investment Corporation showed that by the end of 2016, individual retirement accounts (IRAs) and defined contribution employer-supported pension plans accounted for the largest proportions in the United States pension security system, reaching $7.9 trillion and $7.0 trillion, respectively.[3] As a voluntary pension plan, IRAs include three kinds: traditional individual retirement accounts (IRAs), Roth individual retirement accounts (Roth IRA) and employer-supported individual account plans. Due to the particularity of the commercial endowment insurance of China, we will focus on the traditional IRA and Roth IRA, which are more similar to our options.

The traditional IRA is a savings plan, with preferential tax policies in the payment and investment part and individual income tax in the collection part (EET tax preferential mode). The Roth IRA is also a savings plan, but it pays taxes on both the payment and the investment parts. The payment part implements tax incentives and exempts individual income tax (TEE tax incentive mode). Under the premise of taxable remuneration, each person under the age of 70.5 can pay up to $5500 (approximately ¥34,800) IRA fees and apply for tax exemption each year with both plans. When the payer is over 50 years old, he or she can also pay an extra $1000 (approximately ¥6300) per year.

There are also differences in the method of receiving pensions between the two plans. Normally, traditional IRA policy holders will receive their pensions on time from April 1 of the year when they are 70.5 years old to December 31 of the following year. The Roth IRA has the exemption of different policy holder and account owner, in which circumstance the policy holder cannot receive it until the death of the account owner. Under normal circumstances (namely, the policy holder and the account owner are the same person), the account owner has to pay an additional 10% tax for receiving pensions in advance, except for special conditions such as reaching 59.5 years old,

[2] Investment Company Institute, *2017 Investment Company Fact Book—A Review of Trends and Activities in the Investment Company Industry*, Ch. 7.

[3] Investment Company Institute, *2017 Investment Company Fact Book—A Review of Trends and Activities in the Investment Company Industry*, Ch. 7.

permanent disability, beneficiary of the deceased owner, and purchasing the first property. However, if there is no or insufficient pension, a 50% additional tax will be paid for the unclaimed part.

To ensure the normal and orderly operation of commercial endowment insurance, the United States government has issued a series of laws and regulations. The main basis is the Employee Retirement Income Security Act (ERISA) enacted in 1974. To prevent pension fraud, misappropriation, and mismanagement, the Act is jointly interpreted and supervised by the labor department (the Pension and Welfare Benefits Administration, PWBA), the Internal Revenue Service (IRS), the Committee of Annuity Insurers, and the judiciary. With the improvement of supervision departments and supervision mechanisms, the private pension market has gradually matured. Most owners of individual retirement accounts are willing to take risks to obtain investment income. The main investment institutions have also changed from banks and life insurance companies to mutual fund companies. This allows IRAs to enjoy greater freedom of payment and withdrawal than 401 k corporate annuities.

## *1.2 Commercial Endowment Insurance of Germany*

The design of the pension security system of China has largely drawn from the German experience. In terms of the structures of the system, China is faced with a similar imbalance of the "three-pillar mode" in some European countries. The first pillar of pension security undertaken by the government occupies the dominant position, and corporate annuities and commercial insurance play very limited roles. Before the reform of the pension security system of Germany, more than 80% of the total income of retirees came from statutory pensions. Faced with the challenge of an aging population, with the aging population accounting for 21% of the total population and listed as number three in the world, the German government carried out fundamental reforms in 2001 and 2004, and the pension security system was officially transformed into a three-tier mode of mutual supplementation of legal pensions, corporate supplements, and individual savings in 2005. The reforms in Germany shed light on China's vigorous promotion of the development of the third pillar of commercial endowment insurance.

The current social pension security system in Germany started in the Bismarck era and has a history of nearly 130 years. The system has always followed the pay-as-you-go before the reform, which is the origin of the dilemma. After the reform, the statutory pension only plays the basic role, and the second and third levels based on the fund accumulation system are necessary supplements to ensure a higher standard of living for elderly. The third pillar, commercial endowment insurance, is mainly composed of Riester pensions.

Riester-Rente is the product of the German pension security reform in 2001. The plan is supported by a dual system of direct subsidies and tax incentives. To enhance the attractiveness of the Riester pension, financial subsidies and tax allowances are

constantly increasing during the reform process. For a family, the current basic subsidy per person per year is €154 (approximately ¥1180), €185 (approximately ¥1240) per person per year for children born before 2008, and €300 (approximately ¥2300) per person per year for children born after 2008. To obtain these subsidies, the insured person should use 4% of the previous year's income, up to 2100 euros, to purchase Riester insurance products, and this premium is exempt from individual income tax.

At the same time, the German Federal Financial Services Inspectorate (BaFin) will review whether the Riester pension products provided by insurance companies, banks and fund companies meet the relevant standards set by the government and issue certificates. The requirements include the following: guarantee of the principal, promise of a lifetime annuity, distribution of the contracting expenses evenly over five years, receiving pensions at the earliest age of 62, addition of disability insurance and testamentary insurance, and notification of the premiums in writing. An insured person can only obtain the stated funding if he or she purchase insurance products that pass the review.

The launch of the Lister pension has been recognized by the market, and its share of pension funds has increased year by year, but it has also received much criticism. First, the design is very complicated, and the management and marketing fees are expensive. These costs will eventually be passed on to the insured, which will increase the burden on the insured. Second, the Lister pension also has common problems with commercial insurance, such as misleading sales and contract regulation. Finally, although the tax deferred system is designed so that low-income earners can receive a higher proportion of tax incentives than high-income earners, the Riester plan did not achieve the purpose of income redistribution. However, considering the absolute value of accumulation, the subsidies received by low-income earners are still lower than social average wages, which has a negative effect on workers who are actively looking for jobs.

## *1.3 Commercial Endowment Insurance of Japan*

As a populous country with a limited land area, Japan faces the world's most serious population aging. Under the influence of the Eugenics Protection Act promulgated in 1948, the fertility rate in Japan was low. With the passage of time, the proportion of the elderly continues to rise. As the first country in the world facing the problem of population aging, in the 2016 World Bank's demographics, Japan's aging population far exceeds that of European high-welfare countries such as Germany and Sweden, reaching 27%.[4] With the same reform direction and implementation policy, different ethnic cultures will produce different responses and different effects in different countries. Compared with traditional Western countries such as the United States and Germany, Japan has a cultural atmosphere similar to that of China, and its pension

[4] World Bank, https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS.

**Table 1** Annual income tax deduction policy for Japanese individual annuity insurance premiums

| Amount of premium paid | Deducted amount |
|---|---|
| ¥20,000 (about ¥1160) | All premiums |
| ¥20,001–40,000 (about ¥1160–2320) | ¥10,000 (approximately 580) + 1/2 of the total premium |
| Above ¥40,001 (about ¥2320) | ¥20,000 (approximately 1160) + 1/4 of the total premium |
| Maximum limit is ¥80,000 (about ¥4640) | |

*Data source* Tax Law of Japan, https://www.mof.go.jp/english/tax_policy/

security reform has a more important referent significance for China's response to the aging population and the imbalance of public pension funds.

The rudimentary form of Japan's pension security system can be traced back to the "benefit" system in the Meiji Restoration period, but the construction of the true modern pension security system originated in 1954. After that, the Japanese government successively established the welfare pension and mutual aid pension and promulgated the National Pension Act in 1961, establishing a national pension accumulation led by the government. Since then, the government-led public pension has been the largest and most important part of the Japanese pension security system. According to statistics from the Ministry of Health, Labor and Welfare of Japan, public pensions account for more than 70% of the income of elderly households.[5] However, the wide coverage and high benefits of Japanese pensions benefited from the rapid development of the postwar economy, and the commercial endowment insurance "individual annuities" that appeared in the same period fell at a low ebb due to the substitution effect of public pensions. In addition, the persistently high inflation rate after the 1960s rendered individual annuities less attractive, until after 1980 when the inflation rate stabilized. Under the dual pressure of an aging population and slowing economic growth, public annuity finances have tightened, and the problem of relatively low pension replacement rates has become prominent. The Japanese government was forced to adjust its public annuity system. On the one hand, it gradually increased the premiums of the national pension and employees' annuity to increase income; on the other hand, it delayed the retirement age and reduced the pensions for people aged 60–65 to reduce expenditure.

Against this background, the individual annuity business has ushered in a good opportunity. To ensure a more prosperous elderly life, under the advocacy of the World Bank, people have realized the necessity of a multi-pillar pension security system. In the 1984 tax system revision, the Japanese government made regulations on premium deduction for individual annuities. It was revised several times afterwards until the new tax law came into effect in 2010. The annual income tax deduction policy for individual annuity insurance premiums is shown in Table 1.

[5] The Ministry of Health, Labor and Welfare of Japan, http://www.mhlw.go.jp/toukei_hakusho/.

Under the guidance of the government's policy, multiple institutions, including banks, trusts, and insurance, have entered the individual annuity market and provided diversified annuity products. The "savings type" annuity has nothing to do with the life and death of elderly. Instead, the savings annuity and interest are received in the form of annuities, with relatively flexible amounts and periods, which can meet the needs of different people. The "insurance type" annuity can protect longevity risks, and policyholders can receive annuities during their lifetime. After 1986, "insurance type" annuities were further developed into variable insurance. The "lifetime" variable insurance has the effect of lifetime protection; the "periodical" variable insurance has a term of more than ten years. In addition to the protection covering the entire insurance period, those who survive expiration can also receive maturity insurance.

## 2 Constructing the "Third Pillar" Based on Individual Pension Accounts

According to the Pilot Notice, the system is arranged as follows: "the expenditures for individuals in the pilot areas to purchase qualified commercial endowment insurance products through their individual commercial pension fund account are allowed to be deducted before tax within a certain standard; investments included in the individual commercial pension fund accounts will be exempt from individual income tax; individual income tax will be levied when individuals receive commercial pensions."

Among them, the individual commercial pension fund account "is a commercial bank individual account that is designated by the taxpayer and used to collect tax-deferred commercial endowment insurance premiums, earnings, fund receipts, etc. The account is closed and tied to a resident ID, and it is fixed and unique."

At the same time, "after the pilot, according to the pilot situation, combined with the relevant conditions of the construction of the third pillar of the pension security system, the scope of participating financial institutions and products will be expanded in an orderly manner, and public funds and other products will be included in the investment scope of individual commercial pension accounts."

These arrangements are the same as those suggested by scholars, such as Zheng Bingwen. Individual commercial pension fund accounts are easily portable and help the free flow of human resources. Moreover, this account has the dual functions of insurance and investment, which can be used as a transaction account for purchasing insurance products and as a capitalization account for investments. It can be applied to different levels of social needs and risk preferences of different groups.

The main incentive mechanism of the pilot program is tax incentives, which is analogous to the traditional US IRA incentive mechanism (EET tax incentive mode). It allows a certain standard of tax exemption, "temporarily not levying individual income tax" on investment income and paying taxes at the time of receipt. These arrangements can appropriately smooth the life income curve of laborers and achieve

the effect of using individual income tax relief to encourage the implementation of pilot policies.

However, tax incentives depend on the reform of the tax system. China currently does not have a unified tax system for levying capital gains tax, therefore, the tax exemption on investment income does not have an incentive effect. In addition, the threshold of individual income tax has been continuously adjusted upward, the size of taxpayers has shrunk, and the incentive effect has weakened.

The development of individual commercial endowment insurance should pay particular attention to its connection with enterprise annuity. Despite years of development, the enterprise annuity, which also has tax incentives, is still small in scale and narrow in coverage and concentrated in monopolistic state-owned enterprises, far from developing into a powerful "second pillar". In some cases, it may have a "crowding out effect" on individual commercial endowment insurance.

The second pillar and the third pillar are not distinct from each other. Take Western countries as an example. In addition to IRAs, commercial endowment insurance in the United States also has employer-supported individual account plans. Rurup-Rente in Germany is a combination of commercial endowment insurance and government statutory pension insurance. In view of the fact that there are many small and micro-enterprises in China, we can refer to the experience of SIMPLE IRA (Savings Incentive Match Plane for Employee) of the United States. The design of the system is fair and more conducive to free movement and employment in micro-enterprises. In addition, in response to the crux of the "second pillar", it is possible to connect individual commercial pension fund accounts with annuity transition accounts. When the employer no longer withholds the annuity due to job changes, the assets can be transferred to an individual account. It is even possible to connect individual pension accounts with corporate annuities, unify the ratio or amount of tax incentives, and combine the tax incentives of the two and help the transition from a pay-as-you-go system to a fund accumulation system.

The construction of the "third pillar" also requires the development of insurance and capital markets to provide a well-developed market environment. China's financial market is not open and mature enough and lacks attractive pension insurance products, which is why Chinese families prefer real estate and deposits.

It should be clearly recognized that the purpose of establishing the "third pillar" is not to transfer residents' bank deposits to individual pension savings accounts to achieve institutionalized operations, maintain and increase value, and for the elderly care.. It is a rational choice for Chinese households to allocate most of their assets to real estate and deposits, and the situation is almost impossible to change until the land and other systems are straightened out. Moreover, whether the "third pillar" can compensate for the decline in the replacement rate of social pension security is also doubtful. After all, the 401 (k) and IRA of the United States, with the mature market environment, took more than 40 years to develop to today's scale, while China's elderly dependency ratio will deteriorate to 1:1 in the next 40 years.

More importantly, pensions should eliminate the constraints of the "instrumental rationality" of system and technical parameters and return to their social purpose. The current pension security system is facing two fundamental problems: one is

historical debt; the other is the aging population structure; the former is only a staged issue, and the latter is the key to the sustainable development of society (not just the pension system).

The economic development of a deeply aging society will fall into stagnation even if the pension system is reformed to the fully accumulation one, and it will be difficult to maintain and increase the value of pension savings. The so-called global allocation of assets will cause huge uncertainty, that is, risk. The large-scale introduction of immigrants is also a difficult option.

Unless biomedical technology can change the process of human aging or fertility, a fundamental solution to the aging population structure needs to be proposed: mobilizing policy tools to encourage fertility and maintain the total fertility rate at a certain level. The key lies in the systematic change of social redistribution. For example, the current tax system of China is not based on the family (or differs depending on whether to raise minor children), and the tax benefits of commercial endowment insurance are still negative incentives for bearing children. The first birth rate continues to decline, and the problem of the exhausted need for the second child is still unresolved.

## 3 Policy Recommendations

Pigou, a representative of the welfare economics school, systematically expounds the theory of income distribution adjustment in his representative work *Welfare Economics*, proposing that social welfare is constituted by the sum of the utility of all members of society, and the total amount of national income and the average degree of national income distribution are the two major factors affecting economic welfare. According to the law of diminishing marginal utility, Pigou believes that the transfer of 1 pound from the hands of the rich to the poor will lose less utility to the rich than the increased utility of the poor, and the total economic welfare of society will increase. Based on this theory, Samuelson and others declare that under the optimal allocation of resources, by adding analysis tools such as the social welfare function, compensation principle, Pareto optimality, etc., the economy is efficient and social welfare is maximized, a new Welfare economics will be formed, and a theoretical foundation for the social security system will be laid.

The Swedish School, also known as the Stockholm School, promotes full employment and income equalization policies. They believe that the capitalist production system can promote the optimal allocation of resources and increase efficiency, which is superior than others. However, the capitalist distribution system will bring about disparity between the rich and the poor and class antagonism, which is flawed. Therefore, only by emphasizing income redistribution, increasing transfer payments, and building a complete social security system can inequality in the primary distribution be compensated for and total social utility be increased.

Marx also discusses the socialist social security system in *Critique of the Gotha Program.* He believes that an insurance system must be established in the initial

stage of socialism, and this fund is a deduction to the total product of society. Marx points out that if we first understand the term 'income from labor' as the product of labor, then collective labor income is the total social product. Now, it should be deducted from it: first, the part used to compensate for the consumption of production materials; second, the additional part used to expand production; third, the reserve fund or insurance fund used to deal with misfortunes, natural disasters, etc. The remaining part of the total product is used as consumption material, and it must be deducted before individual distribution: first, general management expenses that have nothing to do with production; second, the parts used to meet common needs, such as schools and health care facilities. Third, for loss funds established by people with working ability, etc., in short, part of the government-run poverty relief business. The social security fund was formally realized through the redistribution principle of two deductions. This idea is the theoretical cornerstone of the establishment of a social security system in a socialist country.

These theories show that it is impossible for China to abandon the current inclusive pension security system and completely push the burden of elderly care to society and individuals. The problems with the operation of the original system can only be solved by continuously deepening reforms and releasing reformed dividends. Only in this way can the two hundred-year goals set forth by General Secretary Xi Jinping be achieved, and the concept of coordination and sharing can be implemented. At the same time, the reform cost should not be completely pressured on a certain generation or a certain group of people. Instead, we will act on the policy requirements in accordance with the report of General Secretary Xi Jinping at the opening ceremony of the 19th National Congress of the CPC to build a tightly woven safety net and to build the necessary institutions, as we work to develop a sustainable multitiered social security system that covers the entire population in both urban and rural areas, with clearly defined rights and responsibilities and support that hits the right level. We will work to see that everyone has access to social security. We will improve the basic pension insurance system for urban employees and the basic pension insurance system for urban and rural residents and achieve national overall planning for pension insurance as soon as possible, helping the people of the whole country enter an all-around well-off society together.

Based on these theories, combined with the historical experience of Western developed capitalist countries and the above mentioned understanding of the reality of China's pension security system, the following policy recommendations are proposed:

1. Transform the social pooling part of current social pension security into a "nominal account" system and spread the impact of the transition from a pay-as-you-go system to an accumulation system over a longer period of time to smoothly transit to a multi-pillar system.
2. Develop the "second pillar" and "third pillar" to make up for the decline in the replacement rate of social pension security; accelerate the pilot process and vigorously develop the "third pillar" based on the "individual commercial pension fund account", connecting it with annuities and making use of tax incentives for

quick promotion, in view of the current employment and human resource flow of China, as well as the reality of the difference in replacement rates between different groups of people.

3. The fundamental problem of the pension security system lies not within but within the population structure. Policy tools should be mobilized to encourage fertility and maintain the total fertility rate at a certain level. Unlike the United States and France, China is not a country of immigrants and needs to rely more on public policies to increase fertility. A fair, reasonable secondary distribution system is the key. Tax reform and public financial expenditure are two important reform directions. Under the macro framework of tax reform, starting with the EET of commercial endowment insurance, subsidies for tax reductions and exemptions should be increased for families raising children; at the same time, they should substantially increase social security for women and children and provide more public expenditures and public services to reduce the impact of socioeconomic factors that inhibit fertility.

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# Population Aging and Industrial Upgrading


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According to the 12th National People's Congress Committee on Internal Affairs, in 1999, China entered an aging society with 10% of the total population aged 60 or above. By the end of 2017, that proportion had increased to 17.3%. Meanwhile, in terms of size, the population aged 60 or above reached 240 million, and the population aged 65 or above reached 158 million. In 2016, more than 10 million people aged 60 or above were added to the population for the first time.[1] The speed and scale of China's aging population is unprecedented in the world.

As an aging population will inevitably aggravate social burdens, bring about an increase in the pressure on health care consumption expenditure of the elderly, reduce labor supply and directly affect economic development, the issue of China's aging population has received a great deal of attention from all sectors of society, including government and academia. At the same time, people are gradually beginning to see some of the opportunities that come with population aging, especially the positive effects on the upgrading of China's industry. As General Secretary Xi Jinping put forward in the report of the 19th National Congress of the CPC, we should "respond proactively to population aging, we will adopt policies and foster a social environment in which senior citizens are respected, cared for, and live happily in their later years. We will provide integrated elderly care and medical services, accelerate the development of old-age programs and industries." Aging is an important feature of current Chinese society and an important factor that we must consider when formulating national development strategies. Only when we recognize the positive effect of population aging on industrial upgrading and its mechanism for it, can we correctly guide the industry to make full use of the opportunities brought by

[1] For details, please refer to the statement by Zheng Gongcheng, member of the Committee on Internal Affairs of the 12th National People's Congress, at the press conference of the press center of the first session of the 13th National People's Congress on 12 March 2018.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_5

the aging of the population to China's economic development and actively carry out industrial upgrading, changing from "passive" to "active", to more effectively reduce the hindrance of population aging to China's economic transformation and development.

## 1 Review of Domestic Literature Research

Since the beginning of the twenty-first century, some domestic scholars have conducted theoretical studies on the impact of population aging on economic growth by building modes. Li Jun (2006) introduces population aging factors into the Solow growth mode and theoretically demonstrates that population aging factors have different effects on economic growth, such as positive, negative or zero, and that relevant policy choices affect the effects of population aging. Peng (2006) quantifies the macroeconomic consequences of population aging in China using a "computable general equilibrium mode" and shows that population aging in China will slow down China's economic growth through negative labor force growth and the resulting low growth of physical capital. Based on the Solow mode and the Douglas production function, Xu (2012) introduces population aging into the economic growth mode and points out that the stock of human capital is an important factor affecting economic growth as a result of population aging.

Research on the empirical aspects of population aging has also rapidly proliferated in recent years. Scholars have used data to fully explore the different mechanisms by which population aging affects economic growth, resulting in a range of perspectives, such as savings rates, labor supply, human capital, consumption and technology. On the demand side, the level of consumption is an important object for many scholars to study the impact of population aging. Wang Yupeng (2011) conducts an empirical study on the consumption behavior of urban residents in China from 2001 to 2008 and finds that the higher the dependency ratio of the elderly is, the higher the average propensity to consume urban residents. Using provincial data from China's 1% population sample survey and population census, Tan Jiangrong and Yang Yunyan (2012) empirically demonstrate that the aging of the rural population has a significant positive effect on rural residents' propensity to consume. Wankede et al. (2013) use data from the sixth census in Shandong Province to reach the opposite conclusion that the increase in population aging causes a decrease in the size of consumption and to some extent inhibits residents' spending power. Recent studies have begun to shift from consumption to consideration of savings rates. Hu, Cui and Xu, Zhaoyuan (2014), based on survey data from the China Household Income Distribution Panel, show that the impact of population aging on the savings rates of urban and rural households is significantly different. Wang Wei and Ai Chunrong (2015) conduct an empirical study using panel data by province and find that the increase in life expectancy has a significant effect on the rise in the saving rate, but the effect of the old-age dependency ratio on the saving rate is not significant. Wang Moning (2016) conducts an empirical test using panel data for 30 Chinese provinces from 1990

to 2014 using a systematic GMM approach and shows that the old-age dependency ratio is significantly and negatively related to the savings rate of residents. In terms of supply-side impacts, the most direct effect of population aging is on the labor force. For example, Tong Yufen (2014) uses the latest projections of the United Nations Population Fund to conduct a study and finds that although aging will cause a decline in the size of the working-age population, the decline is relatively slow until 2030. Using an individual fixed effects model, Liu and Zhang (2017) find that population aging has an "inverted U" effect on human capital investment using panel data for China, Japan and Korea from 1971 to 2013. Science and technology innovation, as a core force of economic development, are also affected by population aging. Based on inter-provincial panel data for China from 2003 to 2012, Yao Dongmin et al. (2017) use a dynamic panel model and a systematic GMM approach to demonstrate that aging has a significant negative effect on the level of science and technology innovation.

In fact, when China began to enter the aging stage, some scholars had already begun to think about the relationship between population aging and its impact on industrial structure. Lu Zhiguo and Huang Chifeng (2003) claim that an aging population has a negative impact on industrial restructuring, and point out the direction of the management and utilization of elderly power in a categorized manner and the development of aging industries. Zhong Ruoyu (2005), on the other hand, analyzes the transmission mechanism of population aging affecting industrial restructuring on the basis of a review of existing theoretical studies on the impact of aging on the economy. Along with China's economy entering a critical period of transformation, some progress has been made in research on the impact of aging on industrial structure in China. Chen Yi and Ye Wenzhen (2013) use relevant data and vector error correction modes from 1981 to 2011 in Taiwan to estimate the long-term relationship between population aging and industrial structure development of Taiwan and find that the dynamic influence between the two is mutual. Ni Hongfu et al. (2014) use an input–output mode to analyze from a more static perspective that changes in population age structure have a significant impact on industrial structure through the consumption demand structures channel. Wang Wei et al. (2015) conduct an empirical study by constructing multidimensional industrial upgrading indicators and using panel data by province in China from 1993 to 2013 and find that population aging promotes not only the optimization of the structures among primary, secondary and tertiary industries in China but also the optimization of the technological structures within the manufacturing and service sectors. Liu Yufei and Peng Dongdong (2016) conduct an empirical study using provincial panel data from 1993 to 2013 to construct a spatial econometric model, which show that China's industrial structure upgrading and population aging both exhibit strong positive spatial correlation and that population aging does not hinder industrial structure upgrading but rather promote industrial structure transformation in a more advanced direction. Zhong Shuiying and Yu Yuan (2017) conclude that population aging has a positive effect on industrial upgrading and a significant positive spatial spillover effect at the national level based on panel data from 2001 to 2015 for each province in China.

As seen from the above, academic research in China focus on the impact of population aging on industrial structure, and some empirical studies have confirmed the positive effect of population aging on the upgrading of industrial structure. This paper will further investigate the specific impact mechanisms and illustrate them in the context of Chinese economic data and finally make recommendations on how to better exploit the positive effects of population aging on the upgrading of China's industrial structure.

## 2 Population Aging Fuels the Silver Industry

Analyzed from the demand side, with the rise of consumption ability and the continuous increase in the proportion of the elderly in the total population, the elderly, as an increasingly large consumer group, have injected a "silver power" into the consumer market, which in turn will affect industrial development on the supply side.

### *2.1 Population Aging Drives the Development of the Elderly Care Industry*

With the aging of the body and the increasing awareness of health care, the elderly need more consumption of medical and health care products, which will drive the development of the pharmaceutical industry, a industry which is significantly different from traditional manufacturing, as it takes innovative R&D as the core development force, with high added value. This is one of the important goals of industrial upgrading. In addition, the service industry for the elderly is booming, such as nursing homes, hospitals, retirement real estate, housekeeping and life insurance. In 2013, the State Council issued the Several Opinions on Promoting the Development of the Health Service Industry, which clearly stated that by 2020, a health service industry system that covers the entire life cycle, rich in content and reasonable structures, will be basically established, and the total scale of the health service industry will reach ¥8 trillion, becoming an important force in promoting the sustainable development of the economy and society. The Several Opinions on Accelerating the Development of the Elderly Care Service Industry issued in the same year also proposed that by 2020, the elderly care service system that is provided withfamily pension, taken care of by the community and supported by social services, with complete functions, moderate scale, covering urban and rural areas will be fully built. In May 2014, the National Office on Aging was entrusted by the State Council to issue the China Elderly Care Industry Plan, which proposed that by 2030, the total output value of the elderly care service industry should exceed 10 trillion (Figs. 1 and 2).

More specifically, the pharmaceutical industry has developed rapidly in recent years. Figures 3 and 4 show that in 2017, the retail sales of Chinese and western

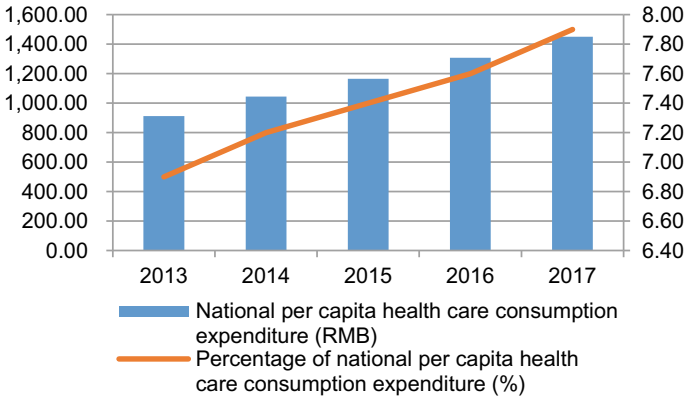


**Fig. 1** Per capita medical and health expenditures of national residents. *Data source* National Bureau of Statistics

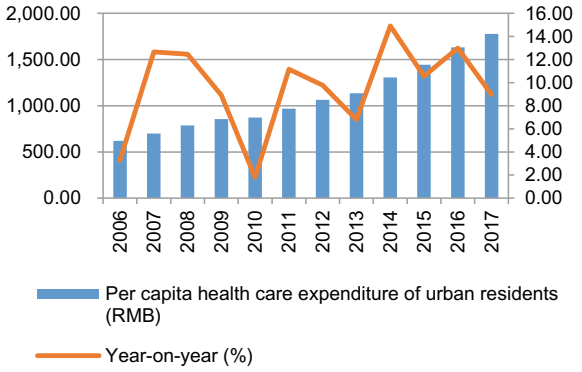


**Fig. 2** Per capita medical and health expenditures of urban residents. *Data source* National Bureau of Statistics

medicines and the total profit of the pharmaceutical manufacturing industry reached ¥948.15 and ¥331.41 billion, respectively. After the recovery and rebound of the pharmaceutical industry in 2007, the retail sales of Chinese and Western medicines maintained a year-on-year growth rate of more than 20% until 2012. Although the growth rate has slowed in recent years, the year-on-year growth rate of total industrial profits can be maintained at approximately 12%, which shows that the demand for pharmaceuticals is very strong, and the aging population must be one of the important driving factors.

Data from the service industry can also reflect the impact of population aging. According to the data on the elderly care service industry released by the Ministry of Civil Affairs, with the aging of the population structure and the improvement of the social welfare system, the number of beds in elderly care services has increased significantly, especially since the twenty-first century, the year-on-year growth rate

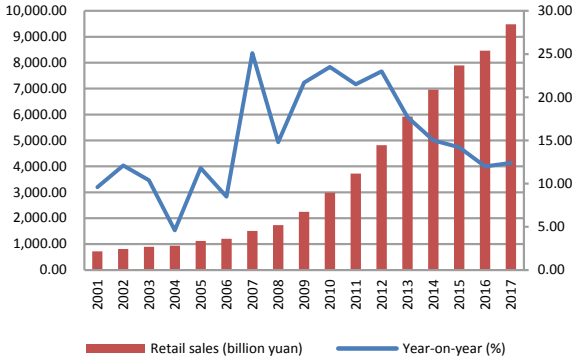


**Fig. 3** Retail sales of Chinese and western pharmaceuticals. *Data source* National Bureau of Statistics

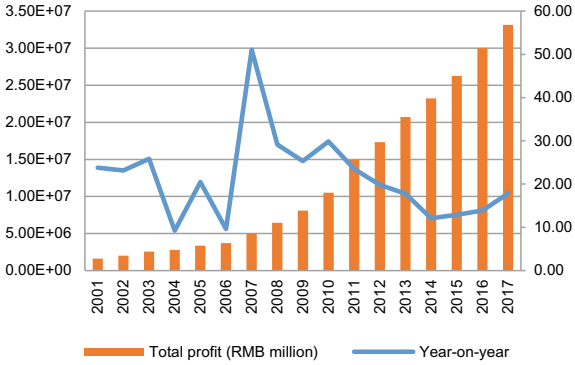


**Fig. 4** Total profit of the pharmaceutical manufacturing industry. *Data source* National Bureau of Statistics

of the number of beds has remained between 8 and 20%, and the number of urban elderly care service institutions has increased from 5264 in 2008 to nearly 9000 in 2016. Continuous improvement of the elderly care service system has promoted the development of the tertiary industry. As people pursue the quality of elderly care, it is expected that the service industry for the elderly will have a broader development space in the future (Figs. 5 and 6).

## *2.2 Population Aging Promotes the Development of Tourism and Education Industries*

Most elderly people have a lot of free time, despite their physical decline. In addition to meeting the needs of basic living, the demand for leisure and entertainment has gradually increased. Tourism and schools for the elderly have enriched their lives and further promoted the upgrading of industrial structure. In March 2017, the State Council issued the 13th Five-Year Plan for the Development of National Aging Undertakings and the Construction of the Elderly Care System, clearly expressing

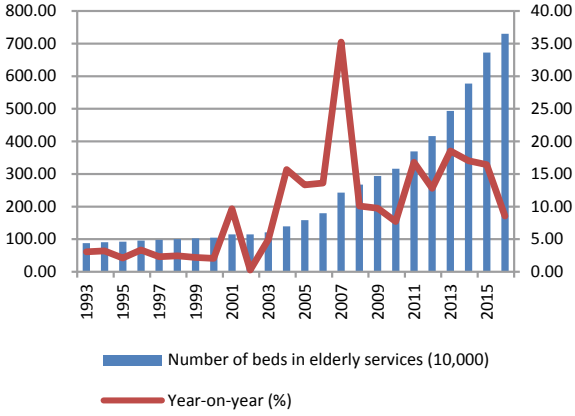


**Fig. 5** Number of beds in elderly care services. *Data source* Ministry of Civil Affairs

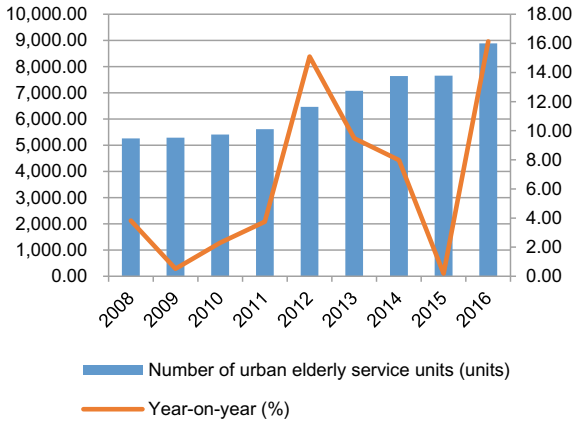


**Fig. 6** Number of beds in urban elderly care service. *Data source* Ministry of Civil Affairs

support for the integrated development of the elderly care service industry, such as health, wellness, tourism, culture, fitness, and leisure; enrichment of the elderly care modes and business forms of the service industry; and encouragement for the financial, real estate, internet and other enterprises to enter the elderly care service industry. By 2020, a new pattern of elderly education with wide coverage, flexibility and diversity, distinctive features, and standards should be formed, and every city above the county level will have a university for the elderly (Fig. 7).

The university for the elderly is to meet the needs of the aging society, the construction of a lifelong learning society and a harmonious society. According to data released by the Ministry of Civil Affairs, elderly education in China has developed vigorously since 2010, especially from 2011 to 2014. The number of elderly schools nationwide has increased significantly, and thus far, it remains stable. This not only reflects the government's care for empty-nest elderly but also reflects that aging provides new development space and motivation for the education industry.

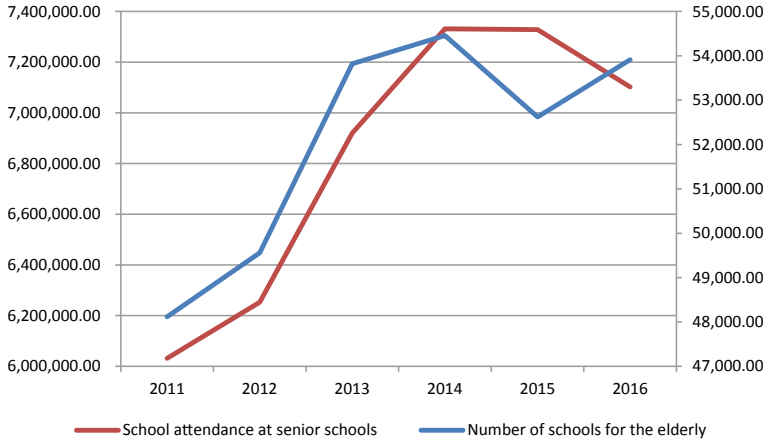


**Fig. 7** The vigorous development of elderly education in China. *Data source* Ministry of Civil Affairs

It should be emphasized that the magnitude of industrial structure upgrading mainly depends on the consumption ability and willingness of the elderly. If the consumption ability is not strong or the willingness is weak, the demand effect will weaken, and this is related to the level of economic development of a country and the degree of perfection of social security. In recent years, with the growth of per capita GDP, the increase in residents' disposable income and the continuous improvement of the social security system, the demand of the elderly for the silver industry has become increasingly vigorous, making the driving force for industrial upgrading stronger.

## 3 Population Aging "Forces" Industrial Transformation

The most important object of population aging is labor. As an important production factor, labor will affect the productivity and direction of the industry. In recent years, as the population structure has aged, the supply of labor has gradually decreased, labor costs have continued to rise, and the disappearance of the demographic dividend has accelerated the arrival of the Lewis turning point. The era of absorbing surplus labor with low wages has gone, together with low-end manufacturing and extensive production mode that rely on a large amount of cheap labor. The rising labor costs have compressed the space of labor-intensive industries, and many factories cannot afford the rising wages and migrate to other low labor cost regions in Southeast Asia. Other companies have increased product research and development efforts and increased automation to replace labor input and improve production efficiency. Enterprises increase the added value of products through technological innovation, thereby enhancing competitiveness. As a result, the increasing scarcity of

cheap young and middle-aged labor has "forced" economic development from "labor chasing capital" to "capital chasing labor", prompting industrial structure to upgrade from labor-intensive to capital-intensive.

## *3.1 Population Aging Accelerates the Arrival of the Lewis Turning Point*

The job-seeker ratio is the ratio of the number of jobs demanded to the number of job seekers, which can better reflect the relationship between labor supply and demand. According to the data of the China Human Resources Market Information Monitoring Center, in addition to the impact of the 2008 financial crisis, the recruitment rate has shown an upward trend since 2001. Taking 2010 as the dividing line, the labor force has undergone a shift from oversupply to short supply. More directly, the urban registered unemployment rate also dropped from 4.3% in 2009 to 3.9% in 2017 after the financial crisis. On the other hand, in terms of the age composition of migrant workers, it can also be seen that the proportion of migrant workers aged 40 years and above has increased year by year since 2008. In 2011, the proportion of migrant workers aged 41 to 50 exceeded the proportion of migrant workers aged 31 to 40. Statistics in 2016 even showed that the proportion of migrant workers between the ages of 41 and 50 reached 27%, close to the proportion of those aged 21 to 30. Both the year-on-year increase in the number of job seekers and the change in the age composition of migrant workers show that China is experiencing the disappearance of the demographic dividend. Population aging caused a decrease in the labor force, especially the younger labor force, and accelerated the arrival of the Lewis turning point. Rising labor costs force Chinese companies, apart from relocating their factories to other countries where the demographic dividend is still available, make efforts to transform to "capital-intensive" and "knowledge-intensive" enterprises and improve product added value and scientific research and innovation capabilities (Figs. 8, 9, and 10).

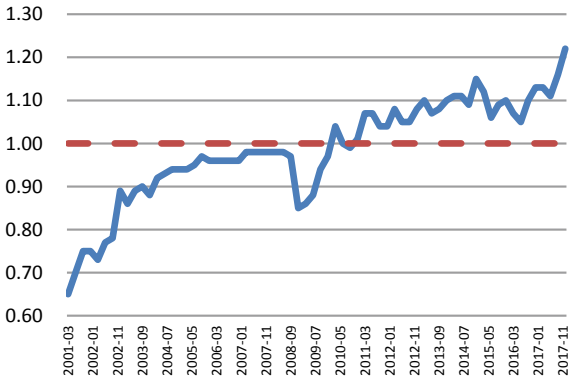


**Fig. 8** The job-seeker ratio of China. *Data source* China Human Resources Market Information Monitoring Center

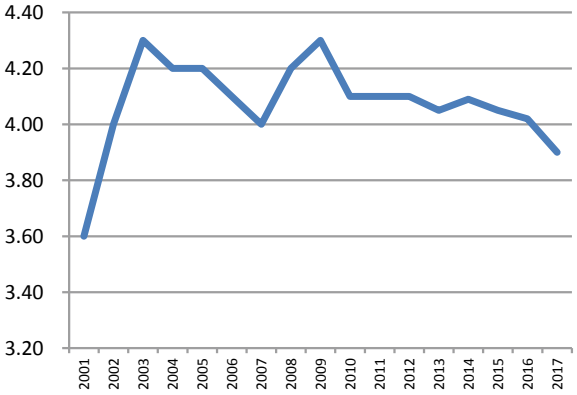


**Fig. 9** Registered unemployment rate in urban areas. *Data source* National Bureau of Statistics

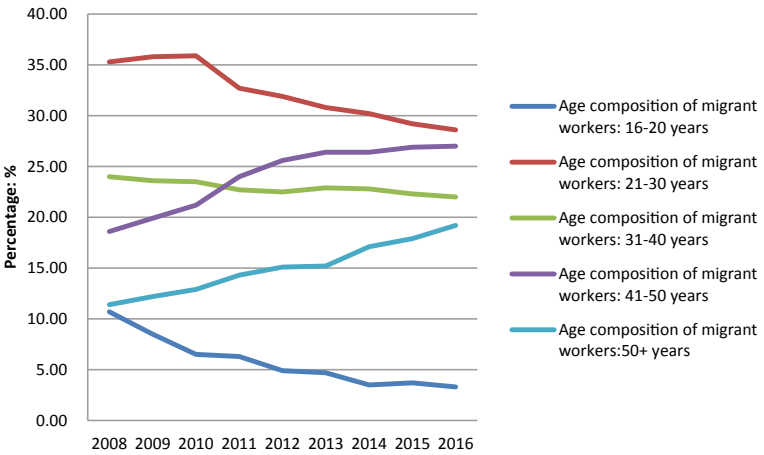


**Fig. 10** Age composition of migrant workers. *Data source* National Bureau of Statistics

## *3.2 Rising Labor Costs*

The direct impact of the decrease in labor supply is the increase in labor costs, and the increase in labor costs is a direct factor in industrial transformation. Data from the National Bureau of Statistics show that both the average wage of employees in the entire society and the average income of migrant workers, which can better reflect the labor cost of labor-intensive industries, have increased year by year in recent years, and the manufacturing and service sectors no longer enjoy the low-cost advantage brought about by the demographic dividend. On the one hand, it is an inevitable requirement of working people's demand for a better life with the increase

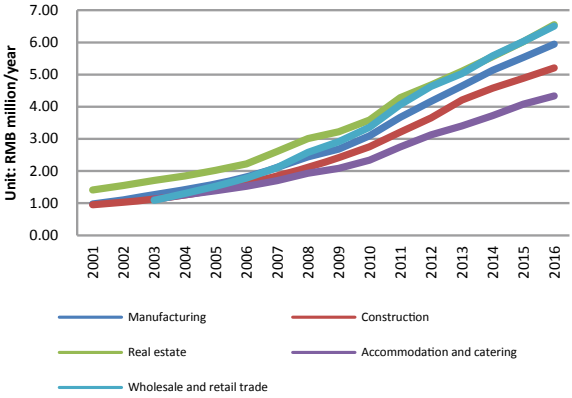


**Fig. 11** The average salary of employed people. *Data source* National Bureau of Statistics

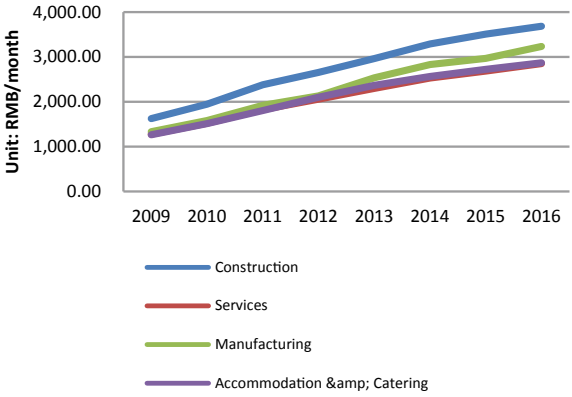


**Fig. 12** The average monthly income of migrant workers. *Data source* National Bureau of Statistics

in economic development; on the other hand, the cost effect of the decrease in labor supply caused by the aging of the population is also inevitable (Figs. 11 and 12).

## 4 Population Aging Deepens Human Capital

Different from "forcing" industrial transformation, in addition to the negative effects of reducing labor and increasing labor costs on the supply side, population aging also has a positive effect on deepening human capital. On the one hand, the proportion of mature labor and senior skilled workers with rich work experience will increase. On the other hand, the increase in life expectancy will increase the benefits of education and the time of education for young people, thereby increasing the accumulation of human capital. The labor force with different qualities or skills determines the development direction of the industry. A large amount of low-quality labor often promotes the development of labor-intensive or rough processing industries, while high-quality

labor promotes the development of knowledge-intensive and deep processing industries. Therefore, the increase in the level of human capital brought about by the aging of the population will make China's industrial structure shift from labor-intensive to technology- and knowledge-intensive; that is, the aging of the population promotes the upgrading of the industrial structure through the effect of human capital accumulation.

## *4.1 An Increase in Mature Labor Increases the Proportion of Experienced Labor*

According to previous data on the composition of migrant workers, it can be seen that in recent years, migrant workers have changed from young and middle-aged under 40 to middle-aged and older over 40 years old. Here, we use the same data again, taking the average age of each age group (the average age of 50 years old and above is treated as 51–60 years old) and calculating the average age of migrant workers and the year-on-year growth rate according to the proportional weight, as shown in Fig. 13. According to the calculated data, although the average age of migrant workers in China has slowed down in recent years, it is still on an upward trend. We have reason to believe that with the process of aging, the work experience of the labor force will become more abundant, thereby increasing work efficiency and quality.

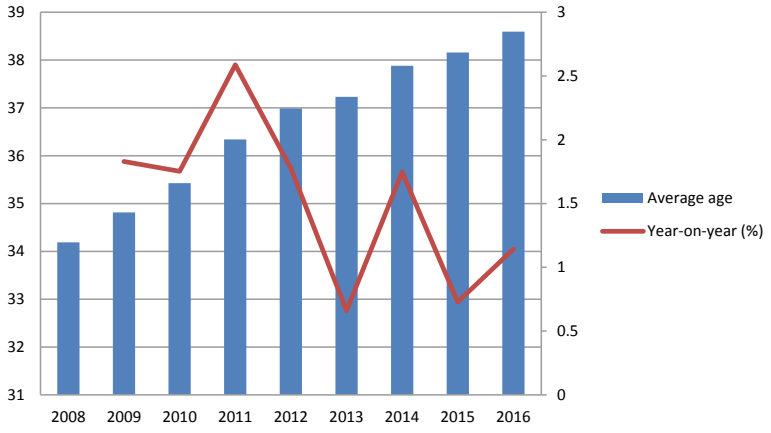


**Fig. 13** Changes in the average age of migrant workers. *Data* Calculated based on data from the National Bureau of Statistics

## 4.2 Extension of Life Expectancy Increases the Education Years of the Labor Force

In addition to work experience, education level is also an important measure of human resources. Through the four population censuses of the National Bureau of Statistics of the population data and life expectancy per 10 thousand people at various educational levels, it can be seen that with the continuous increase in average life expectancy, the time of education has gradually increased. The population with a primary education level per 10 thousand people began to decrease since 1990, especially during the ten years from 2000 to 2010, and the proportion of the population with a primary education level dropped from 35.701% to 26.779%. Correspondingly, the proportion of the population with junior high school education and above has been on the rise. In addition, from the composition of migrant workers' educational level in recent years, it can be found that the education level of the labor force has improved significantly. Whether it is local migrant workers or migrating migrant workers, the proportion of high school and above has increased year by year. This, on the one hand, benefits from the popularization of compulsory education; on the other hand, this is also because the extension of life expectancy increases the number of years people spend in education. In addition, with the aging of the population, the declining fertility rate will disperse the ever-increasing investment in education and health in a smaller labor force, which will also help deepen human capital.

In combination with the population aging "forcing" industrial transformation, the deepening of human capital will further increase the cost of labor. The labor force with a higher education level and rich work experience will require higher wages, which will increase the "forcing" pressure on industrial transformation caused by the shortage of the labor force (Figs. 14 and 15).

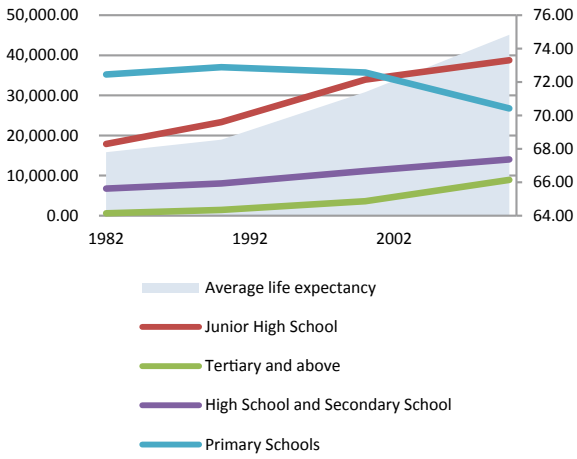


**Fig. 14** Population with various educational levels per 10 thousand people. *Data source* National Bureau of Statistics

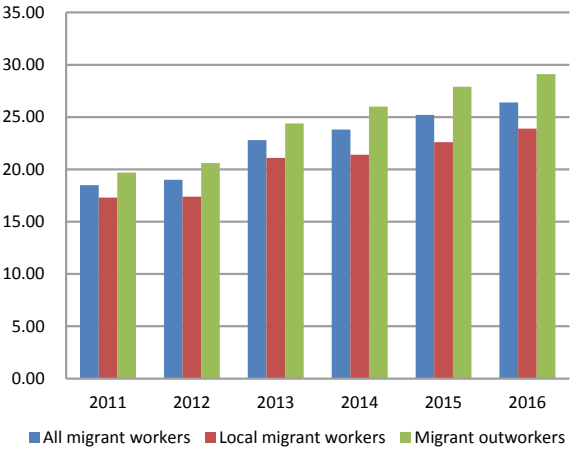


**Fig. 15** Percentage of migrant workers with high school education and above (%). *Data source* National Bureau of Statistics

# 5 How to Better Exploit the Positive Effects of Population Aging on the Upgrading of China's Industrial Structure

## *5.1 Further Improve the Social Security System and Sustainably Tap the Unlock Consumer Potential of the Internet*

As highlighted in the previous section, the magnitude of the upgrading effect of the industrial structure at the demand level of the aging population is mainly dependent on the consumption capacity and willingness of the elderly. Furthermore, increasing the consumption capacity of the elderly will provide a broad market space for the development and innovation of the silver hair industry. In recent years, with the rapid development of China's economy and the continuous improvement of material living standards, people's consumption ability and willingness have increased significantly. However, as a special consumer group, the elderly still retain a large consumption potential. To further strengthen the role of the consumer demand effect on industrial upgrading for elderly, we should first continue to improve the social security system. Only when the basic needs of the elderly in life are addressed can their consumption capacity be liberated and their demand for a higher quality of life be promoted. Therefore, while vigorously developing the aging industry in China, macro reform policies such as income distribution, pensions and healthcare should be coordinated with industrial development policies. Second, the leisure and recreational life of the elderly should be further enriched, taking advantage of the trend of market-oriented reform, the trend of industrial upgrading, and material needs to continue to provide more high-quality and diverse services and products for the elderly. In addition, due to the advent of the information age and the rapid development of the internet, the potential of domestic demand can be continuously released by expanding and

upgrading information consumption through promoting the widespread use of information technology such as the internet in the field of elderly services and community services. At the same time, new forms of consumption, such as online shopping, are also important factors in enhancing the power of modern consumption, while older people are slower to learn to use the internet for consumption and to enjoy services, and there is still room for development today. Finally, it can inject a new force into consumption to actively guide older people to use information technology devices and consume internet products.

## *5.2 Bring into Full Play the Potential of Aging Human Capital and Prevent "Low-Level" Aging*

As China's "demographic dividend" is disappearing due to an aging population and the advent of the Lewis turning point, the first problem facing the economy is a shortage of labor. However, the older workforce has some other advantages over the younger, cheaper workforce in that they are generally longer trained and educated and have more experience or skills. Therefore, China can encourage flexible employment and delayed retirement for the elderly and create jobs and platforms suitable for the elderly workforce to fully utilize the value of the human capital of the elderly. On the other hand, high-quality industrial upgrading is essentially a process of increasing labor productivity, deepening human capital and improving technological content. At present, China's aging population has not yet formed a pattern of upgrading industrial structure that center mainly on advanced manufacturing and modern services, which is not unrelated to the low knowledge and skills structures of China's existing workforce. Therefore, it is necessary to extend the time of education and build a lifelong learning society through education reform to transform the former advantage of "population quantity" into the advantage of "population quality" now and in the future, and prevent "low-level" aging. This will trigger a "new demographic dividend" while offsetting the decline in labor productivity due to aging.

## *5.3 Accelerate Urbanization and Boost the Development of New Service Industries*

The process of urbanization itself includes the process of upgrading industrial structure, and it can also be understood that the construction of urbanization itself is conducive to promoting the transformation of industrial structure. However, in the face of an aging population, there are some new challenges and opportunities for urbanization in China. On the one hand, studies have shown that population aging has a significant and stable hindering effect on the urbanization process through psychological costs and rural family retirement patterns (Kang Chuankun, 2012), therefore,

urbanization should be intensified to counteract the adverse effects of population aging, including vigorously developing service industries and SMEs to increase employment opportunities for migrant workers, further improving the household registration system, and increasing investment in rural education. The government should also increase its investment in education in rural areas. In addition, there is a gap between rural residents and urban residents in terms of demand for health care, accelerating urbanization will help develop this segment of the consumer market, thus adding new impetus to industrial upgrading. On the other hand, the urban agglomeration economy has greater advantages in emerging services such as finance, medical care, education and recreation, and the targets of urban services will also tend to age in the context of aging, so the demand of aging for services can be used to formulate a reasonable industrial planning policy to drive urbanization with the development of emerging service industries and then further induce technological innovation and knowledge spillover. This will then induce further technological innovation, knowledge spillover and human capital accumulation through the urban agglomeration economy, which will gradually spread to other industries in the process of upgrading.

## *5.4 Improve Innovation Capacity to "Leverage" the Upgrading Effect of the Industrial Structure of an Aging Population*

Research has shown that innovation has a "leveraging" effect on the upgrading of the industrial structure of an aging population (Zhuo Chengfeng and Deng Feng, 2018). On the one hand, industrial upgrading is inseparable from innovation, and the improvement of technology can bring more high value-added products while improving productivity and promoting the development of advanced manufacturing and other industries, thereby increasing innovation can offset the negative impact of productivity brought about by population aging; on the other hand, increasing innovation investment is conducive to giving fuller play to the value of human capital, thus "leveraging" the driving effect of population aging on the upgrading of industrial structure through the deepening of human capital. Therefore, against the backdrop of an aging population, it is important to actively expand the opening up to the outside world and introduce advanced technologies through investment promotion, to provide the necessary policy support for innovative enterprises, to create an innovative environment, to build innovative platforms, to increase subsidies for R&D personnel in universities and research institutions and to incentivize R&D activities through tax exemptions or increased R&D subsidies.

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# The Impact of Population Aging on the Economic Growth of China


**Qing Luo, Haichao Ma, and Huinan Wang**

## 1 China Has Entered an Aging Society

Population aging is a natural phenomenon that accompanies the development of human society. With the continuous improvement of living standards and upgrading of medical technology, life expectancy has been further extended. Meanwhile, as the social security system is gradually perfected, the fertility rate continues to decline, and the ancient concept of "raising children for support" is no longer the primary purpose of having children. Consequently, the proportion of the elderly in the total population continues to rise. According to the standards of the United Nations, when the proportion aged 65 and above in a country or region exceeds 7% of the total population, then it officially enters an aging society. The Aging World: 2015 Report written by the Census Bureau of the United States pointed out that there were 617 million people aged 65 and above in the world in 2015, and by 2050, there will be 1.6 billion. By then, the aging population will account for more than 21% in 94 countries and more than 28% in 39 countries.

The problem of population aging in China was the focus of attention as early as the last century. According to the traditional standard of the United Nations at that time, which estimated that the proportion of people aged 60 and above in a region accounted for 10% of the total population marks the entry of an aging society, China formally entered the aging society in 1999. The data released by the sixth census showed that in 2010, the total number of people aged 60 and above in China was 178 million, accounting for 13.26%, an increase of 2.93 percentage points from 2000. Among them, the population of 65 and above was 118 million, accounting for 8.87%, which

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_6

is an increase of 1.91 percentage points from 2000. China has become the country with the largest elderly population in the world, and the elderly accounts for one-fifth of the global elderly population. According to the forecast of the Organization for Economic Co-operation and Development (OECD), the proportion of the population aged 65 and above in China will surpass that of Japan by 2030, becoming the country with the largest elderly population in the world.

Since the beginning of the twenty-first century, the population aging process of China has been developing at a very rapid speed. It has attracted widespread attention, and relevant policies have been issued since then: in November 2011, the "two-child policy for couples that are both only child" was fully implemented in all parts of China; in December 2013, the "two-child policy for couples in which one partner is an only child" was implemented; on January 1, 2016, the "universal two-child" policy was formally implemented, resulting in an increase in the number of newborns in 2016 by more than 1.3 million over the previous year, reaching 17.8 million and creating the largest annual growth rate in 20 years. It was a record high in the past 10 years, with a total population growth rate of 5.86‰.

In the context of such a demographic structure, what impact will population aging have on economic growth? This paper establishes a static panel regression model and uses provincial panel data from 2002 to 2016 to conduct an empirical analysis to verify the impact of population aging on economic growth.

## 2 Theoretical Overview of the Impact of Population Aging on Economic Growth

### *2.1 The Demographic Factors in the Traditional Theory of Economic Growth*

Understanding the process of economic growth has always been an important topic of economics. This section mainly summarizes how modern economists view demographic factors in economic growth. To achieve this goal, we first describe the theoretical framework and then position the demographic elements. Neoclassical models and endogenous growth models are the two mainstream ideas since the Malthus model. These two types of models make two important assumptions about the demographic factors in the economy: (1) the population growth rate is exogenous; (2) the labor force is regarded as homogeneous, that is, without consideration for the structural changes in population growth.

Therefore, in the traditional model, the change process of the labor force is often written as $L_{t+1} = L_t$ or its continuous form $L_t = e^{nt}$, where n represents a given growth rate. These simple assumptions, to a large extent, are unable to describe the characteristics of labor factors. The focus of the debate in the long-term economic growth model is on the marginal benefits of capital accumulation, while little attention is given to labor. However, considering the trend of population aging, this may at least

affect the process of labor force change from two perspectives: one is the proportion of labor in the population, and the other is the impact of demographic changes on labor productivity.

Nevertheless, the traditional economic growth model has provided us with many insights into economic growth and has become the starting point of our thinking framework. Therefore, this part briefly summarizes the framework of the neoclassical model and the endogenous growth model and focuses on the role of demographic factors (or labor force element).

The neoclassical models of Solow (1956) and Swan (1956) assume that total output is based on the production function: $Y = Af(K, L)$. The total output Y depends on technology A, capital K, and labor L, f(.) is the production function, and the marginal benefit is diminishing relative to capital K, which determines the main features of economic growth in the Solow model. This part will be discussed in detail later.

Since the model assumes that the return to scale is constant, the total output per capita is defined as $y = Y/L = Af(k)$, which means it depends on the accumulation of technology A and per capita capital k.

In addition, in this model, changes in capital are determined by both savings and depreciation: the increase in capital comes from reinvesting part of the total output, and this ratio is called the savings ratio, denoted by s. In the meantime, capital is also in the process of reduction, that is, depreciation, and this ratio is also constant, expressed by δ. Thus, the path of capital accumulation is expressed as:

$$K_{t+1} = K_t + sY_t - \delta K_t$$

As mentioned above, the production function has diminishing marginal benefits relative to capital, but the impact of depreciation is linear. Therefore, if capital accumulates to a certain extent, it will no longer increase. At this time, $sY_t - \delta K_t = 0$, which can be read as follows: after the capital reaches a certain level, the rate of depreciation catches up with the return on investment, and this state is called steady state. In the steady state, capital k* is constant, and the total output per capita $y^* = Af(k^*)$; its growth only comes from technology A, and the growth of technology is given exogenously and is irrelevant to the labor force L.

In this way, the relationship between total output and labor force factors is linked with constant returns to scale, that is, $Y^* = Ly^*$, and y* has nothing to do with labor force factors, so if capital accumulation has reached a steady state and other factors remain unchanged, the impact of labor growth on total output growth is proportional.

The above derivation is carried out in a closed economy, and the model can also be extended to an open economy, but this does not change the main conclusion.

The strictest criticism of the neoclassical model is that it assumes that the growth of technology is exogenous. In a steady state, the growth of total output per capita will be completely dependent on the assumption of technology. Romer (1986) proposed an endogenous growth model, which avoided exogenous technological assumptions and followed Arrow's (1962) theory, stating that technology is dependent on capital accumulation itself, namely, $A = K^{\phi}$. Although at the level of individual companies, the diminishing marginal effect of capital is inevitable, the positive externality of

knowledge makes it possible that the marginal benefits of capital may not diminish at the level of society as a whole. Considering the Cobb–Douglas production function, the simplest form of the model is as follows:

$$Y = f(K, AL) = K^{\alpha}(AL)^{1-\alpha} = K^{\alpha+\phi(1-\alpha)}L^{1-\alpha}$$

If $\phi = 1$, the marginal benefit of capital is constant. Many economists have enriched the results from various angles and considered the externalities of this knowledge from various perspectives of R&D, education, and patents, including the human capital of Lucas (1988), consideration of product variety model of Romer (1990) and Aghion and Howitt (1992). However, the model has little further discussion on the influence of demographic factors on economic growth, and it has not changed the main inference of the Solow model.

## 2.2 *The Impact of Demographic Factors on Economic Growth*

How does the demographic structure affect economic growth? This is the most concerning issue in the circles of population and development economics. In the literature, scholars of different backgrounds have discussed this issue from different angles. An important perspective is demographic dividend. In traditional economics, labor is a vital factor in production. According to empirical data from the United States and other Western countries, labor accounts for approximately 70% of total remuneration, which is the largest factor of production. The theory behind the demographic dividend phenomenon is that a sufficient labor force can promote economic development. Bloom and Williamson (1998) examine the impact of age structure on economic growth by using population panel data from 1965 to 1990 in 78 countries around the world, concluding that the demographic dividend can explain one-third of the rapid growth of the East Asian economy (Japan and the Four Asian Tigers). Specifically, the growth rate of the working-age population in these countries from 1965 to 1990 greatly exceeded that of the dependent population, resulting in a continuous decline in the total dependency ratio, thereby promoting a rapid increase in per capita income. Malmberg (1994) use Swedish population data from 1950 to 1989 to construct a life cycle model that includes technology and human capital and study the impact of changes in the population age structure on the Swedish economy. He divides the total population into different age groups and finally finds that if the proportion of people aged 0–19, 20–24, 25–29, and 75 years old increases, it will have a negative impact on economic growth; in contrast, the increase in the proportion of the population of other age groups will have a positive impact on economic growth, with 50–64 years old being the most prominent; people in the 50- to 64-year-old age group have vigorous physical conditions and rich work experience (human capital) and therefore have the greatest promoting effect on the economy.

This finding is consistent with the demographic dividend theory. Lindh and Malmberge (1999) use panel data from OECD countries and reach the same conclusion. They introduce human capital on the basis of the Solow model and use measurement estimation methods such as the instrumental variable GMM and find an inverted U-shaped relationship between the population age structure and labor productivity. With the intensification of the population aging in Western countries, research in recent years has paid more attention to the impact of population aging on economic growth. Bloom et al. (2010a) believe that the aging of the population will reduce the labor participation rate and the savings rate, which will further lead to a decline in capital accumulation and produce a negative impact on the economy.

The relevant empirical results on China are also very rich. In fact, the dependency ratio of the population dropped to its lowest in 2013, which means that the largest demographic dividend was released. Later, as the dependency ratio rises and the aging population increases, the economy will be more affected by the negative impact of the demographic structure. Peng (2008) construct a DSGE model to study the impact of aging on macro-economies. The simulation results tell that the aging of the population will bring about a decrease in labor supply and an increase in wages. Without technological progress, these factors will reduce the economic growth rate. Bloom et al. (2010b) compare the demographic structures of China and India and find that as the demographic structure of China becomes increasingly aging, the economic growth rate will slow down, while India is still in the demographic dividend stage, the promoting effect of the increase in the working population on economic development is still emerging.

## 3 Empirical Research Based on the Provincial Level of China

### *3.1 Research Hypothesis*

Based on a previous theoretical overview and literature review, the following hypotheses are proposed.

**Hypothesis 1** Economic growth is closely related to the stage of development. Regions with a higher level of economic development are prone to slowdown.

**Hypothesis 2** Investment drive and consumption drive are important factors for economic growth.

**Hypothesis 3** Economic growth and household savings have an inverted U-shaped relationship; that is, when savings start to increase from a low level, they have a driving effect on economic growth, while excessive savings are not conducive to economic growth and will produce crowding out effects.

**Hypothesis 4** The age structure of the population affects economic growth by adjusting investment, household consumption and household savings.

## *3.2 Mode Setting*

In the theoretical literature, there are many factors affecting economic growth. Different empirical studies select different explanatory variables, as they have different focuses. Meanwhile, it is unrealistic to include all variables in the regression mode because of the limited data availability. Therefore, missing variables in any empirical research are always inevitable. A good economic theory should pursue a mode that is as concise as possible to describe the complex economic reality. Empirical researchers need to seek a balance between the explanatory power and simplicity of the mode.

Taking into account the different development stages of different provinces and cities, provinces and cities with higher development levels may have entered a plateau period of slower growth and stable development, and provinces and cities developed later may be experiencing an accelerated period of faster and rapid growth. Therefore, the annual economic growth rate depends on its previous level. In terms of the driving force of economic growth, we pay attention to the driving force of investment, especially from the perspective of fixed asset investment and foreign investment, and the driving force of consumption from the perspective of household consumption and household savings, including the quadratic term of household savings, to examine whether there is an inverted U-shaped relationship between economic growth and household savings. In terms of demographic factors, we are more concerned about demographic structural factors than population factors, especially the demographic age structure caused by population aging. Therefore, in the regression mode, we only examine the age structure in the explanatory variables, including the intersection of age structure and fixed asset investment, household consumption, and household savings, to examine the moderating effect of age structure on investment driving force and consumption driving force. By using panel data containing individual and time dimensions, we construct the following static panel regression model.

$$\begin{aligned} Growth_{it} = {} & GDPPerCap_{it-p} + AssetInvest_{it} + FDI_{it} + Consum_{it} \\ & + Sav_{it} + Sav_{it}^2 + AgeStruc_{it} * AssetInvest_{it} \\ & + AgeStruc_{it} * Consum_{it} + AgeStruc_{it} * Sav_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

Among them, $Growth_{it}$ represents the economic growth rate of the province (municipalities) $i$ in the year $t$, $GDPPerCap_{it-p}$ represents the per capita GDP of the province (municipalities) $i$ in the year $t-p$, $AssetInvest_{it}$ represents the fixed asset investment of the province (municipalities) $i$ in the year $t$, $FDI_{it}$ represents the

**Table 1** Information criteria for different lag orders

| Mode | Number of observations | Degrees of freedom | AIC | BIC |
|---|---|---|---|---|
| Including only 1st order lag term | 420 | 10 | −1203.978 | −1163.576 |
| Including 1st and 2nd lag terms | 390 | 11 | −1165.173 | −1121.545 |
| Including 1st, 2nd and 3rd lag terms | 360 | 12 | −1054.381 | −1007.748 |

foreign direct investment attracted by the province (municipalities) $i$ in the year $t$, $Consum_{it}$ represents the resident consumption of the province (municipalities) $i$ in the year $t$, $Sav_{it}$ represents the resident savings of the province (municipalities) $i$ in the year $t$, $AgeStruc_{it}$ represents the age structure of the province (municipalities) $i$ in the year $t$, $\mu_i$ represents the individual characteristics of the province (municipalities) $i$, $\lambda_t$ represents the time characteristics of the year $t$, $\varepsilon_{it}$ represents error term that changes with time and individual.

On the selection of the optimal lag order of per capita GDP, we follow the information criteria, including the commonly used Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). The selection criteria of AIC and BIC are both to minimize the objective function. Adding the first-order lag term, the second-order lag term, and the third-order lag term in the model gradually, the AIC and BIC values are shown in Table 1.

It can be seen that the inclusion of higher-order lag terms gradually increases the AIC and BIC values of the model. Therefore, from the perspective of information criteria, it is most appropriate to include only the first-order lag term of per capita GDP. The final form of the model is as follows:

$$\begin{aligned} Growth_{it} = {} & GDPPerCap_{it-1} + AssetInvest_{it} + FDI_{it} + Consum_{it} \\ & + Sav_{it} + Sav_{it}^2 + AgeStruc_{it} * AssetInvest_{it} \\ & + AgeStruc_{it} * Consum_{it} + AgeStruc_{it} * Sav_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

## 3.3 Description of Indicator Data

In our research, we select the representative of per capita GDP growth rate $Growth_{it}$; select the logarithmic representative of per capita GDP $GDPPerCap_{it-1}$; select the logarithmic representative of the total investment in fixed assets of the whole society $AssetInvest_{it}$; select the logarithmic representative of the total investment of foreign-invested enterprises $FDI_{it}$; select the logarithmic representative of residents'

consumption levels $Consum_{it}$; select the logarithmic representative of the balance of RMB savings deposits of urban and rural residents at the end of the year $Sav_{it}$, and generate a quadratic term $Sav_{it}^2$; in the measurement of the population age structure, we select the elderly dependency ratio index and the child dependency ratio index based on a population sample survey.[1] By comparing these two indicators, we obtain the population age structure variable $AgeStruc_{it}$ used to reflect the degree of aging, namely:

$$AgeStruc_{it} = \frac{\text{Elderly dependency ratio}}{\text{Child support ratio}}$$

It can be seen from the calculation formula that the larger the value of $AgeStruc_{it}$ is, the more serious the aging population. By multiplying the population age structure variables with fixed asset investment variables, resident consumption variables, and resident savings variables, the interaction variables $AgeStruc_{it}$*$AssetInvest_{it}$, $AgeStruc_{it}$*$Consum_{it}$, $AgeStruc_{it}$*$Sav_{it}$ are generated.

Considering factors such as object comparability and data availability, 30 provincial-level administrative regions in China are selected as the research objects (Xizang, Hong Kong, Macau, and Taiwan are not included in the scope of the study due to unavailability of data), and the time span is 2002–2016. The population age structure variables $AgeStruc_{it}$ that reflect the degree of population aging are drawn by province and city, as shown in Fig. 1. It can be seen from the figure that during the period 2002–2016, most provinces and cities showed a clear trend of population aging.

The data contain individual and time dimensions. The individuals in each period are exactly the same, which is balanced panel data. Since $N$ is large ($N = 30$) and $T$ is small ($T = 15$), the research sample data belong to short panel data. All data are from the official data published on the website of the National Bureau of Statistics.[2] The variables involved in prices are all calculated based on the current year's prices. Except for variables with values between 0 and 1, such as the growth rate of per capita GDP and age structure, other variables are expressed in logarithmic values. In official statistics, some variables were missing in 2010, and linear interpolation was used to fill in missing values. The descriptive statistics of the variables are shown in Table 2.

To overcome the influence of multicollinearity between variables on the regression estimation results, all continuous variables (after taking the logarithm) are deaveraged, that is, the original observation value of the variable is subtracted from the group mean. For cross-terms, the individual variables are deaveraged first, and then cross-variables are generated.

[1] The elderly dependency ratio is the ratio of the population over 65 to the working-age population, and the child dependency ratio is the ratio of the population of children under 15 to the working-age population.

[2] http://data.stats.gov.cn.


**Fig. 1** Trend of population aging by province and city

**Table 2** Descriptive statistics of variables

| Variable | Number of observations | Mean value | Standard deviation | Minimum value | Maximum value |
|---|---|---|---|---|---|
| $Growth_{it}$ | 450 | 0.136 | 0.068 | −0.223 | 0.370 |
| $GDPPerCap_{it}$ | 450 | 10.109 | 0.753 | 8.089 | 11.680 |
| $AssetInvest_{it}$ | 450 | 8.509 | 1.162 | 5.418 | 10.884 |
| $FDI_{it}$ | 450 | 10.387 | 1.470 | 6.551 | 13.688 |
| $Consum_{it}$ | 450 | 9.090 | 0.672 | 7.741 | 10.812 |
| $Sav_{it}$ | 450 | 8.696 | 1.054 | 5.404 | 10.959 |
| $AgeStruc_{it}$ | 450 | 0.583 | 0.274 | 0.179 | 1.875 |

## *3.4 Empirical Results*

Empirical analysis is conducted based on the static panel regression model constructed above. In the static panel model, according to the characteristics of individual effects, there are fixed effects models (fixed effects model, FE) and random effects models (random effects model, RE). If the individual heterogeneity $\mu_i$ is related to a certain explanatory variable, the estimated results of the random effects

model are inconsistent. In this case, the fixed effects model should be used for estimation; if the individual heterogeneity $\mu_i$ is not related to all explanatory variables, the random effects model can obtain a consistent estimator and is more effective than the fixed effects model.

In economic theories, random effects models are relatively rare, and fixed effects models can always obtain a consistent estimate. When the data characteristics are not clear enough, the approach is to use both models and then select the appropriate model through the Hausman test. The null hypothesis of the Hausmann test is "$H_0$: $\mu_i$ is not correlated with all explanatory variables"; that is, the random effects model is the correct model. The Hausmann test result of this study shows that at $P < 0.01$, the null hypothesis should be rejected, so the fixed effects model should be adopted. The model estimation results are shown in Table 3. To overcome heteroscedasticity, clustering robust standard errors are used in the estimation.

From the first and second columns of Table 3, it can be seen that compared to the random effects model, the fixed effects model has a better estimation effect (higher goodness of fit). The estimation results of the fixed effects model show that the growth rate of per capita GDP is significantly negatively correlated with the level of per capita GDP at the beginning of the period. That is, the higher the per capita GDP of provinces and cities is, the slower the growth rate in subsequent years. This shows that the economic growth rate is closely related to the stage of development. With the continuous improvement of development, the growth rate will gradually slow down. Research hypothesis 1 has been verified. The regression results of the model show that both fixed asset investment and foreign investment can significantly promote economic growth. In terms of household consumption, the regression coefficient is positive, and household consumption has a certain promotion effect on economic growth, but it is not significant. This shows that in the past 15 years, economic growth at the provincial level has been relatively investment-driven, while consumption-driven growth has not been reflected. Research hypothesis 2 has been partially verified. In terms of household savings, both savings and the square of savings have a significant impact on economic growth, and the estimated coefficient of the quadratic term of savings is negative; that is, there is an inverted U-shaped relationship between economic growth and household savings. An excessively high savings rate is not conducive to economic growth, and research hypothesis 3 has been verified. Regarding the moderating effect of population age structure, by observing the regression coefficients and significance of the three cross-terms, it is found that the population age structure can significantly adjust the marginal impact of household consumption and household savings on economic growth. Hypothesis 4 has been verified. Specifically, the aging of the population will significantly inhibit the marginal effect of household consumption on economic growth and will significantly increase the marginal effect of household savings on economic growth.

If the time dummy variable is generated, the two-way fixed effects model is used for estimation, and the results are shown in the third column of Table 3. It can be seen that the per capita GDP level and fixed asset investment at the beginning of the period still have a significant impact on economic growth. However, due to the significant time fixed effect, the influence of some other variables is no longer significant. This

**Table 3** Estimated results of the static panel benchmark model

| | (1) | (2) | (3) |
|---|---|---|---|
| | RE | FE | FE Two-way |
| Variables | $Growth_{it}$ | $Growth_{it}$ | $Growth_{it}$ |
| $GDPPerCap_{it-1}$ | −0.056*** | −0.213*** | −0.208*** |
| | (0.018) | (0.042) | (0.029) |
| $AssetInvest_{it}$ | 0.021** | 0.113*** | 0.088*** |
| | (0.009) | (0.019) | (0.013) |
| $FDI_{it}$ | 0.022*** | 0.022** | 0.012 |
| | (0.004) | (0.010) | (0.007) |
| $Consum_{it}$ | −0.001 | 0.059 | 0.002 |
| | (0.023) | (0.044) | (0.035) |
| $Sav_{it}$ | −0.046*** | −0.082** | 0.042 |
| | (0.010) | (0.041) | (0.035) |
| $Sav^2{}_{it}$ | −0.004 | −0.015*** | −0.004 |
| | (0.003) | (0.004) | (0.003) |
| $AgeStruc_{it}$ * $AssetInvest_{it}$ | −0.024 | 0.030 | 0.049* |
| | (0.024) | (0.038) | (0.025) |
| $AgeStruc_{it}$ * $Consum_{it}$ | −0.023 | −0.209*** | −0.025 |
| | (0.025) | (0.056) | (0.037) |
| $AgeStruc_{it}$ * $Sav_{it}$ | 0.014 | 0.146** | −0.024 |
| | (0.032) | (0.066) | (0.045) |
| *year3* | | | 0.050*** |
| | | | (0.010) |
| *year4* | | | 0.025* |
| | | | (0.013) |
| *year5* | | | 0.020 |
| | | | (0.016) |
| *year6* | | | 0.090*** |
| | | | (0.019) |
| *year7* | | | 0.077*** |
| | | | (0.024) |
| *year8* | | | −0.029 |
| | | | (0.029) |
| *year9* | | | 0.073** |
| | | | (0.034) |
| *year10* | | | 0.091** |
| | | | (0.038) |

(continued)

**Table 3** (continued)

| | (1) | (2) | (3) |
|---|---|---|---|
| | RE | FE | FE Two-way |
| Variables | $Growth_{it}$ | $Growth_{it}$ | $Growth_{it}$ |
| *year11* | | | 0.013 |
| | | | (0.043) |
| *year12* | | | 0.000 |
| | | | (0.047) |
| *year13* | | | −0.022 |
| | | | (0.050) |
| *year14* | | | −0.049 |
| | | | (0.053) |
| *year15* | | | −0.025 |
| | | | (0.056) |
| *Constant* | 0.007 | −0.005 | −0.040 |
| | (0.005) | (0.007) | (0.026) |
| Observations | 420 | 420 | 420 |
| *R*-squared | 0.342 | 0.426 | 0.779 |
| Number of id | 30 | 30 | 30 |

*Notes*
(1) *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively
(2) Robust standard errors are indicated in parentheses

prompted us to speculate that temporal heterogeneity may play an important role in the regression model. As time evolves, the model's response relationship may undergo structural changes. Next, we will conduct a structural test to discuss this issue in detail.

## *3.5 Test of Robustness*

To verify the robustness of the model estimation results, we adopt the method of variable substitution to test the robustness. Specifically, we adopt three variable replacement strategies, replacing the explained variable, part of the explanatory variable, and part of the explained variable at the same time.

First, replace the variable that measures the economic growth rate on the left side of the regression equation and replace the per capita GDP growth rate with GDP growth rate as the new explained variable $Growth2_{it}$ in the mode. Meanwhile, considering the lagging effect, the logarithmic value $GDP_{it-1}$ of GDP for the 1st period is used to replace the explanatory variable in the original mode $GDPPerCap_{it-1}$. The regression mode is as follows:

$$\begin{aligned} Growth2_{it} = {} & GDP_{it-1} + AssetInvest_{it} + FDI_{it} + Consum_{it} \\ & + Sav_{it} + Sav_{it}^2 + AgeStruc_{it} * AssetInvest_{it} \\ & + AgeStruc_{it} * Consum_{it} + AgeStruc_{it} * Sav_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

Second, we replace the variable that measures the age structure of the population on the right side of the regression equation and compare the population of 65 years and above obtained by the sample survey with the sampled population. We obtain a substitute variable $AgeStruc2_{it}$ for the age structure variable $AgeStruc_{it}$ in the original model. This indicator directly reflects the proportion of the elderly in the total population. Subsequently, by using $AgeStruc2_{it}$, the cross-terms of age structure variables, fixed asset investment variables, household consumption variables, and household savings variables, $AgeStruc2_{it}$*$AssetInvest_{it}$, $AgeStruc2_{it}$*$Consum_{it}$, are generated. The regression model (Robust2) is as follows:

$$\begin{aligned} Growth_{it} = {} & GDPPerCap_{it-1} + AssetInvest_{it} + FDI_{it} + Consum_{it} \\ & + Sav_{it} + Sav_{it}^2 + AgeStruc2_{it} * AssetInvest_{it} \\ & + AgeStruc2_{it} * Consum_{it} + AgeStruc2_{it} * Sav_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

Finally, combining the above two variable replacement methods, the variables that measure economic growth and the variables that measure the age structure of the population are replaced at the same time. The regression model (Robust3) is as follows:

$$\begin{aligned} Growth2_{it} = {} & GDP_{it-1} + AssetInvest_{it} + FDI_{it} + Consum_{it} \\ & + Sav_{it} + Sav_{it}^2 + AgeStruc2_{it} * AssetInvest_{it} \\ & + AgeStruc2_{it} * Consum_{it} + AgeStruc2_{it} * Sav_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

The full sample is used to estimate the regression models Robust1, Robust2, and Robust3, and the results are shown in Table 4.

It can be seen from Table 4 that no matter what variable replacement strategy is adopted, the estimated results and goodness of fit of the three models are close, and the significance of the variables and the signs of the regression coefficients are highly consistent with the benchmark model. The hypothesis of this study continues to be verified or partially verified. After changing the measurement indicators, the economic growth rate is still significantly negatively correlated with the economic level at the beginning of the period; the investment-driven effects represented by fixed asset investment and foreign investment still significantly motivate economic growth; residential consumption has shown a certain stimulating effect on economic growth, but not very strong; the square term of household savings is still significant, and the

**Table 4** The estimation result of the robustness test mode

| | (4) | (5) | (6) |
|---|---|---|---|
| | Robust1 | Robust2 | Robust3 |
| Variables | $Growth2_{it}$ | $Growth_{it}$ | $Growth2_{it}$ |
| $GDP_{it-1}$ | −0.214*** | | −0.256*** |
| | (0.043) | | (0.041) |
| $AssetInvest_{it}$ | 0.106*** | 0.095*** | 0.085*** |
| | (0.017) | (0.017) | (0.015) |
| $FDI_{it}$ | 0.024** | 0.017* | 0.018* |
| | (0.010) | (0.010) | (0.010) |
| $Consum_{it}$ | 0.019 | 0.105** | 0.082* |
| | (0.043) | (0.043) | (0.043) |
| $Sav_{it}$ | −0.027 | −0.053 | −0.003 |
| | (0.041) | (0.040) | (0.040) |
| $Sav^2{}_{it}$ | −0.016*** | −0.007** | −0.005* |
| | (0.004) | (0.003) | (0.003) |
| $AgeStruc_{it}$*$AssetInvest_{it}$ | 0.053 | | |
| | (0.036) | | |
| $AgeStruc_{it}$*$Consum_{it}$ | −0.172*** | | |
| | (0.053) | | |
| $AgeStruc_{it}$*$Sav_{it}$ | 0.115* | | |
| | (0.063) | | |
| $GDPPerCap_{it-1}$ | | −0.250*** | |
| | | (0.041) | |
| $AgeStruc2_{it}$ * $AssetInvest_{it}$ | | −2.325*** | −1.905*** |
| | | (0.550) | (0.516) |
| $AgeStruc2_{it}$ * $Consum_{it}$ | | −2.446*** | −2.153*** |
| | | (0.613) | (0.583) |
| $AgeStruc2_{it}$ * $Sav_{it}$ | | 2.200*** | 1.551** |
| | | (0.760) | (0.723) |
| *Constant* | −0.008 | −0.008 | −0.013* |
| | (0.007) | (0.007) | (0.007) |
| Observations | 420 | 420 | 420 |
| *R*-squared | 0.453 | 0.475 | 0.499 |
| Number of id | 30 | 30 | 30 |

*Notes*
(1) *, ** and *** indicate significance at the significance level of 10%, 5%, and 1%, respectively
(2) Robust standard errors are indicated in parentheses

regression coefficient is negative; for the marginal effect of household consumption, population aging still shows a significant inhibitory effect; for the marginal effect of household savings, the effect of population aging is still significant. Through the above process, it is proven that our regression model has high robustness.

## *3.6 Test of Structural Change*

As mentioned above, when the two-way fixed-effects model is used for estimation, it shows a significant time-fixed effect, which shows that time heterogeneity cannot be ignored. China is a populous country, and population policy has been implemented as a basic national policy for a long time. It is reasonable to assume that the nation-wide macro-effects of the population policies issued in different years might cause structural change in the response relationship of the regression model.

In November 2011, the "two-child policy for couples that are both only child" was fully implemented, which means that if both parents are only child, they can have a second child. This preludes the gradual changes in childbirth policy and adjustment of the age structure of the population. To examine the response relationship between economic growth and investment-driven effects, consumption-driven effects, and population age structure adjustment effects, after the "two-child policy for couples that are both only child" is fully implemented, we use 2012 as the time demarcation point to test the structural changes in regression coefficients. In the specific operation, we adopt the idea of the Chow Test:

First, we perform constrained regression to regress the entire sample ($2002 \leq t \leq 2016$) to obtain the residual sum of squares SSR;

Second, perform unconstrained regression, return to the subsample before 2012 ($2002 \leq t < 2012$), and obtain the residual sum of squares SSR1;

Finally, unconstrained regression is performed, returning to the subsamples in 2012 and later ($2012 \leq t \leq 2016$) to obtain the residual sum of squares SSR2.

According to the principle of the likelihood ratio test, the corresponding F statistic is

$$F = \frac{(SSR - SSR_1 - SSR_2)/K}{(SSR_1 + SSR_2)/(n - 2K)} \sim F(K, n - 2K)$$

Our regression equation has 10 explanatory variables (including quadratic terms, cross terms, and intercept terms), so $K = 10$. Since the regression equation contains a 1st-order lag term, the sample size of 14 periods is 420, that is, $n = 420$. The F statistic calculated according to the likelihood ratio principle is 35.263335, which is larger than the critical value $F(10, 400) = 2.36541$ corresponding to the 1% significance level of the F statistic. Therefore, the null hypothesis that "there is no structural change" should be rejected. In other words, after China has fully implemented the "two-child policy for couples that are both only child", the impact of the population age structure on economic growth has undergone structural changes.

By comparing the regression estimation results of the three columns in Table 5, we find that the difference is reflected in the pulling effect of household consumption on the economy and how the age structure of the population adjusts the marginal impact of household consumption on economic growth. Throughout the sample period (2002–2016), household consumption has a certain positive contribution to economic growth, but it is not significant. However, by looking at the first half of the sample (2002–2011), it is evident that the positive contribution of household consumption to economic growth is stronger and very significant; in the second half of the sample period (2012–2016), the pulling effect of household consumption is no longer significant. This shows that as China gradually enters an aging society, resident consumption has been weak in recent years. Considering the moderating effect of the age structure of the population, the marginal impact of household consumption on economic growth was significantly suppressed by the age structure of the population during the full sample period (2002–2016), but in recent years (2012–2016), the adjustment of the age structure of the population is manifested in significantly increasing the marginal impact of household consumption on economic growth. This shows that with the introduction of macro policies to regulate the age structure of the population, the whole society has formed an expectation of the transformation of the population structure, which in turn has a certain boosting effect on residents' consumption.

### *3.7 Test of Regional Difference*

China is a country with a large population and a vast territory. Since the reform and opening up, the imbalance in the level of development between coastal areas and inland areas has led to huge regional differences, forming the so-called "three growth poles." With the strategies of "the Large-scale Development of the Western Region" "Revitalizing the Northeast Old Industrial Base" "Rise of Central Region" successively launched, industrial gradient transfers between regions began to appear, as well as the differences among economic growth rate, growth mode, industrial structure and population employment. If we consider the flow of the working-age population among the eastern, central, and western regions, the mechanism of the influence of the population age structure on economic growth may have regional characteristics. In view of this, we further examine the location difference of the influence mechanism of the population age structure on economic growth.

Specifically, we divide all 30 provinces and cities into three sub-samples of the eastern region, central region, and western region and perform static panel fixed-effect mode regression to investigate whether location factors affect the economic growth mode. With reference to the common classification standards in the central policy documents, the location groupings of 30 provinces and cities are shown in Table 6.

The model estimation results listed in Table 7 show obvious regional differences.

**Table 5** Estimation results of the structural change test model

| | (7) | (8) | (9) |
|---|---|---|---|
| | 2002–2016 | 2002–2011 | 2012–2016 |
| Variables | $Growth_{it}$ | $Growth_{it}$ | $Growth_{it}$ |
| $GDPPerCap_{it-1}$ | −0.213*** | −0.464*** | −0.351*** |
| | (0.042) | (0.052) | (0.072) |
| $AssetInvest_{it}$ | 0.113*** | 0.101*** | 0.162*** |
| | (0.019) | (0.022) | (0.025) |
| $FDI_{it}$ | 0.022** | −0.006 | 0.020 |
| | (0.010) | (0.011) | (0.015) |
| $Consum_{it}$ | 0.059 | 0.581*** | 0.026 |
| | (0.044) | (0.064) | (0.047) |
| $Sav_{it}$ | −0.082** | −0.170*** | −0.173*** |
| | (0.041) | (0.045) | (0.062) |
| $Sav^2{}_{it}$ | −0.015*** | −0.019*** | 0.032*** |
| | (0.004) | (0.005) | (0.012) |
| $AgeStruc_{it}$ * $AssetInvest_{it}$ | 0.030 | 0.032 | 0.031 |
| | (0.038) | (0.052) | (0.038) |
| $AgeStruc_{it}$ * $Consum_{it}$ | −0.209*** | −0.025 | 0.161** |
| | (0.056) | (0.064) | (0.069) |
| $AgeStruc_{it}$ * $Sav_{it}$ | 0.146** | −0.044 | −0.123 |
| | (0.066) | (0.081) | (0.085) |
| Constant | −0.005 | 0.008 | 0.039*** |
| | (0.007) | (0.008) | (0.012) |
| Observations | 420 | 270 | 150 |
| *R*-squared | 0.426 | 0.392 | 0.699 |
| Number of id | 30 | 30 | 30 |

*Notes*
(1) *, ** and *** indicate significance at the significance level of 10%, 5%, and 1%, respectively
(2) Robust standard errors are indicated in parentheses

The eastern region is generally at a higher development level, and the per capita GDP level has approached or reached the international middle-income level. Meanwhile, the growth rate has slowed down, which is manifested by the initial per capita GDP level that significantly inhibited economic growth. From the eastern region to the central region and then to the western region, this inhibitory effect gradually weakened and became insignificant. This shows that the central and western regions are still in the initial stage of economic development and are undergoing a process

**Table 6** Grouping of provinces and cities

| Location | Provinces and cities | Number of provinces and cities |
|---|---|---|
| Eastern Region | Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan | 11 |
| Central Region | Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan | 8 |
| Western Region | Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan,Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang | 11 |

of rapid growth. Therefore, they have plenty of stamina for development, large room for growth, and a certain degree of latecomer advantages.

From the investment driving effect, the driving effect of fixed asset investment on economic growth is very significant in the eastern and central regions but not in the western region; the driving effect of foreign investment on economic growth is only significant in the eastern region, while in the central and western regions, it is very weak and not significant. This shows that the eastern region has great advantages in government budgets and foreign investment, while the central and western regions are restricted by location factors, making it difficult to attract foreign investment, and local governments have limited financial resources to make large-scale government-led investments. The contribution of investment-driven effects to economic growth is limited.

From the stimulating effect of household consumption on economic growth, the eastern region is the most significant, and the central region also shows a certain stimulating effect, while in the western region, household consumption has almost no stimulating effect on economic growth. Considering the moderating effect of the age structure of the population, the marginal contribution of population aging to consumption has an inhibitory effect, but it is the weakest in the eastern region, followed by the central region, and the strongest and most significant in the western region. A reasonable explanation is that under the same demographic conditions, due to a large number of working-age people migrating from the western region to the central and eastern regions, the young and middle-aged population in the western region is "deficient", and the true aging degree in the western region is more serious than the statistics show; that is, the aging indicators in the statistics underestimate the true aging degree in the western region. In this case, the absolute value of the regression coefficient of the aging index in the western region will be overestimated.

## 4 Conclusions and Recommendations

Based on the examination of the impact mechanism of population aging on economic growth at the provincial level through empirical analysis of panel data from 30

**Table 7** Estimation results of the regression model by sample in the eastern, central and western regions

| | (10) | (11) | (12) |
|---|---|---|---|
| | Eastern | Central | Western |
| Variables | $Growth_{it}$ | $Growth_{it}$ | $Growth_{it}$ |
| $GDPPerCap_{it-1}$ | −0.367*** | −0.194* | −0.117 |
| | (0.066) | (0.101) | (0.083) |
| $AssetInvest_{it}$ | 0.143*** | 0.128*** | 0.053 |
| | (0.025) | (0.044) | (0.070) |
| $FDI_{it}$ | 0.028** | 0.006 | 0.027 |
| | (0.013) | (0.039) | (0.019) |
| $Consum_{it}$ | 0.120** | 0.146* | 0.015 |
| | (0.059) | (0.085) | (0.105) |
| $Sav_{it}$ | −0.031 | −0.190 | −0.086 |
| | (0.044) | (0.117) | (0.098) |
| $Sav^2{}_{it}$ | −0.005 | −0.048*** | −0.028** |
| | (0.004) | (0.015) | (0.011) |
| $AgeStruc_{it}$ * $AssetInvest_{it}$ | 0.012 | 0.450** | 0.176 |
| | (0.037) | (0.198) | (0.304) |
| $AgeStruc_{it}$ * $Consum_{it}$ | −0.105* | −0.516* | −0.761*** |
| | (0.054) | (0.290) | (0.231) |
| $AgeStruc_{it}$ * $Sav_{it}$ | 0.065 | −0.202 | 0.353 |
| | (0.071) | (0.318) | (0.298) |
| Constant | 0.019 | 0.005 | −0.029 |
| | (0.015) | (0.056) | (0.035) |
| Observations | 154 | 112 | 154 |
| *R*-squared | 0.600 | 0.517 | 0.389 |
| Number of id | 11 | 8 | 11 |

*Notes*
(1) *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively
(2) Robust standard errors are indicated in parentheses

provinces and cities in China for the past 15 years, we come up with the following conclusions:

1. In general, the investment-driven effect is the main driving force of economic growth, and the stimulating effect of household consumption on the economy is not obvious enough. Economic growth has an inverted U-shaped relationship with household savings, and excessive household savings are not conducive to economic growth. Population aging has the tendency to restrain residents'

consumption and promote residents' savings, which will further restrain the stimulating effect of consumption on the economy and is not conducive to long-term economic development.
2. As China entered an aging society, the phenomenon of weak consumption has intensified in recent years; the population policy has had a macro-control effect. After the full implementation of the "two-child policy for couples that are both only child" in 2011, the suppression of the aging population on residents' consumption was eased.
3. From the perspective of regional differences, the western region has sufficient potential, and it also has greater disadvantages in attracting foreign investment and expanding investment; taking into account the migration of the working-age population among regions, the real aging degree in the western region is higher than the statistics, with greater pressure to cope with the aging population.

Based on the above conclusions, we believe that the following aspects should be taken to address population aging:

1. Vigorously cultivate the domestic consumer market, actively expand domestic demand, seek new sources of economic growth, and over-leap the "middle income trap".
2. In the process of realizing the transformation of the economic growth mode from investment-driven to consumption-driven, efforts should be made to overcome the resistance brought by the aging of the population: cultivate and support the elderly care industry, medical industry, cultural industry, and tourism industry facing an aging society; promote correct consumption and savings concepts in the whole society; and guide the aging population to consume reasonably.
3. The nation should issue a population policy in a timely manner, actively regulate the population structure, and give full play to the guiding role of macro policies for the entire society.
4. Adhere to the strategy of comprehensive, coordinated and sustainable development, improve the uneven development among regions, focus on helping the western region in attracting foreign investment, increasing investment, and absorbing employment; actively guide migrant workers to return to their hometowns for employment and entrepreneurship; improve the demographic structure of the western region, and prevent it from getting old before getting rich.

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# Population Aging and Financial Support: Based on the Analysis of Financial Institutions Supporting the Development of the Aging Industry


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With the continuous intensification of population aging, the extension of life expectancy and the advent of an aging society, how to meet the various needs brought about by population aging and effectively solve the problem of aging industry development have become important issues today. The aging industry is a key area to ensure and improve people's livelihood, a sunrise industry with national policy support, social capital attention, and broad development space. Driven by complex factors such as population aging, medical integration, and systematization of elderly care, the aging industry develops at a rapid pace, emerging strong demands in investment and financing and gestating a trillion-level financial supply market.

## 1 Comparative Analysis of the Development Modes of the Aging Industry

As of 2017, the number of people aged 60 and above in China reached 241 million, accounting for 17.3%; the number of people aged 65 and above reached 158 million, accounting for 11.4%. Apparently, the trend of population aging in China is becoming increasingly emergent. China has become an aging society. How to effectively serve the rapid development of the aging industry by relying on financial institutions and continuously improve the service ability of the elderly care sector has become an important topic today. There are three main modes of the aging industry globally:

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_7

government mode, market mode, government-led and market-integrated mode. The government mode means that the government manages the development of the aging industry, a typical form of which is public pension institutions in which the government responsible for full funding, appointing or hiring management personnel. This mode is suitable for countries with small populations with easy management and orderly guarantees, such as high-welfare countries Norway and Denmark in northern Europe. Market mode means that the market determines the development of the aging industry and realizes resource allocation through market competition. This mode is suitable for a high-end aging industries instead of a low-end society, as it is prone to market failure. The government-led and market-integrated mode means that the government and the market support each other: the government provides macro-orientation and scientific positioning, policy support and macro-control, and guidance for the construction of a reasonable and orderly service system; the market at a micro-level provides the aging industry the best competitive environment, gives full play to the role of the market mechanism, and meets the public and welfare needs. This mode has been adopted by China and many countries around the world.

## 2 The Overall Position of Financial Institutions Supporting the Aging Industry

As an important part of public utilities, the development of the aging industry needs to rely on the integration of the government and the market: government provides policy support and guidance from the macro level from top to bottom, and the market combines the needs of the aging industry to guide its rapid development, thus establishing a financial service system for the aging industry that the government and the market work together.

1. Position of financial institutions supporting the development of the aging industry. Grasping the opportunities of the aging industry, financial institutions should increase support in key areas and effectively leverage the advantages of comprehensive financial services, promoting the development of the aging industry through multiple channels. First, highlight the leadership of the government and give full play to the role of financial institutions; financial institutions should work closely with the government by signing strategic cooperation agreements, relying on the government's important role in leading the development plan for the aging industry, strengthening the effective connection with the National Development and Reform Commission, the Health and Family Planning Commission, the Civil Affairs Bureau and other relevant departments, and providing financial support for major projects and high-quality enterprises in the aging industry. Second, highlight the strategic planning and focus on financial product innovation. Financial institutions should grasp the historical opportunity of the vigorous development of the aging industry, with national support

for improving the financing mechanism, and encouragement of financial institutions to innovate products and services. Financial institutions should determine the financial support, market planning and customer service strategies in accordance with the characteristics of different regions. In particular, with regard to the support of key industries, it is necessary to increase financial product and service innovation, take first steps in management modes, policy support, and product innovation, and accelerate support for the innovation and development of aging industries, continuously improving the overall competitiveness of the aging industry. Third, highlight the characteristics of the industry and create comprehensive service advantages. Financial institutions must accurately understand the financial needs of the aging industry to improve and serve the people's livelihood, enrich financial service modes based on comprehensive analysis of industry characteristics and service needs, accelerate financial business innovation, improve comprehensive financial services, and scientifically plan "commercial banks + investment banks", "On-balance sheet + off-balance sheet", "Enterprise + Resident", "Bank + Insurance" and other integrated comprehensive financial services, effectively serving high-quality customers and continuously expanding the market space. Fourth, highlight the quality of development and build a smart aging industry. Financial institutions should pay close attention to the development of the aging industry by establishing a multidimensional and differentiated database, scientifically classifying the development data, rationally analyzing the operating characteristics, and effectively controlling abnormal changes in the operation of the aging industry. Financial institutions should improve the efficiency of financial services, control risks, and provide strong support for the intelligent, integrated and systematic development of the aging industry. At the same time, financial institutions should establish a professional service team, combining the actual needs, matching flexible and diverse financial products, and effectively meeting the needs of the aging industry.

2. The service mode of financial institutions supporting the aging industry. According to the development plan for national health and medical big data applications, China will establish a national health and medical big data center and supporting industrial parks, a national and provincial population health information platform, and a national drug bidding and procurement business application platform. How to integrate the health and medical industries with financial capital has become a hot topic today. First, promote the integration of life insurance and pensions and actively carry out cooperation between banks and insurance companies. Life insurance companies such as Life Insurance, Ping An, Taikang and others have designed pension insurance products to provide migratory bird-style pension services, and extensively carry out the location and layout of institutions for the elderly across the country. Financial institutions must provide differentiated services to support life insurance companies to meet their actual needs, understand their acquisition or leasing plans for high-end facilities for the elderly, choose the best cooperation according to the list of projects, and recommend pension companies that carry out financing cooperation, facilitate the purchase of services and reduce various risks of financial institutions and life insurance

companies. Second, expand the entry of capital and develop cooperation preferentially. Financial institutions should carefully select national chain service institutions with good shareholder qualifications, rich experience in medical and pension services, and controllable risks; select high-end medical and pension projects such as traditional Chinese medicine, dentistry, and physical examination, especially those high-end elderly care projects; carry out financing cooperation under the premise of locking in income and cash flow; firmly grasp the rich resources, formulate special aging industry service plans, and effectively improve the financial supply capacity of hospitals and elderly care institutions; consolidate the cooperative relationship between financial institutions and the aging industry; and increase the comprehensive contribution of the aging industry to society through cross-level and door-to-door tracking and maintenance mechanisms. Third, a medical data platform should be built to provide integrated services. Financial institutions should actively participate in the construction of national and local health and medical big data, financing to support the construction of the health and medical big data industrial park and the entry of upstream and downstream companies in medicine, diagnosis and treatment, equipment, health, IT, etc., formulate detailed financial service plans, participate in the national medical big data center and support industrial parks, as well as the provincial population health information platform, the national drug bidding and procurement business application platform and other related constructions, meet the actual needs of the Health and Family Planning Commission in a timely manner, and better perform the function of financial services for the park and related enterprises.

## 3 Implementation Path of Financial Institutions Supporting the Aging Industry

1. Development path of financial institutions supporting the aging industry. Financial institutions should firmly grasp the opportunity for the development of the aging industry, actively expand loans, and vigorously support the establishment, renovation and expansion of public institutions, national and provincial base projects, especially those projects listed by the Ministry of Finance, the PPP demonstration projects and government-purchased service projects of the provincial finance department, relax the loan period considering the actual needs, lower the loan interest rate, and effectively support the development of the aging industry through various financing methods, such as syndicated loans and bond issuance. Financial institutions should seize the rapid development opportunities of listed companies in the aging industry, carry out business-investment interactions, establish close cooperative relationships with high-quality customers in the aging industry with listing plans, actively participate in the determination of large-scale medical, insurance, pharmaceutical, and real estate listed companies, participate in investment banking businesses such as banks, industrial funds, and financial advisors, and combine traditional credit, cash management and other

financial services to achieve strategic cooperation. Financial institutions should integrate Internet finance with mobile medical care, comprehensively expand bank-medicine cooperation, solve resource input issues involved in cooperation through special funds, actively contract settlement services for high-quality hospitals, and establish a scientific financial service system for the aging industry.

2. Development path of financial institutions supporting the medical industry. Financial institutions should combine the opportunities for the increase in overall demand of the medical investment group brought about by the reform of the medical and pension systems, increase project loans and working capital loans to meet the financial needs of public hospitals for improved medical conditions brought by graded diagnosis and treatment and the new rural cooperative medical system. First, as they play an active role in the radiation of the medical industry chain, financial institutions should focus on the supply chain and actively expand three types of medical industry chain financing: the pharmaceutical procurement platform chain, the pharmaceutical chain and the medical insurance chain. The platform chain is an e-commerce platform based on the provincial pharmaceutical procurement platform and pharmaceutical distributors. Relying on the management platform to generate real trade background and verifiable payment information data, financial institutions, hospitals, and pharmaceutical distributors carry out supply chain financing and optimize the quality pharmaceutical procurement platform, as well as the self-built e-commerce platform of pharmaceutical distributors with stable cooperative relations with large hospitals. The pharmaceutical chain takes excellent first-class hospitals as the core enterprise and provides supply chain financing with upstream drug and medical device suppliers. Suppliers with cooperative relationships with first-class hospitals, stable sales income, and logistics and distribution capabilities are preferred. The medical insurance chain is based on the hospital as the core enterprise, and the factoring business is carried out by downstream medical insurance management institutions. Hospitals with higher levels, more beds, and a number of intermediate and senior medical staff are selected for financing. Second, a new format system for the aging industry should be actively built. Medical groups, medical equipment, pharmaceuticals, real estate and other enterprises have extended their development or cross-border integration to the upstream and downstream of the industrial chain, and some new forms of medical and elderly care integration have emerged. The medical group relies on its own rich medical resources and disease sources to develop medical equipment leasing, set up a pension care center with integrated medical care, and try an international strategy of going out to carry out overseas mergers and acquisitions. Medical device suppliers and financial institutions signed cooperation agreements to provide information on the needs of cooperative hospitals. Financial institutions will match different financial needs, and the three parties will work together. Pharmaceutical companies should participate in the reform of the basic medical system, build or purchase hospitals by themselves, and form a complete industrial chain integrating medicine. Real estate companies should integrate their own tourism real estate, hotels and other resources to develop the elderly care industry. Financial institutions should also continue

to innovate financial cooperation modes, conduct key research in combination with emerging new business formats and new projects, and launch a package of financial products such as project loans, mergers and acquisitions, financial leasing, deposits, and settlements in due course.

## 4 The Strategic Option of Financial Institutions Supporting the Pharmaceutical Industry

The pharmaceutical industry is a key area for the development of the aging industry, and how financial institutions can effectively support the business development of the pharmaceutical industry chain has become an important issue for serving the real economy. The pharmaceutical industry industrial chain mainly includes upstream chemical raw materials, pharmaceutical excipients, Chinese medicinal materials and other raw materials, the middle and upper reaches of the pharmaceutical industry such as chemical medicine preparations, traditional Chinese medicine preparations, bio-medicine, medical device research and development and production, and the middle reaches of the pharmaceutical wholesale and retail. Pharmaceutical business includes downstream hospitals, pharmacies, physical examination institutions, health management consulting institutions, health care products, health care and other medical product applications.

1. Development strategy of financial institutions supporting the pharmaceutical industry. The output value of the pharmaceutical industry is growing rapidly. From the perspective of historical development, government medical reform plans, and drug price information, the future pharmaceutical industry market has huge development potential and is full of huge investment and financing opportunities. Financial institutions should seize opportunities for the development of the pharmaceutical industry, increase financial support for key industrial areas, and give full play to their advantages in comprehensive financial services. First, we focus on supporting leading companies in the pharmaceutical industry to improve comprehensive financial service capabilities. With the advancement of policies such as consistency evaluation and the two-invoice system, the pharmaceutical industry is undergoing many changes, and the trend of industrial agglomeration is very obvious. Financial institutions must provide key and high-quality customers such as industry chain leading enterprises with deposits and loans, bond issuance, equity financing, comprehensive financial services such as investment and wealth management, financial leasing, cash management, international business, financial markets and comprehensive services. Second, actively follow up the extension of the pharmaceutical industry chain and reasonably grasp business investment opportunities. In recent years, while based on their main business, pharmaceutical companies have gradually extended their business to upstream and downstream of the industrial chain to achieve economies of scale. This trend will bring financial institutions business opportunities for

commercial investment. Financial institutions should combine the characteristics of subindustry and customer clusters, expand corporate resources around the industrial chain, and increase overall penetration; at the same time, they should focus on business and investment interactions and combine traditional credit business with industrial funds and other off-balance-sheet financing businesses to select the companies that best meet the domestic and overseas M&A needs of leading companies in the industry chain and support innovative companies with strong R&D capabilities and successful entry. Third, relying on the radiation capabilities of leading companies promotes the development of supply chain financing businesses. Financial institutions should prioritize meeting the supply chain financing needs of large-scale comprehensive industry leading enterprises, relying on their upstream and downstream radiation capabilities to expand online supply chain financing business, focus on key capital demand throughout the life cycle of upstream pharmaceutical industry orders and downstream pharmaceutical business and hospital procurement funding needs, and focus on the pharmaceutical trading platform that is being piloted.

2. Development path of financial institutions supporting pharmaceutical companies. Financial institutions should scientifically sort out pharmaceutical companies, formulate a list of financial services for pharmaceutical companies, focus on the top 100 pharmaceutical companies and listed pharmaceutical companies, and select high-quality companies in the park and the new third board innovation layer. First, the top 100 pharmaceutical companies. The Top 100 Pharmaceutical Industry List released by the China Pharmaceutical Industry Information Center and the Top 100 Pharmaceutical Business List released by the Ministry of Commerce include nearly 200 top 100 pharmaceutical companies, covering leading companies in the industry. Financial institutions should focus on the stability of production and operation, as well as recent development in the past few years, whether there has been a cliff-like decline in product sales or excessive investment and financing, etc., and provide comprehensive financial services for the top 100 pharmaceutical companies. Second, A-share listed companies. In 2017, there were more than 200 pharmaceutical A-share listed companies in China. These companies have been reviewed and screened by the China Securities Regulatory Commission. Most of these companies are industry leaders. Financial institutions should focus on changes in credit ratings, stability of their main businesses, management status in the past few years, and the income of the pharmaceutical business has given financial support to key development areas and scientific research fields. Third, there are high-quality enterprises in the park. Industrial parks are mainly national high-tech zones, pharmaceutical industrial parks, biomedical industrial bases, etc. Industrial parks create a good environment for the agglomeration and characteristic development of pharmaceutical companies. Financial institutions should cooperate with the park management committee, pay attention to the park's policy guidance, and screen for growth. High-quality companies with good performance and controllable risks are included in the list of key support companies. The selection criteria for excellent companies mainly include the major shareholder of the company and members of the national

"Thousand Talents Program" medical experts and biomedical products such as antibody drugs, recombinant protein drugs, new vaccine products, nucleic acid drugs and cell therapy products. The company has major innovative drugs or first generic drugs that have entered Phase III clinical trials and has at least one single drug product with a sales revenue of more than ¥10 million. Fourth, innovative enterprises on the New Third Board. In 2017, there were more than 60 pharmaceutical companies in the New Third Board innovation companies. Such companies have strong market competitiveness and large capital market business needs. Financial institutions should focus on growth and avoid investing in "drawing big pie" to make a living. Fifth, outsourcing R&D organizations and outsourcing processing organizations. With the in-depth advancement of the consistency evaluation and drug marketing license holder system, the demand for R&D and production outsourcing of pharmaceutical companies continues to increase. CROs and CMOs will be important forces in the pharmaceutical industry. Financial institutions should focus on the R&D capabilities of such companies. Several outstanding enterprises provided key financing support.

3. Coordination and linkage mechanism of financial support industry development. Financial institutions should maintain close communication with government departments such as the Ministry of Industry and Information Technology, the Food and Drug Administration, the Health Commission, the Ministry of Commerce, and relevant industry associations to share information on the pharmaceutical industry; actively connect with local government departments to grasp changes in local pharmaceutical industry policies and focus on special subsidies Information such as the list of companies and companies; cooperate with industry associations and research institutions in the region to regularly obtain industry statistics, market research reports, corporate product rankings and other information to provide decision-making reference for the expansion of related businesses; and accurately grasp the product efficacy characteristics and market prospects can be explored by external experts and third-party evaluation mechanisms. Financial institutions should promote the pharmaceutical industry as a whole, do a good job of market research, field investigations and forecast analysis, clarify the list of key enterprises, do a good job in communication and coordination with relevant departments, and establish relations with government agencies, key enterprises, industry funds, various pharmaceutical research institutes. The normalized exchange mechanism of industrial institutions actively explores innovative financial services. Financial institutions should establish a pharmaceutical industry chain marketing team, build an information exchange platform, and carry out systematic promotion through information interaction, training and guidance. Financial institutions should strengthen business coordination with other departments in the industry and coordinate with companies in the industry to form an integrated financial service mechanism. Domestic and foreign financial institutions must maintain effective linkages, strengthen the information sharing of leading companies in the cross-regional and cross-border layout, establish a normalized communication mechanism, and jointly serve key enterprises and major projects. Financial institutions should strengthen risk prevention

and monitoring mechanisms, deeply analyze the operation and financial status of pharmaceutical companies, and strictly observe the bottom line of risk control. For customers included in the list of key companies, financial institutions should clarify the person responsible for corporate risk prevention and control and implement business access and survival Periodic management responsibility to ensure the sustainable and healthy development of the business of the listed companies.

## 5 Suggestions for Financial Institutions Supporting the Happiness Industry

The happiness industry is an important development direction of the aging industry, including tourism, culture, medical care, education, pension, sports and other industries, which can promote the optimization and upgrading of the aging industry and enhance the competitive development advantages of financial institutions in the conversion of old and new kinetic energy of the aging industry. The report to the 19th CPC National Congress stated that "the principal challenge facing Chinese society is the gap between unbalanced and inadequate development and the people's growing expectation of a better life", which has brought major development opportunities for the happiness industry. The happiness industry has many advantages, such as being green, having a weak cycle, and having a stable livelihood. It has received increasing attention from government departments at all levels and has become a key area for governments at all levels to attract investment. According to the plan of the National Development and Reform Commission, the proportion of the happiness industry in GDP will increase from the current 23.5% to approximately 30% by 2020, and the added value of the happiness industry will reach ¥35 trillion. The happiness industry will become a new driving force for future economic growth, accelerate the optimization of the economic structures, drive consumption upgrades, and become a key sunrise industry with policy guarantees, social recognition and development potential. Financial institutions should grasp favorable opportunities for the development of the happiness industry, accelerate the cultivation of new drivers of happiness, regard the happiness industry as a new engine and key development direction for the transformation of the aging industry, adhere to the principle of government-led, service aging, and optimal efficiency, and closely focus on hospitals, scenic spots, universities, senior care, sports and other fields, solidly promoting the full financing and full product supply of the happiness industry.

Financial institutions should choose to develop well-known scenic spots listed on the World Natural and Cultural Heritage Protection List, scenic spots with cultural heritage or unique natural landscape resources in key areas such as economically developed provinces, first-tier cities, and major tourism provinces where industries are highly concentrated, and provincial-level cultural tourism group medical industry chain, key colleges, education and training and pensions and other core sectors. First, we should continue to strengthen docking and cooperation with local government departments to seize the commanding heights of new market expansion.

Financial institutions should comprehensively strengthen the docking and cooperation with local development and reform commissions, cultural bureaus, health and family planning commissions, sports bureaus, tourism development commissions and other government departments, establish regular contact and consultation and communication mechanisms, realize a package of comprehensive financial service cooperation, grasp key enterprises from the source, investment planning and implementation arrangements for major projects, actively seek support from the competent government departments, and put forward guiding financial demand recommendations, make good use of financial discounts, poverty alleviation and other policies, promote the implementation of major cooperation projects, maintain the first-mover advantage in the aging industry market, and establish market dominance. Second, we focus on establishing a systematic promotion mechanism to deepen service support for key industries and key enterprises. Financial institutions should take the development of the happiness industry as a sunrise industry, combine the characteristics of regional development, scientifically formulate happiness industry service targets, make full use of government policies and resources, give priority to the allocation of credit resources, formulate service support plans based on local conditions, select companies List, lock support projects, match professional teams, improve service efficiency, and ensure financial services for the happiness industry are in place. Third, exclusive financial service plans and financing guidelines are formulated to improve service quality and efficiency. Financial institutions should take into account the development of the regional happiness industry and the characteristics of corporate needs and implement matrix guidance for key industries with financing guidelines, service plans, and case expansion, scientifically positioning what to do, how to do it, how to manage risks, how to improve overall returns, and how to improve services quality and financing efficiency. Financial institutions should establish exclusive service teams for the happiness industry covering different levels and professional fields, organize different levels of guidance through seminars, forums, etc., interpret happiness industry policies, introduce key financial products, analyze specific service cases, and enhance the service team in all directions.

Financial institutions should combine regional resource endowments and project reserves to formulate happiness industry expansion goals and, based on these goals, determine the service targets and development directions of the happiness industry, study and analyze the financial service needs of listed companies, establish hierarchical and multidimensional definitions for financing matters, match the exclusive credit scale of the happiness industry, formulate a schedule of financing services for each enterprise, and realize the rapid and healthy development of the happiness industry. First, the financial product portfolio should be strengthened and the breadth of business cooperation should be expanded. Financial institutions should combine specific industry characteristics and corporate needs, leverage the advantages of linkage, strengthen financial product portfolios, rely on linkages between on-balance sheet and off-balance sheet, investment and loan linkage, explore joint development modes, formulate overall happiness industry solutions, actively use project loans and financial leasing, supply chain and other financing products, unite Happiness Industry's large deposit certificates, wealth management, payment and

settlement, bank cards, Internet finance and other businesses. At the same time, we will coordinate with relevant departments to carry out special service activities to further promote the financing services of the happiness industry and continuously improve the overall profitability of the company. Second, strengthen the coordination of departments and improve management efficiency and quality. Financial institutions should further strengthen multi-sector linkages. According to the business needs of the happiness industry with industry characteristics and representative projects, we study the happiness industry project management guidelines, clarify business service terms, guide the selection of high-quality projects, and regularly evaluate project solvency and cash flow conditions to ensure good quality of corporate assets. Third, risk management measures should be strengthened to ensure the healthy development of investment and financing. Financial institutions should continue to optimize credit policies for key industries in the happiness industry, ensure the entry of investment and financing enterprises and projects, improve the service efficiency of various artificial tourism projects, such as theme parks and tourism complexes, and strive to resolve excessive investment scale, unclear positioning, and low investment-level repeated construction, insufficient level of operation management, real estate related difficulties, actively pay attention to the commercial operation mode of the health and elderly care sector, select high-quality enterprises, control substantial risks, and ensure the sustainable and healthy development of the happiness industry.

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# Population Aging and Supply-Side Structural Reform


**Ximing Dou, Wei Dai, and Jingfeng Wu**

The phenomenon of population aging first appeared in developed countries in Europe and the United States in the 1950s and covered most of the developed countries by the end of the 1970s. By the beginning of this century, it spread to developing countries such as China at a rapid pace. Population aging has become the most important demographic and social phenomenon worldwide today. According to the statistics released by the World Bank, the global population aging rate[1] was 8.48% by 2016, which exceeds the international standard of 7%, indicating that the world has entered an aging society. In the 40 years of the reform and opening up of China, while the economy is rapidly rising, the problem of population aging has also attracted much attention (Chen Sheying et al. 2011).

## 1 The Formation of an Aging Society and the Evolution and Status Quo of Population Structure

### *1.1 The Formation of an Aging Society in China*

Since the founding of the People's Republic of China (PRC), the trends of birth rate, mortality rate and aging rate of the population can be roughly divided into the following four periods according to the changing trends of different periods:

[1] IN this article, aging rate specifically refers to the proportion of people over 65 years old (inclusive) to the total population.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_8

(1) From 1949 to 1958. The birth rate was at a relatively high level of 30–40‰, and the mortality rate was also at a relatively high level of 10–15‰, showing no signs of aging.
(2) From 1959 to 1961. During the three years of economic hardship, the birth rate dropped sharply to 18.13‰ in 1961, and the mortality rate rose to 25.43‰, with no signs of aging.
(3) From 1962 to 1977. During the period of the restoration of food production and the Cultural Revolution, the birth rate began to rise again; after reaching its peak in 1963, it began to decline to a certain extent and remained at a high level above 20‰; the mortality rate began to fall at the earliest period and fell to 6.91‰ in 1977.
(4) since 1978. During the 40 years of reform and opening up, under the strict birth control policy, the birth rate dropped from 22.28‰ in 1982 to 14‰ in 2000; the mortality rate has always been maintained below 7‰; and the aging rate gradually rose as China entered an aging society. See Fig. 1.

In the first three periods of PRC, no matter how the birth rate and mortality rate changed, the aging rate remained stable at a low level of 3–5‰. Since the reform and opening up, the aging rate has started to rise from 4.46% in 1978 to 10.12% in 2016, driven by two major factors: low birth rate and low mortality rate. An aging society has formed, and it is getting worse every year.

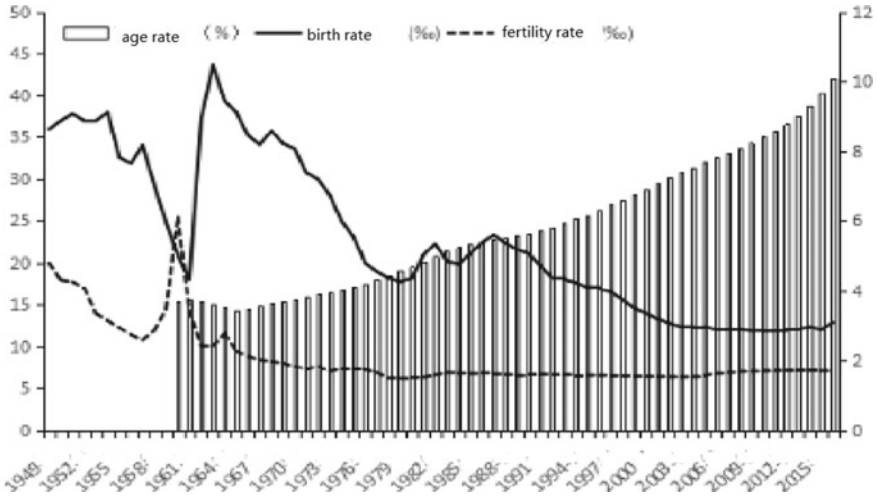


**Fig. 1** The graph of the trend of birth rate, mortality rate and aging rate in China. *Data source* Birth rate and death rate (1949–2016) are from *China Statistical Yearbook 2017*; aging rate (1960–2016) is from the World Bank

## *1.2 Evolution of the Aging Population Structure of China*

In an immature society with high birth and mortality rates, the age ratio structures of the social population present a "pyramid" shape. The top of the pyramid is the elderly population, the tower body is the labor force, and the tower base is young. The high mortality rate means that the elderly die out very quickly, thus forming a sharp spire; the high birth rate means that the newborn population is very large, resulting in a very wide base of the tower, thus presenting a typical "pyramid" population structure. With the further deepening of aging, in an aging society with low birth and mortality rates, the speed of death of the elderly becomes slower and slower, the spire becomes increasingly blunt; the young population at the bottom is smaller, and the base gradually narrows. The "pyramid" structure of population proportion has gradually evolved into a "0" shaped population structure, as shown in Fig. 2.

From the composition chart of the population proportion of each age group in China from 1982 to 2016, we can see that the proportion of the elderly is increasing, and the proportion of the labor force is also increasing, but the growth speed is not as fast as the growth of the elderly population; meanwhile, the relative decline of the proportion of the young population is also very fast. The reason for the rapid increase in the proportion of the elderly and the labor force is that the strict population control policy has led to the rapid decrease in the proportion of young people. See Fig. 3.

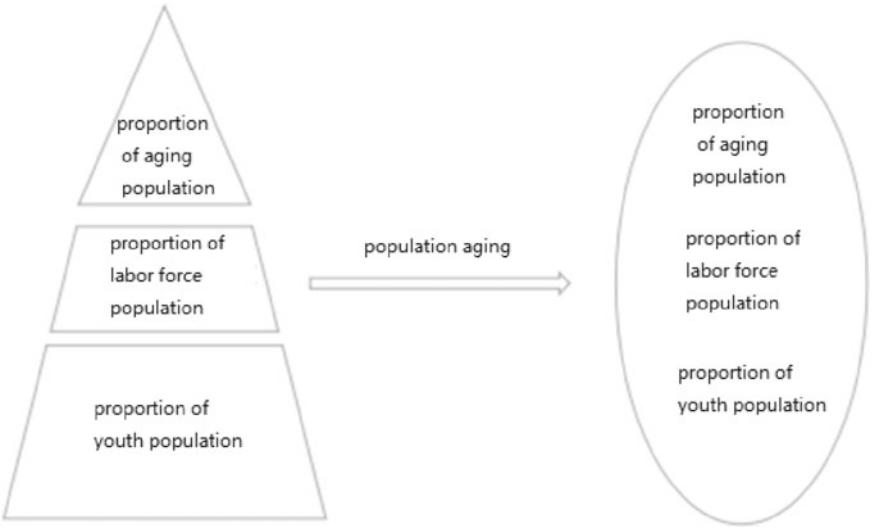


**Fig. 2** The evolution of the population proportion from the "pyramid" structure to the "0" structure

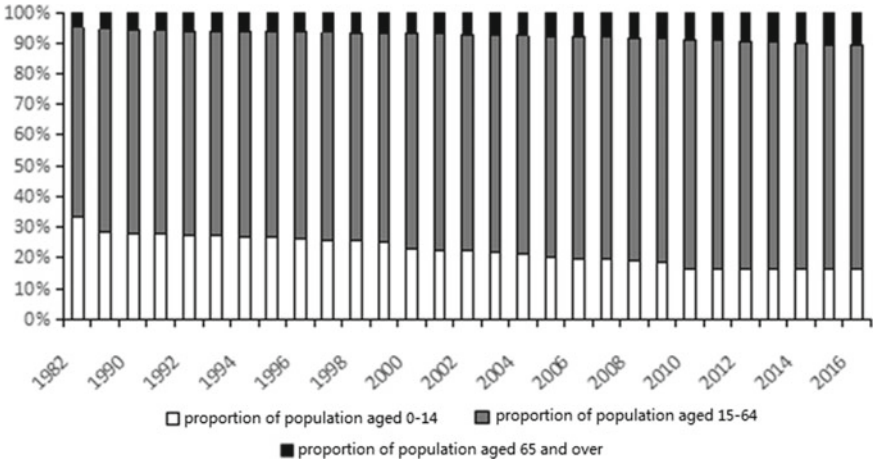


**Fig. 3** Composition chart of the population proportion of each age group in China from 1982 to 2016. *Data source China Statistical Yearbook 2017*

## *1.3 The Status Quo of Population Aging*

The United Nations released a report on global population aging in 2001, which can be summarized as the following four basic characteristics: "unprecedented", population aging is unprecedented in history, "broadness", its influence spreads to the whole world and affects everyone, "deepness", its influence has had a huge negative impact on many aspects of the economy and society, including economic growth, investment, consumption, savings, labor market, pensions and other economic fields, as well as social life such as family demographic structure, migration and housing, "lasting", and its influence is still being fermented and deepened after more than 60 years of development and continues to this day.

Population aging in China has the following three characteristics compared with global aging:

(1) Large population number and base
The number of elderly people over 65 in China has grown from 49.91 million in 1982 to 150 million in 2016, accounting for 10.9% of the total population. The large population base and an aging rate of 10.9% make China the country with the largest number of aging population in the world.

(2) Late start and fast growth
Population aging in China started in the 1980s. The population aging rate in 1953 was only 4.4%, and it experienced a slow increase. Only after 40 years of reform and opening up did it begin to accelerate, from 4.9% in 1982 to 10% for the first time at the end of 2014.

From a vertical level, the annual average growth rate from 1953 to 2016 was 1.4%. From the population policy implemented, population aging can be divided into three stages: 1953 to 1982 was the first stage, the time after the founding

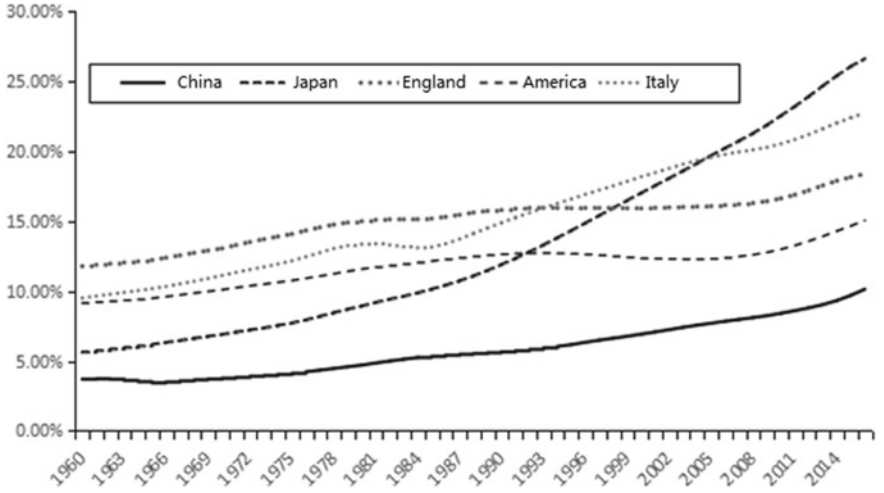


**Fig. 4** The trend of the aging rate in Japan, the United States, the United Kingdom, Italy and China. *Data source* World Bank

of the PRC and before family planning was established as the basic national policy. The annual average growth rate was relatively slow at only 0.3%; 1982 to 2015 was the second stage, from the implementation of family planning to the two-child policy. The annual average growth rate was 2.4%, 8 times the first stage; 2015–2016 was the third stage, and the population aging rate increased by 3.8% only one year after the two-child policy.

Horizontally, from international comparison, according to statistics from the World Bank, the aging rate of China ranked 75th in 1960 and jumped to 62th in 2016. Japan, the most aging country, took 35 years for the population aging rate from 5 to 10%; Italy, ranking second, took at least 100 years; China only took 33 years to become the country with the fastest aging growth rate in the world. See Fig. 4.

(3) Full entry of an "advanced aging society"
The aging society can be divided into the following 5 stages based on the degree and speed of population aging[2] by international indicators (see Table 1).

According to the standards of the United Nations, a country (or region) with more than 10% of the population over 60 years old (inclusive) or over 7% of the population over 65 years old (inclusive). This is regarded as a criterion on the entry into an aging society. China officially entered an "aging society" in 2000 with an aging rate exceeding 7% and entered an "advanced aging society" in 2014. If the average rate of the past 10 years continues, it is expected that China will enter the "aged society"

[2] See Wang Zhibao, Sun Tieshan and Zhang Jiefei, "Division of Population Aging Regional Types and Analysis of Regional Evolution-Taking China, the United States, Japan and South Korea as examples", *Geographical Science* 2015(7).

**Table 1** Division of the degree and speed of population aging

| Stage of population aging | Average population aging rate$^{x}$ (%) | Speed | Average growth rate of aging population (%) | Grade |
|---|---|---|---|---|
| Non-aging society | $x \leq 7$ | Super slow | $v_x \leq 1$ | 1 |
| Aging society | $7 < x \leq 10$ | Medium slow | $1 < v_x \leq 3$ | 2 |
| Advanced aging society | $10 < x \leq 14$ | Medium fast | $3 < x \leq 4$ | 3 |
| Aged society | $14 < x \leq 20$ | Fast | $4 < v_x \leq 5$ | 4 |
| Hyper-aged society | $x > 20$ | Super fast | $v_x > 5$ | 5 |

in 2027 and reach the "super-aged society" in 2047. Without control, the time will be even advanced.

## 2 Analysis of the Causes of China's Population Aging Under Specific Historical Conditions

To actively respond to the problem and challenge of population aging, it is imperative to have a full analysis of the underlying reasons for the increasing trend of population aging in China and a thorough exploration for a realistic path of supply-side reform at the critical juncture of deepening reforms.

Multiple factors have resulted in the population aging of China, such as population policies and the extension of life expectancy. Population policies are the main reason. Many experts and scholars (Wang Xianzhi 1998; Yao Jing and Li Shuang 2000; Li Lanyong and Liu Yuan 2013; Wu He 2017) have conducted research on the low birth rate caused by family planning and the low mortality rate caused by the extension of life expectancy. However, few studies have paid attention to the three waves of "baby booms" entering the aging period after the founding of the PRC and the population outflow and domestic population flow. Now, we mainly elaborate from these two perspectives.

### *2.1 "Baby Boomers" Have Aged Successively*

The first baby boom appeared in China from 1949 to 1958, the second baby boom appeared during 1962–1973, and the third baby boom appeared from 1985 to 2000; 1959–1961 and 1976–1982 were the low ebbs. The three major "baby booms" are shown in Fig. 5.

The first wave was the "post-war baby boom" period from 1949 to 1958. The domestic and foreign wars ended, under the policy of "Rehabilitation" and "more people, more strength" in the people's communal movement, the birth rate was at a

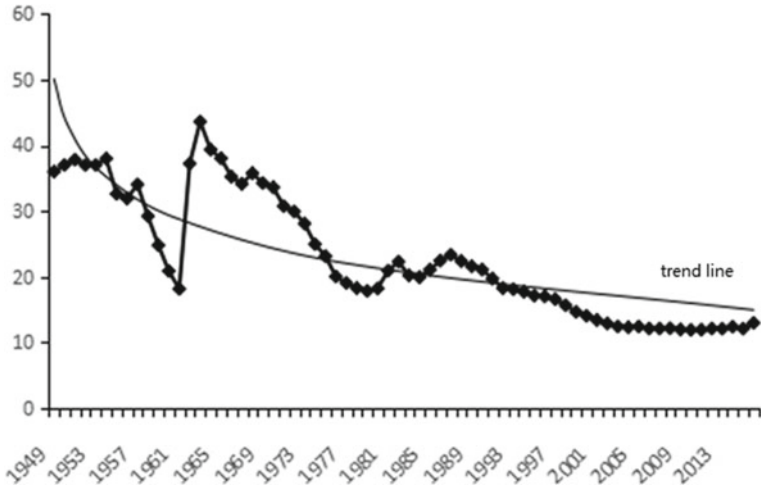


**Fig. 5** The birth rate (‰) and trend of China from 1949 to 2016. *Data source China Statistical Yearbook (2017)*

high level of 30–40‰. The number of babies born during this period was nearly 208 million, but due to the poor medical and health conditions and three years of economic hardship, the mortality rate was relatively high. The "post-war baby boom" population failed to become the main peak of the baby boom, similar to other countries after World War II.

The second wave was the main peak baby boom period from 1962 to 1972. After three years of economic hardship, food production recovered, and people's living conditions improved. The birth rate exceeded 30‰ and peaked at 43.6‰ in 1963. It was unprecedented in Chinese history, with the largest number of births and the most profound influence; nearly 300 million babies were born, accounting for 21.7% of the current population.

The third wave was the "echo baby boom" period from 1986 to 1990. This is another baby boom that resulted from the postwar and the main peak baby boomers reaching the age of childbirth. It peaked in approximately 1989. Nearly 123 million people were born during this period, accounting for 9.0% of the current total population; the number of births was less than the previous two waves of baby booms because of the strict population control policy.

At present, postwar baby boomers are entering the aging period at approximately 60–70 years old. The main peak baby boomer, with a large proportion, is about to enter the aging period at approximately 45–56 years old. The interaction of the first two "baby booms" has intensified the increasing aging of China.

## 2.2 Population Migration

According to the degree and speed of aging, it can be divided into non-aging (1), mild aging (2), advanced aging (3), aged (4) and hyper-aged society (5). The aging rate of most provinces and cities of China falls at the 1, 2 and 3 levels. There are 12 "advanced aging" provinces and cities, in which Liaoning has the highest aging rate, and Shandong and Jiangsu take second place. Provinces and cities with larger populations of young immigrants, such as Beijing, Shanghai, Guangdong and other developed coastal provinces and cities (except for those provinces and cities that have not yet released corresponding data, such as Zhejiang), have lower degrees of aging than the cities with large outflow populations in the northeast, west, and southwest regions. The three northeastern provinces, Liaoning, Jilin and Heilongjiang, all fell in rank 3, becoming the regions with the most serious aging rates in the country. The aging degree in various provinces, autonomous regions and municipalities of China in 2016 is shown in Table 2.

**Table 2** The aging degree in various provinces, autonomous regions and municipalities of China in 2016

| Region | Proportion of population aged 65 and above (%) | Level | Region | Proportion population aged 65 and above (%) | Level |
|---|---|---|---|---|---|
| Anhui | 12 | 3 | Liaoning | 13.51 | 3 |
| Beijing | 10.6 | 3 | Inner Mongolia | 0 | 1 |
| Chongqing | 12.5 | 3 | Ningxia | 0 | 1 |
| Fujian | 8.6 | 2 | Qinghai | 7.54 | 2 |
| Guangdong | 8.55 | 2 | Shanghai | 0 | 1 |
| Guangxi | 9.95 | 2 | Shandong | 13.18 | 3 |
| Guizhou | 10.32 | 3 | Shanxi | 9.49 | 2 |
| Gansu | 9.07 | 2 | Sichuan | 0 | 1 |
| Hainan | 0 | 1 | Shaanxi | 10.4 | 3 |
| Henan | 9.9 | 2 | Tianjin | 8.6 | 2 |
| Hebei | 0 | 1 | Xinjiang | 0 | 1 |
| Heilongjiang | 12 | 3 | Xizang | 0 | 1 |
| Hunan | 11.75 | 3 | Yunnan | 0 | 1 |
| Hubei | 0 | 1 | Zhejiang | 0 | 1 |
| Jiangsu | 12.77 | 3 | Hong Kong | 0 | 1 |
| Jiangxi | 9.8 | 2 | Macau | 0 | 1 |
| Jilin | 11 | 3 | Taiwan | 0 | 1 |

*Note* Since the data on the "proportion of population aged 65 and above" in Hubei, Zhejiang, Sichuan and other provinces have not been released, it is treated as 0 here
*Data source* Statistical Bulletin of National Economic and Social Development of China's Provinces (municipalities and autonomous regions) 2017

(1) Population migration has exacerbated the aging imbalance of regions
Without population migration, the birth rate and mortality rate of developed cities such as Beijing, Shanghai, Guangzhou and Shenzhen are relatively low and will be the areas with the highest aging degree in China. For the central and western regions, the aging phenomenon will be less serious. However, population migration has alleviated the aging trend of permanent residents in developed cities due to its powerful "siphon effect", namely, metropolises attract young laborers to work and settle. With the process of reform and opening up and urbanization, hundreds of millions of young rural laborers have poured into cities to work. Elderly people and children stay in the countryside and become empty-nest elders and left-behind children. When young people fully settle in cities, they will take the elderly and children to the cities.[3] This has accelerated the aging trend of the relatively backward central, western and northeastern regions and has enlarged the differences and imbalance of the aging process among regions.

(2) Population migration has widened the aging gap of regions
In the beginning, from low to high, the aging rate of China was divided into three major plate patterns in the western, central and eastern regions. With the narrowing of the aging gap in the central and western regions, it gradually transformed into the "two major plates" pattern in the central and western regions. The aging rate in 2005 was 9.07%, 13 provinces and cities exceeded the average level, including 7 provinces and cities in the east (accounting for 53.8%), 3 provinces and cities in the central region (accounting for 23.1%) and 3 provinces and cities in the west (accounting for 23.1%). There are 18 provinces and autonomous regions less than 9.07%, mainly in the west (50.0%), central (27.7%) and east (22.2%). In 2016, the aging rate climbed to 10.9%. At present, the aging rate of the eastern regions is very different from that of the central and western regions, while only small differences can be found between the central and western regions, forming the "two major plate" pattern of aging.

## 3 Policies and Reform Measures Dealing with Population Aging in Typical Countries of the World

China entered the aging society approximately 50 years later than the earliest country. Combined with the specific historical conditions, it is of great significance to learn from the coping mechanisms under the similar background of the typical aging countries in the world to think about the current situation of China's population structure and find the focal point on the supply side.

[3] See the "Preface" of this book, "China's Road and the Employment Strategy of Population Aging".

### *3.1 The Policies and Reform Measures in the UK*

The UK is one of the first countries to enter an aging society. The aging that began in the 1950s and the aging process mainly experienced three stages: (1) The nonaging society before the 1950s. (2) The mild aging and advanced aging period from the 1950s to the mid-1970s. (3) The aged period after the middle of the 1970s. The aging rate in 2016 increased to 18.36%.

In response to the increasing rate of population aging, the UK has introduced a series of related policies, such as curbing early retirement, advocating social integration, and relaxing immigration:

(1) Suppress early retirement. Before Brexit, the UK had been implementing the unified system of the EU to encourage early retirement. The average age of retirement in the EU was 60 in 2001. The employment rate of older workers in 2002 in EU member states was only 40.1%. However, as the industry develops toward high-end service and sophisticated technology, young people must obtain a higher level of education to meet the demand of industry, the growth of the employment rate in the entire society lags behind the retirement rate of the labor force, and the labor force is insufficient. If the policy of early retirement is continued, it will cause labor shortages, increase the number of people receiving pension benefits, and place huge financial pressure on the government.

    In the process of reemployment, older laborers over the age of 50 still face the issue of age restriction and discrimination. In 2000, EU countries passed the Employment Directive, removing restrictions on overage during recruitment. The British government implemented this law in 2006. In 2010, the employment rate of the older workforce in the UK exceeded 50%, making it one of the few countries that reached the EU's goal of curbing early retirement.

(2) Relax immigration policies. Since 1997, the government has introduced a series of immigration relaxation policies to increase the number of overseas immigrants. The growth of net immigration can not only offset a certain degree of population aging but also play an important role in raising the birth rate of the population and making up for labor shortages. Although the UK's net immigration cannot fundamentally solve the aging problem, it slows down the aging of the British population significantly.

(3) Adopt more flexible policies to promote employment. The United Kingdom not only helps the unemployed find a job but also continues to follow up and gives certain support polices until they are fully adapted to the job to prevent the unemployed from being squeezed out of the job market and staying in the position of low wages and social securities. At the same time, the British government helps employees achieve the goal of balancing corporate and family responsibilities through cooperation with enterprises.

### *3.2 The Aging Process and Reform Policies in Japan*

The population aging of Japan began in the 1970s, and its aging rate surpassed those of developed countries such as the UK and the United States successively, ranking first in the world today. The aging process of Japan has mainly experienced four stages: (1) Non-aging period from 1960 to 1970. (2) Mild and advanced aging period from 1971 to 1990. (3) Aged period from 1995 to 2005. (4) Hyper-aged period since 2006. The population aging rate increased to 26.56% in 2016.

To cope with population aging, Japan has issued a series of policies in the fields of macro planning, medical care, employment, and childbirth:

In terms of macro planning, the central and local governments of Japan have incorporated the development of elderly care services into the national development plan as a long-term policy. The Outline of Strategy for Longevity Society, Ten-Year Strategy for the Promotion of Health and Welfare for the Elderly and Outline of Strategy for the Elderly Society were successively promulgated. In terms of the medical system, Japan began to implement a free medical system for the elderly in 1973. In terms of nursing needs, a nursing care insurance system was introduced in 2000, compulsorily requiring national citizens to pay insurance from the age of 40 and to enjoy the corresponding nursing services after the age of 65. In terms of elderly employment, the Employment Stability Law for the Elderly was promulgated in 1971 and regulated that companies must choose one of three options: "continue to hire retirees", "raise the retirement age" and "abolish retirement". To encourage retirees to be reemployed, institutions were made to abolish the age restriction of employment. In terms of childbirth policy, fiscal support is reflected in a series of subsidies ranging from the pregnant woman's conception to the birth of the child and then to school, reducing the cost of childcare for young families; leave policy support is reflected in the regulation that female employees can get 14 weeks leave (included in working service time) before and after childbirth, and the father of the newborn can also take maternity leave.

## 4 Theory and Policy Research on Supply-Side Structural Reform

### *4.1 Theoretical Connotation of Supply-Side Structural Reform Under the New Normal*

In November 2015, President Xi Jinping officially put forward the policy of "supply-side structural reform" for the first time: while moderately expanding aggregate demand, strengthen the supply-side structural reforms. The current supply-side structural reform focuses on solving two major problems of "supply lags behind demand" and "mismatch of supply and demand" under the current new normal. Focusing on

the supply side and demand side, the reform policies in the past 40 years of reform and opening up can be divided into three main periods:

The first phase from 1978 to 1992 was the period dominated by "supply-side reform". The reforms in this period were mainly concentrated in the fields of land, state-owned enterprises, and systems, with the goal of invigorating and releasing productivity while gradually realizing reform and opening up; the second phase from 1992–2012 took "demand-side reform" as the focus. The reform of the market economy system became the largest driving force. Reforms mainly included "macro-control" policies to ease the international and Asian financial crises. In the third phase from 2015 to the present, Xi Jinping's "supply-side reform" shifted back. The connotation of the reform policy has been explained in the previous section. The discretionary decision of transition from "demand-side reform" to "supply-side structural reform" is mainly a response to the excessive participation of government in the operation of the economy at the micro level, the problems of misallocation of resources, overcapacity and structural distortions in resource allocation.

The aim of the "supply-side structural reform" is to ensure the decisive role of the market in resource allocation and upgrade industries to provide effective supply and a good institutional environment and development path for the sustainable growth of the economy through the reform of the economic system and the optimization of plans under the current economic new normal.

## *4.2 Analysis of the Economic Principle of Supply-Side Structural Reform*

The principle of supply-side structural reform can be explained intuitively through the "AS-AD" in macroeconomics from the perspective of economics, as shown in Fig. 6.

In the early days of the founding of the PRC, the price level and the total output of the society were very low, the aggregate demand curve corresponds to AD and the aggregate supply curve corresponds to AS. Driven by economic growth, the aggregate demand curve AD moves to AD1. At this time, the national income Y increases and the price P remains unchanged. When the aggregate demand curve moves beyond point A to AD2, gross national income continues to grow, but the growth rate decreases significantly, and the price begins to rise. Meanwhile, further growth will make the price level rise rapidly. This principle is consistent with the "Lewis turning point" theory in development economics (the "Lewis turning point" corresponds to point An in Fig. 6). If we continue to stimulate domestic demand, the aggregate demand curve will move beyond point B to AD3 and is unable to increase national income compared with AD2. Ineffective stimulus of demand will only fall into a "stagflation" dilemma.

At this time, shifting the supply curve AS one-way to the right is similar to expanding the demand-side variable, and both can achieve the goal of national income

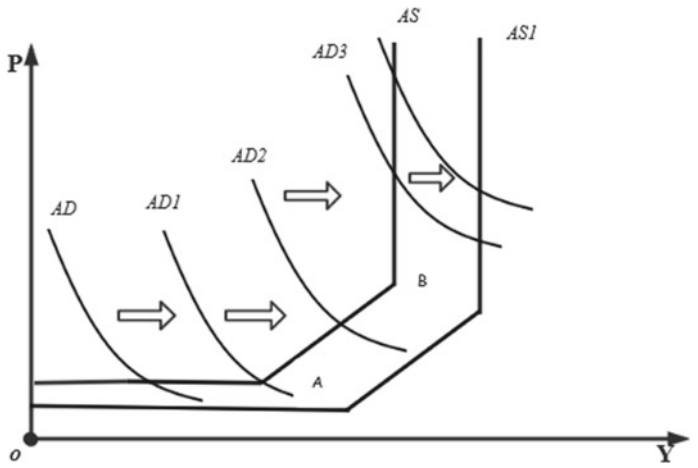


**Fig. 6** Deduction of economic principles of supply-side structural reform

growth. The supply-side structural reform means that when stimulating domestic demand and pushing the aggregate demand curve to the right can no longer bring growth momentum to the economy, creatively shifting the AS aggregate supply curve to the right by continuously breaking through the marginal value of social production and realizing the shift of the supply side from low-end to high-end industries. National income increases, prices drop slightly, and prices drop slightly as the aggregate supply curve shifts to the right.

## 5 The Supply-Side Issue in an Aging Society of China

The 19th National Congress of the CPC pointed out that "the principal contradiction facing Chinese society in the new era is that between unbalanced and inadequate development and the people's ever-growing needs for a better life". Meeting the huge needs of the elderly will be a serious social problem in the face of aging. According to statistics from the National Bureau of Statistics, as of the end of 2017, there were nearly 160 million people aged 65 and above in China, accounting for 11.4% of the total population. Investment in the pension industry is an important branch of the national economy and an important diversion affecting national consumption, investment, and government expenditure. The proportion of elderly people is also an important determinant of the effective and sustainable supply of human capital in China. Therefore, in the face of the shift and decline in the current economic growth rate, it is imperative to realize national economic development and maximize social welfare through supply-side structural reform. Based on the specific historical conditions and the current national development strategy of "supply-side structural reform", the current problems include the following:

First, the uneven aging among regions widens the differences in regional economic development. The population structure of developed areas is different from that of poor areas. Generally, the siphon effect of the rapid development of first- and second-tier cities makes the proportion of young labor in their population structure higher than that of poor areas, and the problem of aging in poor areas is more prominent.

Second, the "feedback mode" put forward by Fei Xiaotong, which refers to the way that parents raise and nurture their children, and the children support their parents when they grow up, otherwise they will be condemned by both morality and public opinion, no longer adapts to the current new normal economic development. The strategy of "three removals, one reduction and one supplement" has pointed out the direction for the reform of this traditional mode of elderly care. In the following sections, several aspects of supply-side factors, such as economy and finance, social welfare, social medical care, and labor productivity, will be analyzed to further explore the supply-side reform policies of population aging suitable for the development of China's national conditions.

## *5.1 Population Aging Increases Downward Pressure on the Economy and Finance*

As of 2015, the elderly dependency ratio of China was 19.6 and was still accelerating. The issue of elderly care has become a serious political issue. Excessive pressure on the pension economy will inevitably bring excessive downward pressure on the development of the entire national economy. On the macro level, pensions divert national fiscal expenditures, affect the development of other industries, and cause a decline in economic growth. Microscopically speaking, the increase in pension expenditures renders the household expenditures unbalanced and the quality of life declining. For example, as the age of grandparents grows, the number of elderly people in the family increases, and the young labor force of the family has to face the issue of providing for the elderly and consider their own pension and even their children's future pension at the same time.

## *5.2 A Large Base of Population Aging Causes an Imbalance in Social Welfare*

According to the principles of fairness and efficiency in welfare economics, social welfare and social security will squeeze part of the social production economy. On the one hand, with the increase in the number and proportion of the elderly population, government and family expenditures in the medical and health field have increased. In addition, the proportion of people investing in social capital in the pension insurance industry has also increased recently. The proportion of urban basic medical insurance

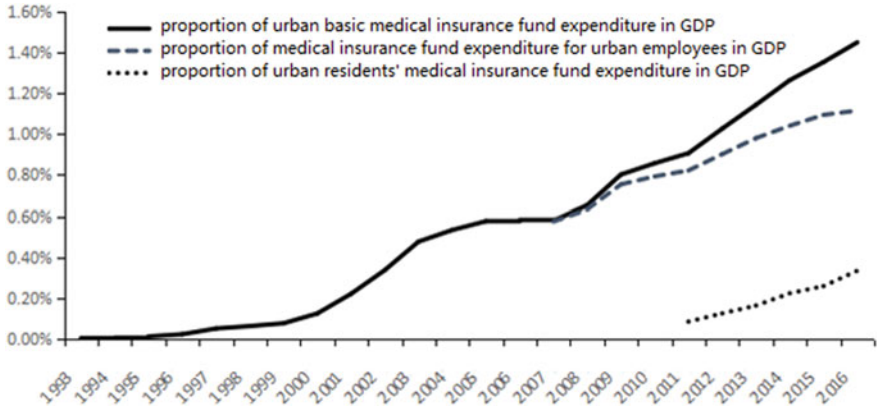


**Fig. 7** Trend chart of the proportion of the urban basic medical insurance fund expenditure, urban employee medical insurance fund expenditure, and urban residents medical insurance fund expenditure in GDP. *Data source China Statistical Yearbook (1994–2017)*

fund expenditures, urban employee medical insurance fund expenditures, and urban residents medical insurance fund expenditures in GDP is increasing (see Fig. 7), a large part of which is due to the increase in medical expenses brought about by the aging of the population.

## *5.3 The Upgrading of the Traditional Elderly Care Service Industry Forces the Introduction of a High-Quality New Medical System*

With the increase in the elderly in China and the enhancement of their consumption ability, the elderly service industry has developed as a third emerging industry that provides services for the elderly. However, with the increase in income, the needs of the elderly have gradually changed from single material needs to diversified demands for life care, medical care, mental health consultation and medical care. Therefore, in the new era of the development of social aging services, to effectively solve the bottleneck of the development of China's elderly service industry, the starting point should be the transformation of the supply-side structures, guiding enterprises to provide high-quality services for the elderly in various aspects, and solving the bottleneck of the supply and demand of the elderly.

### 5.4 Demographic Imbalance Calls for the Increase in Labor Productivity

The current "4-2-1" family structure of China has become mainstream, and most families are faced with the dilemma of "getting old before getting rich" and increasing pressure from rising household expenditure ratios. The per capita GDP generally exceeded US$5,000 when the developed countries entered an aging society, while the per capita GDP of China just exceeded US$1,000 at the beginning of aging. Economic development is urgently needed for the development of high-tech, high-efficiency and high-tech industries, the deepening of supply-side reforms to replace traditional backward production capacity and enterprises, and an imminent task to complete the structural upgrade of the elderly care industry, especially with the current structural imbalance of the shortage of effective labor supply and the downward pressure on pension costs.

## 6 Research on Supply-Side Structural Reform Against the Background of Population Aging

### 6.1 Vigorously Promote the Supply-Side Reform of PPP Projects

The PPP project accelerates the realization of supply-side structural reform in promoting the transformation of government functions, improving enterprise technology and efficiency, and driving the development of private capital. Many abandoned and idle training centers, hotels, hospitals, and commercial properties can be upgraded to elderly care services to achieve the goal of "decapacity and destock" in the PPP mode through inventory guidance.

### 6.2 Form a Shared Service Chain by Communitization of Medical and Healthcare

Make full use of modern technology to develop elderly care products, realize the convenience, intelligence and practicality of elderly care services, and ensure the happiness of the elderly in their later years. For example, the elderly community service mode of "small scale, multifunction, service chain" can be developed. Small multi-function service stations mainly provide daily services, door-to-door services and other services for the elderly. This will not only help the elderly maintain their original social interaction circle but also help to give full play to the community's function of providing diverse services. In addition, on the one hand, the service chain

mode can promote the development of medical intermediary institutions; on the other hand, it can strengthen the cooperation between nursing homes and hospitals to form a nursing care ecosystem.

## 6.3 Promote Reemployment of Senior Citizens' Consulting and Education Positions

The elderly have accumulated a wealth of life experience. Establish a platform of a "talent center for the elderly" in cities to provide temporary short-term employment and reemployment opportunities for the elderly so that they can continue to serve society. Provide positions suitable for the elderly, such as consulting and re-education services, set up corresponding consulting and re-education windows, and build a benign platform for inter-generational communication.

## 6.4 Encourage Fertility to Break the "4-2-1" Dilemma

China's economy has been advancing rapidly in the past few decades, but with the current dilemma of increasing population aging and declining birth rate, labor costs are increasing, and the development of the national economy is under great pressure; the old round of demographic dividends is almost exhausted. Encouraging fertility is imperative. The government can provide certain subsidies and support for childbirth, such as establishing public childcare centers and childcare institutions, providing longer maternity subsidies for pregnant couples, and providing housing, education funds, and taxes to families that meet the second child policy fee reduction and subsidies.

## 6.5 Promote Pension Finance and Set Elderly Care as a Lifetime Goal

Franco Modigliani's "life-cycle consumption theory" refers to elderly care as a long-term inter-period project, that is, people need to reasonably plan consumption and savings over a longer period of time so that the consumption reaches the optimal allocation in the entire life cycle. The domestic pension financial market has matured for insurance, pension funds and housing pensions, but financial methods such as pension securities and funds have not yet emerged. In these respects, we can learn from the United States public offering fund mode and build REIT structures. The convergence of trickle water becomes a stream. The whole life stage should be reserved for the old time, instead of waiting until it is too late. Maintaining balanced economic

development throughout the life cycle is important for improving the quality of one's personal life and has strategic significance for the stable operation of the national economy.

## *6.6 Promotion of Artificial Intelligence and Intelligent Elderly Care*

The traditional elderly care methods have the following problems: the design of traditional electrical appliances does not take into account the habits of the elderly who are physically inconvenient; shortage of monitoring safety protection, and the loss of the elderly often occurs; children cannot be connected immediately in emergencies; children cannot keep informed of the activities of the parents, etc. In response to these problems, we can adopt artificial intelligence, such as intelligent companions, intelligent detection, and intelligent medical robots. In the report of the 19th National Congress of the Communist Party of China, General Secretary Xi Jinping proposed targeted response strategies to the aging problem: the implementation of a healthy China strategy requires us to actively respond to population aging, build a policy system and social environment for the elderly, filial piety and respect for the elderly, and promote the integration of medical services and elderly care, with the goal of accelerating the structural upgrading and development of aging undertakings and industries. Through the structural transformation, we can achieve precise and targeted elderly care; it is a tough battle that we have to win in the promotion of the supply-side structural reform, to promote development through transformation and reform through transformation, finally to realize the healthy development mode of "the elderly have support, support, and happiness" in order to make a small family happy and strengthen the whole country.

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# Research on the Integrated Mode of Elderly Care and Medical Services Under the Trend of Population Aging


**Shuaixiong Fu and Shunkui Huang**

The report of the 19th CPC National Congress clearly stated that we should "respond proactively to population aging … provide integrated elderly care and medical services and accelerate the development of pension programs and industries." The number of people aged 60 and above in China reached 194 million by the end of 2012, and it is expected to exceed 300 million in 2025. China has entered a stage of rapid development of population aging. With the rapid shift of an aging population structure, the consequent issue of elderly care has become increasingly prominent, especially with the increase in the number of elderly people of advanced age, loss of their only child, empty-nest, disabled and with chronic diseases, and those suffering the decline of physical functions and the deterioration of physiological organs. Their demands for medical and health services, and rehabilitation care are more urgent. This has brought new challenges to traditional family pension, community pension and institutional pension which more or less separate life care and health services, and put forward new requirements for elderly care services. In this context, a new mode of elderly care service that integrates medical services and elderly care came into being and has been proven to be applicable and feasible, providing good experience and practice to further improve the elderly care mode in China.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_9

# 1 The Integrated Mode of Elderly Care and Medical Services is an Inevitable Choice Under the Current Trend of Population Aging

The integrated mode of elderly care and medical services does not simply refer to the integration of medical institutions and elderly care institutions but the intervention and integration of medical resources into elderly care.[1] It puts health and medical services in a more important position and helps to meet the diversified needs of medical care and elderly care services. The rise and development of integration mode is an inevitable choice under the current trend of population aging in China. The Outline for Healthy China 2030 Plan clearly puts forward the integration mode. To date, almost all provinces (autonomous regions and municipalities) have formulated corresponding implementation opinions and have achieved certain results.

## *1.1 The Reform of National Institutions Provides a Foundation for the Integration of the Medical System and the Pension System*

In China, elderly care and medical services institutions are divided into two administrative departments: elderly care to the civil affairs department and medical care to the health commission. The phenomenon of separation between elderly care and medical services is very prominent. In fact, in addition to the guarantee of basic living standards for the elderly, providing professional medical care for the elderly is also very necessary. The State Council's Institutional Reform Plan approved by the 13th National People's Congress proposed that the functions of the China National Committee on Aging should be transferred from the Ministry of Civil Affairs to the National Health Commission, and the Chinese Association of Aging, supervised by the Ministry of Civil Affairs, should also be replaced by the National Health Commission. These changes in policies and mechanisms provide an important opportunity for the future integration of elderly care and medical care and lay a solid foundation for breaking the bottleneck of the integrated mode.

## *1.2 The Good Environment of Social Care Institutions Provides Support for the Integrated Mode*

Under the trend of an aging population, encouragement to social pension institutions has become an important means to deal with the increasing pressure on pension

[1] See Zhao Xiaofang, "Research on the 'Integration of Medical Care and elderly care' Service mode for the Elderly under the Background of Healthy Aging", *Lanzhou Academic Journal*, 2014(9).

payments and the government's financial burden, and a series of policy measures have been introduced for this purpose. In September 2013, the State Council promulgated Several Opinions on Accelerating the Development of the Elderly Service Industry, which clearly stated that "to stimulate social vitality, give full play to the main role of social forces, and improve the elderly service system". At the same time, efforts are also made to create a fair investment environment, intensify the pilot work of public construction and private operation, and support private elderly care institutions in undertaking local public elderly care services. The government also promoted the development of the social pension mode through investment and finance. For example, the National Development and Reform Commission's PPP projects, including pension, health and wellness projects, securities and bond markets, as well as industry guidance funds, trusts, and insurance, can all be used as financing channels for pension institutions. Finally, the government actively promotes national-level medical-care integration pilot projects and supports social forces in establishing nonprofit medical-care integration institutions.

### *1.3 The Physiological Characteristics of the Elderly Require the Establishment of a Long-Term Care System Under the Integration Mode*

There are 238.6 million people aged 60 and above in China, accounting for 16.7% of the total population, of which 150.3 million people aged 65 and above account for 10.8% of the total population.

The degree and speed of aging in China is increasing. The number of elderly people who are of advanced age, have lost their only child, are empty-nest, are disabled, and have chronic diseases is increasing, and the treatment and service for sick, disabled, and semi-disabled elderly people have become the most important part. At the end of 2016, the proportion of the population aged 60 and above in China accounted for 16.7% of the total population, of which the proportion of the population aged 65 and over was 10.8%.[2] It is estimated that by 2030, the proportion of the population aged 60 and above in China will reach approximately 25%; by 2050, the proportion will reach 34%, which is 12 percentage points higher than the global average.[3] The number of the elderly with disabilities and chronic diseases continues to increase. According to World Bank data, by 2030, the aging population of China will increase the burden of (healing) chronic diseases by 40%. The number of the elderly who lost their only child and were empty-nest also increased. Elderly people living alone account for 10% of the total number of elderly people, and the number of elderly people who are empty-nest accounts for approximately half of the total number.

[2] See Ministry of Civil Affairs, "2016 Statistical Bulletin of Social Service Development [EB/OL]", (2017-08-31) [2018-05-10] http://www.mca.gov.cn/article/sj/tjgb/201708/20170815005382.shtml.

[3] See Du Peng, Zhai Zhenwu, Chen Wei, "The Development Trend of the Population Aging of China in the Past Century", *Population Research*, 2005(6).

Eighty percent of the elderly suffer from diseases that do not need to go to a large hospital for treatment.[4] Elderly care institutions need to undertake the main tasks of disease prevention and rehabilitation care for the sick. In this context, the demands of the elderly for medical and health care will continue to increase, and the separation of medical care under traditional family pension, institution pension, and community pension modes cannot meet the needs. The combination of medical care and elderly care requires the medical mode to shift from focusing on medical treatment to a long-term follow-up and maintenance family doctor mode and to promote the integration of medical resources and elderly care resources.

### *1.4 The Optimal Utilization of Elderly Care Resources and Medical Resources Requires Integration*

Traditional family pension, institution pension, and community pension are limited by technology, capital, human resources, equipment management, etc., and most of them can only provide simpler daily care services and cannot meet the needs of health management and basic medical care, rehabilitation and other special medical needs. Family pension is the main embodiment of the concept of "raising children for support". However, as the size of families continues to shrink, the miniaturization of families has led to the continuous weakening of the family pension function. Institution pension is also facing the problems of short supply and low resource utilization.[5] At the end of 2014, the average number of beds per 100 elderly people in China was only 3 beds,[6] which is much less than the international standard of "50 elderly beds per 1,000 elderly people", while the actual vacancy rate of beds in elderly care institutions exceeded 50%.[7] The main reason is that elderly care institutions lack relevant medical service support, resulting in a great waste of resources. Family pension, institution pension and community pension are mainly classified by location; they can either be a single service or an integrated mode. It is necessary to actively develop integrated care institutions, providing professional and diversified medical and health services for the elderly. Therefore, the concept of "integration of medical services, elderly and continuous life care" has become an advanced mode, and it is imperative to implement institutional elderly care.

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[4] See Chen Yuangang, Tang Chunhua, Chen Fang, et al., "An Analysis of the Construction of the Urban Community Medical and Health Service System for the Elderly in China", *Journal of Chongqing Technology and Business University (Social Science Edition)*, 2013(3).

[5] See Mu Guangzong, "The Dilemma and Countermeasures of China's Institutional Aged Care Development", J*ournal of Central China Normal University (Humanities and Social Sciences Edition)*, 2012(2).

[6] The data comes from the 2017 "Statistical Bulletin of China's National Economic and Social Development", calculated by the author.

[7] See Tian Yuyan, "Analysis of China's Institutional Pension Policy Changes", *Social Welfare*, 2014(12).

Hospitals also cannot provide long-term inpatient services for sick elderly people. The integration is conducive to more rational use and the advantages of medical institutions. In large and medium-sized hospitals, some elderly people often take various measures to refuse discharge to enjoy better medical services.[8] This not only increases the financial burden on the elderly but also increases the medical pressure on the hospital. At the same time, a large number of small and medium-sized hospitals have encountered a crisis of idle medical resources, especially the medical and health functions of private and community hospitals, which have been continuously weakened. Through integration, primary medical and health service institutions are seamlessly connected with elderly care institutions to provide medical and health services for the elderly aged at home and in the community so that the elderly can obtain public health services nearby, thereby effectively alleviating the shortage of medical resources. At the same time, it has created conditions for the transformation of primary medical institutions to carry out elderly care services and realize the rational allocation of medical resources.

## 2 China Has Gained Certain Experience in the Integration Mode

In 2016, the National Development and Reform Commission, the Ministry of Civil Affairs, and the Health and Family Planning Commission identified 50 cities (districts) in 25 provinces and cities as the first batch of pilot units for the integration mode at the national level. Starting from their own real conditions, Qingdao, Hefei, Zhengzhou and other cities have achieved good results and accumulated good experience in exploring the establishment of different types of medical care integration mode, creating mode brand cases and system breakthroughs in key links.

### *2.1 Multiple Types of Integration Mode Have Been Established*

At present, various localities are actively exploring the integration of medical and elderly care, and various types of integrated medical and elderly care modes have been established, mainly including the following: the first is the signing of cooperation agreements between elderly care institutions and medical institutions. Medical institutions and elderly care organizations in the same area sign mutual agreements based on their respective resources and requirements, open green channels to each other, realize the rational use of resources, and achieve the goal of combining medical care and elderly care. For example, Beijing's Taikang House • Yanyuan

[8] See Cheng Liang, "Medical Care Integration: Exploration of New Paths for the Development of Elderly Care Institutions", *Zhongzhou Academic Journal*, 2015(4).

replicated building a high-end elderly care community, and through cooperation with surrounding medical institutions, it can meet the medical and nursing needs of elderly residents. The second is the self-run medical institutions. Some large-scale elderly care institutions set up geriatric hospitals, rehabilitation hospitals, infirmaries, etc., according to the needs of the elderly to ensure timely medical assistance. For example, Qingdao Shengde Nursing Home for the Elderly has established a medical department within it and hired specialist doctors and nursing staff to provide all-around one-stop services for the sick elderly people. Third, medical institutions establish or operate elderly care institutions. By adjusting the functions of the hospital, integrating medical resources, and setting up beds or wards for the elderly in medical institutions, it can more accurately provide elderly patients with long-term medical care and other services. For example, Binhu Hospital in Hefei relies on the advantages of a tertiary hospital to build a geriatric ward inside the hospital, adopting a seamless connection between "medical insurance hospitalization" and "care for the elderly" to achieve easy conversion between the two without moving beds to meet the needs of elderly people suffering from chronic diseases. The fourth is the community support radiation mode. Community service centers for the elderly and community health service agencies cooperate to provide services such as life care and medical care for the elderly at home. For example, the Shanghai Community Health Service Center plays a central role in integrating medical and nursing resources and promoting the radiation and turnover of medical resources. The community health service center provides corresponding medical services to various elderly groups in the community.[9]

## *2.2 A Number of Demonstration Cases of Medical Care Integration Have Been Formed*

In 2015, the General Office of the State Council forwarded the Guiding Opinions on Promoting the Integration of Medical and Elderly Services issued by the Health and Family Planning Commission and other departments and proposed further promoting the integration of medical and health services with elderly care. Ninety cities (districts) were selected as the pilot area after two batches of selection. In addition to the experience and practices of Taikang Home·Yanyuan in Beijing, Qingdao Shengde Nursing Home, and Hefei Binhu Hospital, many demonstration cases have been formed. The Social Welfare Service Center of Yanzhou District, Jining City, delegates all management rights to the Yanzhou District Hospital of Traditional Chinese Medicine. The hospital has set up medical centers in nursing homes to improve the overall professional standards of nursing and realize the comprehensive

[9] See Li Changyuan and Zhang Juguo, "Typical modes and Optimization Strategies of Integrated Medical Care and Elderly Care in China", *Qiushi*, 2017(7).

integration of nursing, prevention, treatment, and rehabilitation.[10] The First Affiliated Hospital of Chongqing Medical University invested in the construction of the Qinggang Elderly Nursing Center and established a complete internal circulation "zone transfer mechanism"—"Elderly area-chronic disease rehabilitation area-hospital headquarters-elderly area". The Ninth People's Hospital of Zhengzhou collaborated with 36 elderly care institutions in Henan Province to initiate the establishment of the Henan Provincial Elderly Medical Care Collaboration Alliance, breaking the pattern of "separate governance" between medical institutions and elderly care institutions and forming a perfect two-way referral mechanism.[11] Changsha City has integrated the resources of the Pozi Street Community Home Elderly Service Center in Tianxin District with the Tianxin District People's Hospital to establish the Xinyuan Elderly Care Center that integrates life care, medical care, rehabilitation services and hospice care.

### *2.3 The Institutional Basis of the Medical Care System Has Been Explored*

In terms of departmental collaboration, the key is the connection between the medical system, the elderly care system and relevant departments, building an integrated platform to achieve communication and coordination between medical and nursing service agencies.[12] Shanghai has established a coordinated promotion mechanism for integration. The Health and Family Planning Department takes the lead in responsibility for medical services, the Civil Affairs Department takes the lead in coordinating other non-medical services, and the Human Resources, Social, Financial, and Development and Reform Departments fully cooperate. Suzhou city has established a coordination and promotion agency, and it has established a joint meeting system to study and formulate relevant policies and regulations.

In terms of the convergence of medical care policies, the expenditure between pension insurance, medical insurance and long-term care is the key. Qingdao city pioneered and implemented a long-term care insurance system in the country, incorporating medical services and elderly care services into a unified system framework for the first time.[13] The system uses urban employee medical insurance as a platform. Employers and individuals do not need to pay additional nursing insurance premiums. The fund comes from medical insurance funds, government subsidies, and welfare

[10] See Liao Rui, Zhang Kaining, Wang Huaping, et al., "Integration of Medical Care Under the Background of Healthy Aging in China: Basic Concepts, Service Modes and Practical Problems", *Chinese General Practice*, 2917(3).

[11] See Huang Jiahao and Meng Fang, "The Necessity, Difficulties and Countermeasures of the 'Integrated Medical Care' Pension mode", *China Health Policy Research*, 2014(6).

[12] See Li Changyuan and Zhang Juguo, "Typical Modes and Optimization Strategies of Integrated Medical Care and Elderly Care in China", *Qiushi*,2017(7).

[13] See Chen Zhenying, "Research on the Optimization of Long-term Care Insurance System in China-Taking Qingdao as an Example", Shandong University, 2017.

funds. Participants can apply to be in designated nursing institutions according to different nursing needs. Hospitals, homes and communities have alleviated the payment pressure on the government and the elderly. Qingdao City won the "Chinese Government Innovation Award" for its long-term medical care insurance system. Shanghai has included the internal medical institutions in the approved pension institutions in the scope of medical insurance settlements. The settlement objects include basic medical insurance for employees and urban residents, basic medical insurance for residents in small towns, and mutual medical assistance programs for citizens. For personnel, the settlement scope includes the personal medical account section, personal self-sufficiency section and an additional fund section.[14]

## 3 Problems and Bottlenecks of the Integrated Mode

### *3.1 Multi-management of the Government Makes It Difficult to Implement Policy Support*

The government's promulgation of support policies is an important means to actively respond to the needs of the elderly for medical and health services. The state clearly points out that it actively promotes cooperation between medical institutions and elderly care institutions, accelerates the development of health and elderly care services, and promotes the integrated development of medical care, involving tax reduction and exemption, hospital management, land use, etc. From the perspective of institutional management, ordinary elderly care institutions are subject to the approval and management of the civil affairs department, but integrated medical service and elderly care institutions involve civil affairs, health, social security, and finance departments. The policies issued by different departments have poor coordination, different responsibilities and management systems. There is no unified and effective management and support, the phenomenon of "one size fits all" policies of various departments and separation of medical resources and pension resources prevails, and it is difficult to form a policy synergy. The separation of the medical and pension systems has caused inconvenience and high costs for the elderly. Although pilot cities such as Shanghai, Qingdao, and Suzhou have tried to be strongly promoted by the government to break the barriers of the administrative system, the higher-level government still conforms to the multi-head management system of administrative division, resulting in the changed top and unchanged bottom, and the top change makes no difference.[15] For example, the establishment of medical and health rooms in elderly care institutions must meet the standards of the health department for building hospitals, which exceeds the ability of most elderly care institutions to provide

[14] See Yang Zhenzhen, "Construction and Empirical Research on the Financing Mode of Social Elderly Service with the Combination of Medical Care and Care", Zhejiang University, 2014.

[15] See Li Changyuan and Zhang Juguo, "Typical Modes and Optimization Strategies of Integrated Medical Care and Elderly Care in China", *Qiushi*, 2017(7).

medical services. For another example, the "combination of medical and elderly care" should be a semi-public welfare and semi-commercial public service product. The corresponding affiliation, medical insurance reimbursement, drug management, industry qualifications and government input need to be further clarified. Preferential policies for water, electricity, heating, and medical treatment are often difficult to implement.

## *3.2 Impediment of Large Capital Investment in Orderly and Healthy Development of the Integration Mode*

Even with corresponding policy support, a large amount of capital investment has become the key to restricting the orderly development of the integrated medical care service mode. For example, in setting up medical institutions in elderly care institutions, according to the Basic Clinic Standards issued by the Ministry of Health in 2010, the construction area of infirmaries shall not be less than 40 square metres, and independent consultation rooms, treatment rooms and the infusion observation room shall be set up separately.[16] At the same time, it is necessary to purchase equipment and medical staff to ensure the 24-h operation of the medical room. The development of elderly care services in medical institutions also requires a large amount of reconstruction funds and financial subsidies. According to the research data of the research team of the China Research Center for Aging, 56% of private elderly care institutions have infirmaries, 52.1% of public elderly care institutions have infirmaries, less than 20% of institutions have rehabilitation treatment rooms, and 22.3% of elderly care institutions have neither a separate medical room nor professional medical staff[17] and cannot provide professional medical and health services.

Due to the large amount of investment, government subsidies are not enough to maintain its operation, and the medical institutions in the elderly care institutions are scrambling to be included in the designated medical insurance units. Some elderly care institutions have become medical institutions to some extent, turning general rehabilitation care into medical care. Services, prescriptions, nutrient solutions, medicines or treatments related to traditional Chinese medicine physiotherapy, the corresponding medical expenses are reimbursed by medical insurance, which violates the original intention of combining medical care and pension services, and loses the rights of other insured people to enjoy medical insurance funds. The funding issue has become the key to the orderly and healthy development of the medical-care-integrated elderly service mode.

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[16] See Wang Changqing, Mao Pengyuan, Chen Na, et al., "Multiple Integration of Medical and Elderly Resources", *Xuehai*, 2016(6).

[17] See China Research Center for Aging Research Group: "National Research on the Status of the Disabled Elderly in Urban and Rural Areas", *Research on the Disabled*, 2011(2).

### 3.3 Difficulty in Applying for a Medical Practice License and Medical Insurance Designated Qualification

The specific operation of the integrated medical service and elderly care also involves the issue of medical practice licenses and medical insurance designated qualifications, which directly affects whether medical institutions can provide medical treatment to patients and whether they can be reimbursed through medical insurance. When applying for a practice license, medical institutions must meet hardware requirements such as functional partitions, classification of clinics, rescue rooms, treatment rooms, disinfection rooms, etc.,[18] which are significantly higher than the operating standards of elderly care institutions that only provide basic medical care services. At the same time, if reimbursement cannot be made through medical insurance, patients cannot enjoy corresponding subsidies for seeing a doctor, which restricts the elderly's demand for medical services in elderly care institutions.

### 3.4 High Charges and Incomplete Medical Service

Traditional institutions are social welfare institutions with low fees and small profits. They mainly rely on government subsidies to provide life care services. It is difficult to provide effective health management and family pension services for the elderly. Elderly care institutions with integrated medical care are mainly based on the combination of elderly care and real estate. The fees are beyond the affordability of most ordinary elderly people. The bed utilization rate of integrated medical care and elderly care institutions is not high, and in normal elderly care institutions, "a bed is hard to find."[19] In addition, the key to the integrated medical care and elderly care mode is the level of "medical care". It is often easier for public hospitals to receive government subsidies. High-quality medical resources are concentrated in a few hospitals, and these hospitals have a large number of patients and cannot invest more resources in the elderly care service. However, the elderly prefer to choose these hospitals, which causes some private medical and elderly care service organizations to withdraw from the market. The country has not formally established a long-term care insurance system, and most medical and elderly care institutions have not yet been included in the scope of designated medical insurance institutions. It is difficult to share the costs of medical care, health care, and nursing care of the elderly with corresponding insurance and funds.

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[18] See Wang Suying, Zhang Zuosen, Sun Wencan, "The Mode and Path of the Combination of Medical Care and Care-A Survey Report on Promoting the Combination of Medical Care and Elderly Care", *Social Welfare*, 2013(12).

[19] See Hu Qianqian, "Problems and Countermeasures in the New Type of Elderly Care Service Mode of Integration of Medical Care and Elderly Care", *China Market*, 2016(34).

### *3.5 Untimely Follow-Up of the Laws and Regulations of the Integrated Mode*

Western developed countries have established a comprehensive elderly care evaluation system, including the evaluation of the level of institutions and the health level of the elderly. Elderly care institutions provide the most suitable mode for each elderly individual. However, in China's integrated medical care and elderly care services, there is still a lack of clear supervision bodies and evaluation systems in terms of access standards, service standards, funding, compensation methods, and liability identification.[20] It often appears that the previous standards are not applicable, and there is no suitable new standard to follow. Other problems lead to untargeted supply and deviation, resulting in a waste of resources or insufficient supply. For example, there are no clear regulations on whether hospitals are eligible to set up elderly care beds, medical insurance reimbursements for the elderly are not clearly defined, and many hospitals are not enthusiastic about investing in the elderly care industry. Similarly, the opening of medical services in elderly care institutions also requires relevant laws and regulations, and the construction scale and standards need to be clearly defined.

## 4 Policy Recommendations for Improving the Integrated Mode

### *4.1 Straighten Out the Administrative Management System and Build an Integrated Administrative Coordination Mechanism*

First, laws and regulations on the integration mode should be continuously improved. As an emerging service mode for the elderly, integration care cannot take the old path of the government taking care of everything, nor can it all depend on the market.[21] It is necessary to provide good policy guidance and continuously improve and implement tax incentives, financial subsidies, land supply, and personnel training and employment policies. The LTC insurance system should be established to reduce the medical care and pension expenses of the elderly, for example, by adopting financial subsidies or combining with the commercial insurance system to reduce care expenses. The second is to establish an administrative coordination mechanism that integrates medical care and nursing care. The health department should promulgate

[20] See Wang Changqing, Mao Pengyuan, Chen Na, et al., "Multiple Integration of Medical and Elderly Resources", *Xuehai*, 2016(6).

[21] See Qing Lianbin and Chen Lei, "Let All People Have a Sense of Support for the Elderly a Survey of the Construction of the Yaoyang Elderly Care Service System of the Red Cross Society of China", *Scientific Socialism*, 2014(5).

and improve the construction standards, facility standards, medical staff employment standards, service standards and management standards of relevant medical-care-integrated medical institutions as soon as possible, formulate access and exit mechanisms, and strictly regulate the market behavior of integrated medical institutions. The Ministry of Human Resources and Social Security and the Ministry of Finance shall actively cooperate with the health and civil affairs departments in terms of talents and capital guarantees, respectively. Establish an interdepartmental coordination agency and improve the communication and coordination mechanism for all parties.

## *4.2 Establish a Diversified Input Mechanism to Form a Coordinated Pattern of Joint Construction and Sharing*

The long-term investment cycle and low profit rate of the integrated medical and elderly care mode require the government to improve and implement support policies to promote the diversification of the main body of the integrated medical and elderly care service organization, the diversification of funding channels, and the marketization of operation methods. Establish a special fund to support the development of integrated institutions. Social forces should be actively mobilized to attract charitable organizations and social capital to participate in the construction of elderly care institutions combining medical care and elderly care through financial subsidies, the purchase of services, franchising, public construction and private operations, and private office assistance. The government should provide appropriate subsidies for the construction and operation of pension institutions. For example, Qingdao offers preferential treatment to institutions that meet the conditions and is planning to implement a combination of medical and elderly care in terms of institution setup, land use, facility construction, investment and financing, taxes and fees.

## *4.3 Improve the Elderly Care Service System and Create a Multilevel Supply Mode*

First, establish a government and market pension service system. Due to the limited resources for pension and medical care, the integration of medical and elderly care must involve the participation of multiple parties, especially the establishment of a multiparty cooperation mode such as government, market, community, and NGOs. The government should provide policy guidance and increase capital investment to ensure that pension resources and medical resources can basically meet local needs. Social forces should be encouraged and guided to establish integrated institutions, and corresponding policy preferences should be given to continuously improve the supply capacity of elderly care services and medical services. The transformation of private

hospitals and community health service centers into rehabilitation homes, nursing homes and other integrated elderly care institutions should be actively encouraged, and the supply channels of integrated medical care and elderly care services should be broadened. Second, we rationally plan and build a multilevel implementation of combined medical care and elderly care services to meet the diverse needs of the elderly. For large-scale elderly care institutions, on the basis of providing basic living care services, internal medical institutions that comply with the regulations of the health department shall be established; for small-scale elderly care institutions with imperfect surrounding medical and health service networks, the relevant Standard establishment of simple health clinics, infirmaries, etc. FFor small-scale elderly care institutions with a relatively complete surrounding medical and health service network, it is necessary to cooperate with community health service centers and nearby hospitals to cooperate with hierarchical diagnosis and treatment to establish a close referral system to achieve the sharing of medical resources and form a smooth two-way referral mechanism.

### *4.4 Innovative Payment Methods and Build Long-Term Care Systems*

First, reform the payment method of medical insurance, including medical institutions in qualified medical care and elderly care institutions, into the designated scope of basic medical insurance. Regulate medical and nursing service items provided by medical and health institutions for the elderly at home. The medical insurance management department shall formulate reasonable access standards and reasonably define the payment items and reimbursement ratios of medical expenses. Second, a long-term care insurance system should be built. Speed up the design of the LTC insurance system for the elderly, establish a financing mode of "individual payment + medical insurance compensation + government subsidies" as a supplement to basic medical insurance, provide nursing protection and economic compensation, and reduce the economic burden of LTC for the elderly.

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# Population Aging and Changes in the Developmental Dynamic Mechanism


**Laijun Luo**

## 1 The Issue of Population Aging in China

Since the beginning of the twenty-first century, the demographic structure of China has been rapidly aging, and the long-term demographic dividend has gradually disappeared. According to the Report of World Population Prospects 2012 of the United Nations, the proportion of elderly aged 60 and above in China will reach 30%–40% by 2050. By then, China will become the country with the most aging population in the world. The report of the 18th National Congress of the CPC clearly stated that proactively responding to the aging of the population and vigorously developing services and industries for the elderly are a major strategic deployment of the Party Central Committee on the increasingly severe problem of population aging.

The obvious trend of population aging in China is reflected in the annual change in the dependency coefficient; please refer to Table 1. The dependency coefficient refers to the ratio of the nonworking age population to the working age population. The larger the dependency coefficient, the greater the number of dependents per worker has to burden, and the more serious the dependency burden of each laborer. This phenomenon also shows that the aging of the population is bound to trigger a series of changes.

The proportion of the elderly aged 65 and above in China was lower than the world average in 1999 and reached 7% in 2000. It only took approximately 18 years for the age structure of China's population to change from an adult society to an old society, a very short time compared with other countries: for the same transition, France took 115 years, Switzerland 85 years, the United States 60 years, the United Kingdom 45 years, Japan 25 years, India 30 years, and more than 50 years for other developing countries or regions. Moreover, the beginning of population aging in developing countries is later than that of China, and most of the population age

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_10

**Table 1** Changes in the dependency coefficient of China (1950–2050) (unit: %)

| | 1950 | 1970 | 1990 | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Elderly dependency coefficient | 7.3 | 7.1 | 8.3 | 9.9 | 11.9 | 16.7 | 26.1 | 34.8 | 41.8 |
| Child dependency coefficient | 56 | 72.2 | 41.5 | 32.6 | 22.3 | 26 | 21.1 | 23 | 21.2 |
| Total dependency coefficient | 63.3 | 79.3 | 49.8 | 42.6 | 34.4 | 42.7 | 47.2 | 57.8 | 63 |

*Data sources China Statistical Yearbook 2013* and *United Nations World Population Outlook 2012*

structure will only appear to age approximately in 2025, 25 years later than China. China will enter a deep-aged society from 2025 to 2030 and then a super-aged society at the same time as Western countries in 2035–2040 at the fastest aging rate in the world.

The average annual growth rate of elderly people over 80 years old in China during 1982–1990 was 5%, which was faster than the average annual growth rate of the elderly of 60 years and over, and the average annual growth rate during 1990–2010 was 4.1%, higher than the world average of 3% and the developed countries' average of 2%. Data from the sixth census in 2010 showed that China's population of elderly people over 80 years old has reached 20 million. According to United Nations projections, this figure will reach 120 million in 2070. Since the 1980s, the median age of the Chinese population has begun to rise. In 2010, it was 34.6 years old and will rise to 52 years old by 2050 (see Fig. 1), which reflects the "aging" of the labor force.

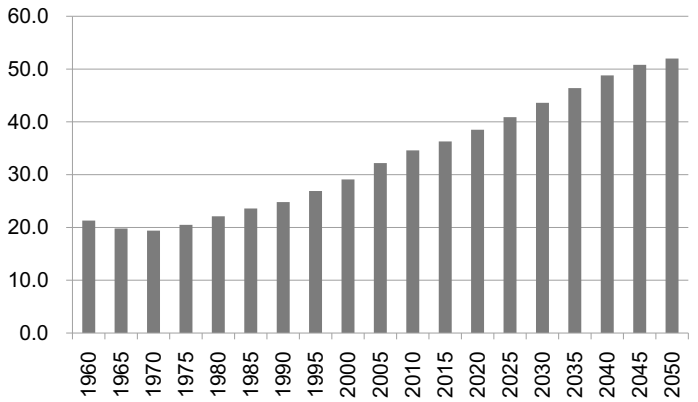


**Fig. 1** Estimate of the median age of the population in China and its annual trends. *Source United Nations World Population Outlook 2012*

## 2 Analysis of the Changes in the Impact Mechanism of Population Aging

### *2.1 The Impact of Population Aging on Industrial Structure Upgrading*

The industrial structure of a country or region reflects the economic and technological ties and proportional relationships within and between industries, and their changes are usually closely related to the country or region's consumption structure, factor endowments, and technological progress. The aging of the population is an important factor that affects the consumption structure, labor supply, human capital accumulation, technological innovation and labor productivity of a country or region. Therefore, the intensification of population aging will inevitably impact the optimization and upgrading of industrial structure. Domestic scholars have roughly formed three views on this issue.

The first is that the aging population is conducive to the upgrading of industrial structure. Scholars such as Wang Wei et al. (2015) point out that the aging of the population has a "reverse mechanism". The aging of the population forces companies to reduce the pressure of rising labor costs and replace labor with capital and technology, thus promoting the transformation and upgrading of the industrial structure. Zhang Jie and He Ye (2014) point out that the aging population has short-term and long-term differences in the low-cost international trade export advantages of China's manufacturing industry. In the short term, the changes in labor supply and demand caused by the aging population and the continuous increase in labor costs will not change the low-cost advantage, nor will it have a fundamental impact on China's manufacturing exports. In contrast, the aging population has to a certain extent spawned and strengthened the endogenous driving force for the structural adjustment and optimization of the manufacturing sector. However, in the long run, it will bring severe challenges to the competitiveness of the manufacturing industry.

The second is that the aging of the population has an adverse effect on the upgrading of industrial structure. Cai Fang and Wang Meiyan (2012) believe that, on the one hand, the aging population will lead to the gradual loss of China's low-cost and low-price labor-intensive industries' international comparative advantages; on the other hand, the level of laborers' human capital and technical capabilities cannot be improved in a short period of time, which will delay the transformation and upgrading of industrial structure. Yang Daobing and Lu Jiehua (2006) believe that the aging of the labor force's age structure will, on the one hand, lead to insufficient innovation ability and difficulty in adapting to the adjustment of industrial structure; on the other hand, it is not conducive to the improvement of labor productivity, thus affecting social and economic development.

The third is that the impact of population aging on the upgrading of industrial structure is uncertain. Nie Gaohui and Huang Mingqing (2015) believe that there are significant regional differences in the impact of population aging on the upgrading of

industrial structure. In the eastern and central regions, population aging can promote the upgrading of industrial structure, while in the western region, population aging has an inhibiting effect on industrial structure. Yi Xin (2015) points out that the impact of population aging on the three industries is different; it has a certain degree of inhibiting effect on the primary and secondary industries while promoting the tertiary industry. Some scholars have concluded that the aging of the population has a dual impact on the adjustment of China's industrial structure. The improvement of the quality of the young labor force and the transformation of the consumption structures of the elderly promote the adjustment of the industrial structure. The aging of the surplus labor force indirectly hinders the upgrading of the industrial structure.

It is important to study the impact mechanism of population aging on the upgrading of industrial structure. The more representative ones are the research results of Ma Zihong et al. (2017). According to their research, the imbalance in the labor supply structures caused by the aging population has severely restricted the optimization and upgrading of the industrial structure. The labor force of different ages has great differences in physical strength, innovation ability, and comprehensive quality. The most direct impact of population aging is to reduce the number of young and middle-aged laborers and extend the working hours of elderly laborers. Due to the limitations of their own physical functions, their role is very limited in labor input, skill enhancement, efficiency improvement, etc., which makes it difficult for production enterprises to effectively guarantee the needs of laborers, and largely restricts the adjustment and optimization of industrial structure. The deepening of population aging will inevitably lead to the aging of the age structure of the working population, and to lower labor productivity, which are not conducive to industrial upgrading. The difficulty and cost of receiving new knowledge and learning new skills are relatively high, considering the aging structures of workers, which is manifested by the difficulty of aging labor adapting to the requirements, thus hindering industrial transformation and upgrading.

Second, technological progress also has an influence. With the advent of an aging society, the degree of technological progress among different industries is not the same, resulting in an imbalance in the development speed and production efficiency between industries. Industries with higher development speed and efficiency gradually occupy the market. The industries with low technological development and slow production efficiency will gradually decline, which will lead to the optimization and upgrading of the entire industrial structure. The aging of the population has also gradually increased the proportion of experienced workers in society, which has promoted the increase in labor productivity to a certain extent; the aging of the population has increased the average number of years of education per capita and promoted the development of knowledge-intensive and technology-intensive industries, promoting the transformation and upgrading of the industrial structure.

Then, there is the impact of institutional innovation. In the historical and realistic process of economic development in a country or region, changes in industrial structure will inevitably lead to structural changes in industrial development. With the advent of an aging society, China's industry's competitive advantage based on low-cost factors has rapidly weakened, as well as some institutional dividends. It is

necessary to accelerate the reform of unreasonable institutional mechanisms, create institutional dividends, and provide effective measures for the upgrading of industrial structure.

Through reforms, the problems of existing systems and mechanisms that are not compatible with the upgrading of the industrial structure will be eliminated so that the market will play a decisive role in the allocation of resources. To accelerate the transformation of government functions, instead of directly intervening in the specific activities of the industry, the government is mainly responsible for the following tasks: strengthening strategy, planning, policy, standard formulation and implementation, strengthening market supervision, maintaining market order, promoting sustainable development and green growth, and making up for market failures; attaching great importance to the cultivation and development of social intermediary organizations; and guiding them to play a better role in the formulation of industrial policies, the creation of common technology platforms, and industrial early warning.

Through institutional innovations, institutional dividends have been created for the upgrading of industrial structure; the institutional mechanisms required for the development of strategic emerging industries and high-end productive service industries are taken as a breakthrough to create institutional dividends to support the development of emerging enterprises and high-tech small and medium-sized enterprises; tax incentive policies for strategic emerging industries and high-end production are further improved. The service industry with high intelligence input and low input deductions, methods of value-added tax reduction and exemption based on the implementation of preferential income tax policies should be explored, and financial innovation and technological innovation should be combined. Risk investment acts as an incubator for SMEs in the R&D stage, and angel funds and private equity investments should encourage their development under the premise of effective supervision.

## *2.2 The Impact of Population Aging on Technological Innovation*

Understanding the mechanism by which population aging affects technological innovation is crucial for studying long-term economic growth, but thus far, the academic community has not reached a consensus on this. Most researchers hold a pessimistic attitude. The main reason is that with aging, personal physical fitness, cognitive ability, innovation motivation and acceptance of new technologies will all decline, which will have an adverse effect on innovation, but some scholars also disagree. The viewpoints of Wang Jixu and others (2017) are worth learning. They believe that the deepening of population aging will produce technological innovation effects, thereby promoting economic growth.

Their research show that an aging population will force companies and society to transition to labor-saving technological progress. The aging of the population will force enterprises and society to carry out labor-saving technological innovations,

which in turn will promote the transformation of economic growth in an innovative direction. To save costs, companies either replace labor with capital or carry out technological innovation. The substitution of capital for labor faces the problem of diminishing marginal returns on capital. Borsch-Supan points out that the negative effect of the decline in the working-age population on economic growth cannot be offset by increasing capital investment, but human capital should be improved through education and training and the improvement of labor productivity. Therefore, the best choice for enterprises is to carry out labor-saving technological innovation, which will cause the whole society to pay more attention to technological progress, and trigger the reallocation of social resources.

The aging population will make society and families pay more attention to education and human capital investment. With the increasing complexity of technological innovation and the expansion of previous knowledge stock, knowledge accumulation will become increasingly important. To enhance their own innovative research and development capabilities, young people have to spend a long time receiving formal education before work. However, the longer the time to receive education, the later the time to begin work, and the higher the education expenses borne by the family, which will increase the opportunity cost of education for the younger population. The aging population provides opportunities for families and society to invest in education. Aging comes from two key reasons for changes in the age structure of the population: the first is the decline in the child population caused by the decline in fertility. This means that the population structure of each family presents an inverted pyramid shape, which in turn makes the family's resources for children's education more concentrated. The second is the increase in life expectancy caused by the decline in mortality. This will make people no longer pursue an increase in the amount of family labor but pay more attention to the improvement of individual labor productivity, thereby increasing investment in education and technical training.

The experience of the elderly can compensate for the decline in cognitive ability caused by aging of the population. Human capital can be obtained not only through formal education but also through "learning by doing" to accumulate work experience and labor skills. Older laborers can use their accumulated work experience to discover more effective work strategies and organizational methods, and they can also complement the new knowledge of young people to improve the efficiency of innovative work. If the work experience of the elderly can offset the decline in productivity caused by cognitive decline, then the aging of the population does not necessarily lead to a decline in innovation capabilities. Evolutionary economics and organizational learning theories emphasize that knowledge diversity is indispensable for innovation. Although an increase in the elderly may reduce the company's stock of new knowledge and the ability to search for new technologies, the influx of young employees can bring companies with new ideas and new technologies, and the elderly can reduce mistakes in the innovation process by sharing mature experiences with young people, thereby promoting innovation activities.

## 2.3 The Impact of Population Aging on Human Capital Accumulation

Many domestic scholars also pay attention to the study of the relationship between population age structure change and human capital accumulation, and their conclusions are also very different. Some scholars believe that population aging is not conducive to human capital accumulation, and some scholars have demonstrated that the two have a positive correlation.

In a specific study, Wang Dewen et al. (2004) points out that demographic transition is an important challenge to the continuous growth of China's economy. In the process of demographic transition, the life cycle and inter-generational transfer will affect labor supply and savings. Technological progress further affects economic growth. Guo Jianxiong (2005) points out that a longer life expectancy (that is, an aging population) will give people an additional stimulus, thereby encouraging people to receive more education and increasing the accumulation of human capital.

The research results of Qu Lingyun (2013) show that although a low fertility rate will aggravate population aging, it will promote per capita education investment and human capital accumulation, which shows that the net effect of population aging on human capital accumulation is positive. Wang Yunduo (2014) believes that in the short term, population aging will lead to an increase in human capital investment time and a decrease in labor supply, resulting in a decline in production capacity and an increase in economic costs; however, in the long run, the population is aging. Globalization will enable younger generations to become more skilled workers when they enter the labor market, greatly increasing labor productivity and ultimately reducing the economic costs of an aging population.

Zhang et al. (2015) show that the working age structure will affect the transformation and upgrading of the industry through the accumulation of human capital and labor productivity in a specific industry, and for every 1% increase in the working-age population, the per capita output will increase by 1.57%. Every 1% conversion of unskilled labor to skilled labor among the aged population will increase per capita output by 1.43%. They also point out that although China has liberalized its single-child policy, the aging population still suffers economic growth and social welfare losses. It may be necessary to further relax population control policies so that China can smoothly enter an aging society.

Liu Yufei and Wang Wei (2016) integrate relevant research and point out that in the process of population structure change and aging, changes in the entire society's material capital, human capital accumulation, labor productivity level, savings rate, and economic growth mode will occur, and different pension modes will also play an important intermediary role. For developed countries such as European countries and the U.S., due to the relatively sound social security system, the family pension mode has been almost completely replaced by the social pension mode. In China, social security is not sound, and the home pension mode is still the mainstream, which will affect the aging of the population and the path of influence of globalization on human capital accumulation.

## 2.4 The Impact of Population Aging on Labor Supply

Demographic transition refers to the phenomenon in which various demographic phenomena gradually progress and change in stages as social and economic conditions change. The demographic transition is usually from a high birth rate and a high death rate to a low birth rate and a low death rate. Therefore, the aging of the population that occurs with the demographic transition is an inevitable phenomenon, and the labor supply situation is bound to be affected.

The current situation in China is that the proportion of the working-age population is gradually declining, while the proportion of the elderly is rising. The 15–59 working age population in mainland China was 937 million at the end of 2012, a decrease of 3.45 million from the end of the previous year, and this group accounted for 69.2% of the total population, a decrease of 0.6 percentage points from the end of the previous year. The absolute number of people aged 15–59 in the working age group has declined for the first time. According to the forecast of the United Nations, the working-age population in China will gradually decrease over a relatively long period of time (see Table 2).

On the whole, before the arrival of a well-off society, an aging society will come. Due to the family planning policy, the aging development process in China is significantly different from that in other countries and regions in the world. China's population change is subject to the dual impact of economic and social development and family planning policies. Compared with other countries, China's population change is not a natural evolutionary process but has a large degree of human control. Before entering a well-off society, China will enter an aging society and encounter unprecedented problems and unique policy challenges in other countries. For example, compared with the course of economic development, the supply of labor began to decrease ahead of schedule and faced the problem of aging earlier. How to deal with the relationship between the population and the economy and society in China is a brand new problem and challenge.

**Table 2** China's 15–64 working age population forecast (unit: 100 million)

| Year | UN medium plan | UN low plan |
|---|---|---|
| 2020 | 9.29 | 9.29 |
| 2025 | 9.08 | 9.08 |
| 2030 | 8.77 | 8.63 |
| 2035 | 8.43 | 8.09 |
| 2040 | 8.23 | 7.68 |
| 2045 | 7.88 | 7.13 |
| 2050 | 7.26 | 6.30 |

*Data source United Nations World Population Outlook 2012*

## *2.5 The Impact of Population Aging on Labor Productivity*

The development trend of population aging will reduce the labor productivity of the entire society. Scholars who support this view believe that the increase in the age of producers will restrict the steady improvement of production efficiency and thus restrict social and economic development. The analysis of Zhou Hao, Liu Ping (2016) and other scholars suggests that this issue needs to be viewed dialectically.

According to the research of Zhou Hao and Liu Ping (2016), the physical function of the aging labor group will be significantly reduced, accompanied by the decline of their labor skills, the decline of labor ability, etc., so they begin to separate from the fast-paced life mode and further promote the reduction of labor productivity. Even if the current labor productivity increases to a certain extent in the future, how to eliminate the negative impact of population aging on the increase in labor productivity is still a big problem. Although older workers have many advantages, there is a large gap between them in terms of physical fitness and energy compared with younger workers, so labor productivity cannot be significantly improved.

Compared with younger laborers, older laborers are weaker in work ability and innovation ability. In addition, the elderly often resist new knowledge and are accustomed to old thinking patterns and old production techniques. The advancement of science and technology will also affect the labor productivity of the aging population. This is because the continuous advancement of science and technology has produced a variety of emerging industries, and the division of labor in society has become increasingly detailed. These all affect the learning ability and knowledge and technology of the labor force. However, older workers are less able to accept new knowledge and new technologies than younger workers, and it is more difficult for them to adapt to work in this emerging industry, which affects the labor productivity of the entire society.

Compared with the younger labor force, the elderly labor force also has advantages. When workers first started working, they often reduced their labor efficiency due to the lack of technical experience. With the gradual enrichment of work experience, the problem of labor efficiency will be improved. However, after entering old age, this skill may tend to decrease due to physical factors. With the rapid development of the social economy and technological progress, physical factors play fewer roles in the work process, which in turn enables the rich experience of elderly workers to be used. In this sense, although the aging population of the entire society continues to increase, in the production development practice of certain specific industries, population aging is no longer an important factor affecting labor productivity, and population aging will not affect the entire production efficiency.

## 3 Policy Recommendations on Population Aging

As the aging of the population has many impacts, to ensure that the human factor provides the best power support for future economic development, we must take scientific and effective countermeasures to address the problem of population aging.

1. Improve the quality of human capital and increase labor productivity. As the population ages, the absolute amount of effective labor will continue to decrease. If no countermeasures are taken, the aging of the population will also lead to a decline in the labor productivity of the entire society, which will hinder industrial development and inhibit industrial transformation and upgrading. Then, in the context of population aging, to meet the needs of economic construction, it is necessary to increase labor productivity, which requires the improvement of the quality of human capital, the improvement of labor skills, and the increase in the output capacity of individual labor. From a national perspective, it is necessary to increase investment in education, vocational skills training, etc., to continuously improve the level of education and professional skills of the labor force and to improve the quality of human capital. From the perspective of the labor, it is necessary to invest more on knowledge improve business skills, and adapt to the requirements of new industrial development.
2. Technological innovation should be sped up to offset the adverse effects of aging. On the one hand, we should speed up and promote industrial technological innovation, start industries and products that require less labor, and reduce labor input. Judging from the practice of developed countries, at a time when labor is becoming scarce, new industries with fewer labor and higher output levels can be developed through technological innovation. On the other hand, the development of technological innovation is suitable for the acceptance and utilization of more elderly laborers into economic activities. In addition, targeted education and technical training should be carried out for the elderly labor force to adapt to technological innovation and industrial development.
3. Develop the elderly industry and open up the elderly market. The aging of the population means that the demographic structure is transforming, and the proportion of the elderly is increasing. Then, the industrial structure can also be transformed according to the degree of population aging and suitable industries for the elderly can be developed and cultivated. The development of the elderly industry will, on the one hand, provide jobs suitable for the elderly to make more elderly people an effective labor force, and on the other hand develop more products and services suitable for consumption by the elderly to release the elderly consumption ability, therefore expand the economic market for the elderly. In addition, the government can further improve the social security system, such as medical care, pension care, and employment for the elderly in accordance with the conditions, to stimulate the vitality of the elderly for social participation.
4. Expand employment opportunities and make full use of labor resources. According to the traditional view, the aging of the population will gradually

reduce the effective labor force. Then, we can open up more employment channels and provide more employment opportunities so that more laborers can find jobs, which will alleviate the reduction in the labor force. In the short term, there is no shortage of labor in China, but the shortage of cheap labor is increasing. Relevant data show that China's job seekers will maintain an annual growth rate of 24 million in the next few years, and based on the 8% GDP growth as the calculation indicator, China's labor market will provide a total of 11 million new jobs each year. In other words, there is still employment pressure in the short term. In the long run, there will be a shortage of effective labor, and the trend will continue to increase. We need to provide corresponding employment opportunities based on labor conditions and make full use of labor resources.

5. Improve the labor market and increase labor mobility. The current labor market in China is imperfect, and the effective flow of labor is insufficient. As population aging increases, China needs to take greater measures to improve the labor market. When the overall amount of effective labor is insufficient, a complete labor market is needed to ensure that labor resources can be optimally allocated through free flow. There are still many shortcomings in the labor market in China: the restrictions of the household registration system, discriminatory employment policies, barriers to mobility between urban and rural areas, employment barriers between different regions, etc., these problems have severely hindered orderly, unified openness, and fair competition. In the process of population aging, China should deal with these problems in the labor market and gradually form a labor market with a sound market mechanism.

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# Age Structure of the Population and High Savings: Theoretical Models and Empirical Evidence


**Qiuyun Zhao, Zhenrong Zhao, and Jinqiu Ma**

## 1 Introduction

It has been widely recognized that the savings rate of China is significantly higher than that of other countries and regions around the world. According to statistics from the World Monetary Fund (IMF), the total savings rate of China fluctuated approximately 40–50% from 2000 to 2015, while the average value in other countries in the world was approximately 30%; it is approximately 10–20% in western developed countries such as the UK and the United States. Despite the statistical discrepancy between China and the United States in terms of savings and income (Ren Ruoen and Qin Xiao, 2006), there is still a large gap in the average savings rate between China and the United States after some comparability adjustments (Xu Zhong et al., 2010). China's high savings rate has become an indisputable fact.

In the research literature that has emerged in recent years, the reasons for the high savings rate of China can be attributed to the following aspects. First, from the perspective of population structure transformation, according to life cycle theory, demographic factors have an important impact on the savings rate. Modigliani and Cao (2004) point out that the family planning policy of China has a dual impact on the savings rate. On the one hand, changes in population structure will directly reduce the household consumption rate; on the other hand, they will indirectly encourage working people to increase their savings for the elderly. Yuan Zhigang and Song Zheng (2000) establish a generational overlap mode with the pension insurance system and find that the aging of the population will increase household savings.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_11

Liu Shenglong et al. (2012) collect provincial panel data from 1990 to 2009 for empirical testing, and the results show that life expectancy had a significant positive impact on the savings rate. They believe that the increase in the dependency ratio of the population does not necessarily lead to a decrease in the savings rate because the aging of the population is largely caused by the increase in life expectancy. Wang Wei (2010b) finds that a decline in the population growth rate will increase the national savings rate, and the impact of population aging is uncertain through a three-phase generation alternation mode. Yang Jijun and Zhang Erzhen (2013) introduce the impact of social security on individual consumption behavior in the mode and found through empirical analysis that weakening the family planning policy and increasing the birth rate cannot reduce the current household savings, but delaying the retirement age and tapping the age-appropriate consumption potential of the working population and reducing the uncertainty through the reform of the pension insurance system are more effective in reducing the high savings rate. Second, from the perspective of institutional changes and preventive savings, Song Zheng (1999) believes that an important reason for the rapid growth of savings is that Chinese residents' savings behavior becomes more cautious when future income is uncertain. Kraay (2000) finds that the uncertainty of future income has a significant impact on urban household savings. Xie Ping (2000) points out that the expected impact of institutional changes on personal savings is greater than the impact of inflation and interest rates. Due to the uncertainty of future income and economic systems, people use a large part of their current income for savings to prepare for consumption expenditures that may be caused by institutional changes. Yang Rudai and Chen Binkai (2009) use CHIP data to conduct empirical studies, and under the framework of a life cycle mode, they established a mode with education expenditure. They believe that the reform of higher education has a significant crowding-out effect on household consumption. He Lixin et al. (2008) use household survey micro-data to study the impact of pension changes on the household savings rate and employ the pension insurance policy changes to overcome the endogenous problem of wealth. The results show that pension wealth has a significant substitution effect on household savings; Bai Chongen et al. (2012) and Zang Wenbin et al. (2012) focus on the relationship between medical insurance and household consumption. Third, from the perspective of economic growth, according to the theory of permanent income, income and its growth will affect savings. Lewis (1954) points out that the reason for the increase in savings in national income is the increase in the income of savers in national income, and capitalists are the main savers. Fan Gang and Lu Yan (2013) establishes a dynamic economic mode based on the research of Lewis (1954) and points out that in the development process of an economy with dual economic characteristics, the existence of surplus labor will increase corporate profits and corporate savings and achieve rapid capital accumulation and expansion of the modern production sector. Fourth, from the perspective of financial development, the financial system of China prefers state-owned enterprises, although they are less efficient than private enterprises, because they can obtain bank loans. However, state-owned enterprises cannot absorb all of the loans. Therefore, net saving appears; Jiang Jing (2014) divides financing constraints into commercial credit, bank credit,

and government subsidies. Relaxing commercial credit and bank credit financing constraints and reducing government subsidies can help reduce the savings rate of state-owned enterprises. However, the relaxation of bank credit has increased the savings rate of non-state-owned enterprises; Xu Lifang et al. (2017) believe that financial development will reduce household savings and increase corporate savings. There is an inverted U-shaped relationship between financial development and the national savings rate. Undoubtedly, the above research literature helps us understand the reasons for China's high savings, but it is obviously not enough for us to have a complete answer to this question. Further research to broaden our horizons is still necessary.

We will demonstrate from the theoretical mechanism and empirical research that the changes in the age structure are the main factors affecting the change in the national savings rate. Different from Western countries, the changes in the age structure of China are largely affected by the external intervention of the family planning policy, which is one of the reasons that China, a developing country, has entered the aging society earlier. Specifically, with the family planning policy implemented in the late 1970s, the population age structure underwent significant changes: the child dependency ratio dropped sharply, and the elderly dependency ratio also rose. According to data from the Fifth Census, the number of elderly people over 65 reached 88.11 million in 2000, accounting for 6.96%, close to the national standard for population aging. At the end of 2005, according to a sample of 1% of the national population, the population over 65 years old reached 10.55 million, accounting for 7.7%, and the population over 60 years old reached 144 million, accounting for 11%. According to international standards, China has truly entered the aging stage. According to research findings by Du Peng et al. (2005), it is estimated that by 2023, the elderly dependency ratio will exceed the child dependency ratio, and the focus of social support will shift from children to old age. In 2050, China will enter a stage of advanced aging, and the elderly dependency ratio will reach 58.76%. In addition, the population aging of China has characteristics of "getting old before getting rich" (Du Peng, 2007), which has a great impact on the current pension system. In summary, careful consideration of the impact of changes in population age structure on the national savings rate is a useful exploration to deal with aging and its economic consequences.

We use a theoretical model to show that the intensified aging of China will make individuals save more for elderly care under the combined pension system of "fully funded + pay-as-you-go", and the decrease in the child dependency ratio will cause more wealth for consumption and savings after the rigid cost of childcare. We then used inter-provincial panel data from 2000 to 2015 to empirically test the conclusions of the theoretical analysis, and the results confirmed the significant impact of changes in the population's age structure (a rise in the elderly dependency ratio and a decline in the child dependency ratio) on the national savings rate. Moreover, after controlling for factors such as the capital-output ratio, FDI, government fiscal policy (measured by fiscal expenditure), human capital, labor growth rate and other factors, as well as dealing with issues such as the endogeneity of explanatory variables and abnormal

sample points, the impact of structural changes on the national savings rate is still significant and robust.

Based on the existing research literature, we have expanded the theoretical explanation of the population age structure for the high savings rate. At the same time, in terms of the empirical estimation results of the control variables, this article supports some views of some literature, such as the positive relationship between the capital-output ratio and the national savings rate (Li Yang and Yin Jianfeng, 2005), the labor growth rate and the national savings rate. The positive relationship between the savings rate (Liu Shijie 2010) does not support other views, such as the impact of human capital on the national savings rate (Yang Rudai and Chen Binkai, 2009; Zhang Zhiyuan and Zhang Minghong, 2016). However, the existence of differences in empirical results should indicate the need to continue relevant empirical research and does not mean that there must be a distinction between right and wrong between different documents; more importantly, for us, the existence of these differences does not change in the age structure of the population that we advocate is one of the important reasons affecting the national savings rate.

The structures of this article are arranged as follows: the second section is a theoretical analysis, and a theoretical model will be used to explain the economic mechanism of population age structure affecting savings; the third section explains the measurement mode and data, all data are from 2000 to 2015 Interprovincial panel data; the fourth section is empirical research results and discussions, including robustness testing, etc. Finally, a brief summary of the full text is provided.

## 2 Theoretical Analysis

The basic framework of the model in this paper comes from the generational overlap model of Diamond (1965). Like Schmidt and Vosen (2010), it considers the survival rate of the elderly and increases the consideration of the child dependency ratio. In this way, we can discuss how the decline in the child dependency ratio and the increase in aging will affect savings in the economy.

### *2.1 Population Age Structure and Social Security Fund System*

Suppose that at time $t$, the number of young individuals is $Lt$. Young individuals have the ability to work and can obtain the wage rate $Wt$; among these young individuals, only the proportion of $x \in (0,1)$ can continue to survive in the $t + 1$ period, but at that time, they will become incapable old people and cannot obtain wage income again; one can only live on savings or social security funds. At the same time, young people in period $t$ will also raise children so that the ratio of raising children is fixed

at $n$, that is, $nLt$ children in the population of period t will be nurtured; assuming that all children can be healthy adults, they will become young by $t + 1$. Therefore, the number of young laborers in the economy in period $t + 1$ is $Lt + 1 = nLt$. Of course, they will also raise children, so the number of children in period $t + 1$ is $nLt + 1 = n^2Lt$.

Under the above assumption, the aging rate at period $t$, that is, the proportion of the elderly in the total population, is $\frac{xL_{t-1}}{xL_{t-1}+nL_{t-1}+n^2L_{t-1}} = \frac{x}{x+n+n^2}$, which means that the aging rate actually depends on the survival rate of the elderly and the child-rearing rate. The higher the survival rate of the elderly population, the higher the rate of aging. The child rearing rate corresponds to the number of children raised by each young individual, which is $n$.

Regarding social security funds in the economy, there are two different systems in the literature. One is a fully funded social security system, and the other is a pay-as-you-go system. The former is insured by the individual when he is young, and when he is old, his premium will be fully returned to the individual, including the principal with interest, which is actually equivalent to personal saving for pension (Wang Dihai, 2011, pp. 373–375), while the latter is in each period. The premiums paid by the young people (collected pension insurance tax) are equally distributed to the old people in the current period. For the social security fee collection under the pay-as-you-go method, it may be assumed that a social security tax with a tax rate of $\tau \in [0,1]$ is imposed on the labor force; obviously, if $\tau = 0$ means that there is only a fully funded social security system in the economy. As far as China is concerned, the State Council issued the Decision on Establishing a Unified Basic Pension Insurance System for Enterprise Employees in 1997, establishing a pension insurance system that combines personal account with social pooling. This is actually a fully funded and pay-as-you-go system. In the subsequent investigation of individual decision-making behavior, we will use this hybrid model as the decision-making background.

## *2.2 Individual Decisions*

In this model, each individual actually survived for three periods: childhood, youth and old age. However, we assume that children do not need and cannot make any decisions but can only be nurtured by young individuals; the economic decisions of consumption and savings are made by individuals in their youth; when they are old, they only accept the consequences of their own decisions in their youth. Then, they make their own economic decisions. Therefore, from the perspective of individual decision-making behavior considerations, the model is essentially still a generational overlapping one that weighs the trade-offs between two periods.

For the sake of simplicity, it is assumed that the utility that young people get from childcare is fixed[1] and standardized to zero. The goal of young people's decision-making is to use their disposable income to maximize their consumption utility in youth and old age,[2] and the objective function is

$$u_t^Y = \frac{(c_t^Y)^{1-\theta}}{1-\theta} + x \cdot \frac{1}{1+\rho} \cdot \frac{(c_{t+1}^O)^{1-\theta}}{1-\theta} \tag{1}$$

In Formula (1), we adopt the utility function of constant relative risk aversion, which is a utility function commonly used in macroeconomic textbooks (for example, Romer, 2001). $\rho$ is time preference, $\theta$ is the constant risk aversion coefficient; $c$ is consumption, and the superscripts $Y$ and $O$ represent young and old, respectively. Note that the utility term for old age has been multiplied by the survival rate $x$; the fixed utility for raising children has been omitted.

Assume that the cost of childcare for each young person is $z(n)$, $z'(n) > 0$, and we regard this cost as a rigid expenditure. Therefore, the disposable income that young individuals can use for intertemporal allocation is $(1-\tau)w_t - z(n)$. . Please recall that $\tau \in [0,1]$ was mentioned earlier as the social security tax rate, so the income that young people can allocate across periods is the after-tax wage rate deducting the remaining part of the rigid childcare cost. Given that the amount of consumption in youth is $c_t^Y$, the amount of individual savings is $s_t = (1-\tau)w_t - z(n) - c_t^Y$. Thus, the consumption of individuals in old age can be written as

$$c_{t+1}^O = \frac{1+r_{t+1}}{x} \cdot \left[(1-\tau)w_t - z(n) - c_t^Y\right] + \frac{n}{x} \cdot \tau w_{t+1} \tag{2}$$

The first item at the right end of the above formula is the income obtained from saving when the individual is young to old age. Because the survival rate of old age is $x$, the true rate of return on savings is $(1+r_{t+1})/x$; the second item is the pension received under the pay-as-you-go formula because in period $t+1$, the number of young people is $Lt+1 = nLt$, and the number of old people is $xL_t$, so the pension received by each old man is $nL_t\tau w_{t+1}/(xL_t) = n\tau w_{t+1}/x$. Rearrange formula (2) to obtain individual budget constraints

$$c_{t+1}^O + \frac{1+r_{t+1}}{x} c_t^Y = \frac{1+r_{t+1}}{x}[(1-\tau)w_t - z(n)] + \frac{n}{x}\tau w_{t+1} \tag{3}$$

[1] Generally, the utility of a family often changes with the number of children raised. However, this article assumes that the number of children raised by each young person is fixed at n, so its utility is regarded as fixed. The assumption of a fixed number of children may be particularly suitable for China, because the family planning policy largely limits the number of children that people choose to have according to their wishes.

[2] When children become adults, they will get wt, and they will also use wt to plan their lives. Therefore, it is implicitly assumed that the individual does not consider helping the child or expecting the child's relief when making decisions.

Individual decision-making can be solved using a rather intuitive derivation method recommended by Romer (2001, chap 2).[3] If the marginal utility of consumption in a certain period is higher, the individual should allocate more wealth to that period. Therefore, in equilibrium, the marginal consumption utility of the two periods is required to be the same. That is, there should be

$$(c_t^Y)^{-\theta}\Delta c = \frac{x}{1-\rho}(c_{t+1}^O)^{-\theta}(1+r_{t+1})\Delta c \tag{4}$$

The left side of Eq. (4) is the marginal utility of consumption in youth, and the right side is the marginal utility of consumption in old age. Δc represents a small change (because the period here is discrete). Rewriting (4), there is

$$\frac{c_{t+1}^O}{c_t^Y} = \left[\frac{x(1+r_{t+1})}{1+\rho}\right]^{1/\theta} \tag{5}$$

Equation (5) depicts the optimal decision-making behavior of the individual, multiplying $c_t^Y$ its two sides and bringing it into the budget constraint Eq. (3). After calculation, we can obtain

$$c_t^Y = \frac{(1+r_{t+1})[(1-\tau)w_t - z(n)] + n\tau w_{t+1}}{(1+r_{t+1}) + x^{1+1/\theta}\left[\frac{(1+r_{t+1})}{1+\rho}\right]^{1/\theta}} \tag{6}$$

$$s_t = (1-\tau)w_t - z(n) - c_t^Y \tag{7}$$

Equation (6) is the amount of consumption allocated to youth, and the amount of savings $s_t$ is determined by Eq. (7) at the same time. Using the chain rule $\partial s_t/\partial x = -\partial c_t^Y/\partial x > 0$ to find the derivative $z'(n) > 0$ is easy to prove $\partial s_t/\partial n = -\partial z(n)/\partial n < 0$ (); and because it was pointed out earlier that the increase in $x$ means the increase in aging, and the decrease in $n$ means the reduction of the child dependency ratio. In summary, we have the following propositions.

Proposition: if other conditions remain unchanged, the increase in aging and the decline in the child dependency ratio can lead to an increase in individual savings.

The above proposition can be easily explained from the economic intuition: if the individual is more likely to survive in old age, then the individual will make more plans for the elderly; the number of children raised decreases, the individual can have more money, or have more money. Great freedom to spend income on consumption and savings, not on children.

In particular, when $\tau = 0$, the proposition is still valid, but the social security system degenerates from a mixed pension social security system to a fully funded social security system. More generally, using the chain rule to find the derivation

[3] A Lagrangian function can also be constructed to solve it, but the method in the article is more intuitive.

is easy to prove, and its economic significance is very intuitive: the higher the pay-as-you-go social security tax rate, the lower people save for the elderly. In other words, compared with the mixed-system pension mode, people will save more in the fully funded pension mode. In China, urban areas implement a mixed-system pension mode, while rural areas mainly rely on farmers' self-saving pension before the implementation of the new rural insurance (equivalent to a fully funded social security system). The analysis here means that, keeping other conditions unchanged, rural residents will save more for retirement than urban residents.[4]

## 3 Measurement Model and Data Description

This article aims to study the impact of changes in the age structure of the population on changes in the national savings rate. Combined with the aforementioned theoretical derivation, we set the following model:

$$S_{it} = \beta_1 Ydep_{it} + \beta_2 Odep_{it} + \gamma Z_{it} + u_i + \varepsilon_{it}$$

Among them, the subscripts $i$ and $t$ represent regions and periods, respectively; $u_i$ are unobservable province fixed effects; $\varepsilon_{it}$ are random disturbance items; and S is the national savings rate (%), which is total savings (including private savings and public savings) divided by GDP. The calculation method is to calculate national savings by subtracting total social consumption from GDP and then obtain the savings rate. To measure changes in the age structure of the population, we use two indicators, namely, the child dependency ratio ($Y$dep) and the elderly dependency ratio (Odep).[5] $Y$dep and Odep are the core explanatory variables that this article focuses on.[6] *where* $Y$dep is the child dependency ratio (%), the calculated index is the ratio of the population

[4] However, at the level of empirical analysis, due to the data limitations, we are still unable to distinguish between urban and rural areas.

[5] It should be noted that in the process of empirical research, we use the pension dependency ratio to measure the aging status. This approach has also been widely used in similar domestic studies (Li Wenxing et al., 2008; Wang Wei, 2009).

[6] Taking into account the systemic differences in the internal structures of the dependent population, we introduce the child dependency ratio and the old dependency ratio to jointly characterize the changes in the population's age structure. If we only use the dependency ratio of the total population, we will undoubtedly miss a lot of rich information. First, as stated in the theory, different dependent populations have different paths to the savings rate; second, in reality, two countries or regions with roughly the same level of total support may have relatively large differences in the internal structures of their dependent populations. For example, in 2005, the dependency ratio of the total population of Japan and Iran was roughly equal, but the child dependency ratio of Japan was 20.9%, and that of Iran was as high as 43.1%, which is more than twice the absolute level of Japan. Correspondingly, the absolute level of Japan's pension dependency ratio is more than four times that of Iran. With roughly the same total dependency ratio, one country has just entered the demographic dividend period, and the other is the demographic dividend period that has ended and is one of the countries most affected by aging problems in the world (Liu Shijie, 2010).

under 15 to the population aged 15–64; Odep is the elderly dependency ratio (%), the calculated index is the ratio of the population over 65 to the population aged 15–64. The changes in *Y*dep and Odep over time reflect the changes in the age structure of the population. According to the previous theoretical analysis, we expect the coefficient of *Y*dep to be negative and the coefficient of Odep to be positive.

Z is the control variable that affects the national savings rate and its changes. The control variables mainly consider the important factors mentioned in the existing research literature, including the following: (1) $K/Y$ is the capital-output ratio. The research of Li Yang and Yin Jianfeng (2005) believes that the capital-output ratio and the savings rate change in the same direction. (2) FDI is foreign direct investment, expressed as foreign investment in the fixed asset investment of the whole society. Yu Yongding and Qin Donghai (2006) explore the impact of FDI on savings and believe that the effect of this impact is complex. (3) Government expenditure measured by the proportion of local government fiscal expenditure in GDP can be regarded as a proxy variable of government fiscal policy. Loayza et al. (2000) believe that the impact of fiscal policy on government savings can only be partially offset by the corresponding changes in private savings, so expansionary fiscal policies may lead to a decline in the national savings rate. Xu Lifang et al. (2017) believes that an increase in government public expenditure can reduce income uncertainty, thereby reducing precautionary savings. (4) Human capital, characterized by average years of education. Research by Yang Rudai et al. (2009) find that years of education have a significant positive impact on consumption, and the increase in human capital will have a negative effect on the growth of savings. (5) The labor growth rate is expressed by the growth rate of the total number of employees in each province. Liu Shijie (2010) proves through a theoretical model that an increase in the proportion of the working-age population will have a positive impact on the savings of the residential sector and verifies this conclusion using data from rural areas. The purpose of this entry is to examine whether the continued growth of labor input will bring about an increase in the savings rate as a large developing country with abundant labor resources.

In terms of data, China's national savings rate, child dependency ratio, and elderly dependency ratio showed a clear trend from 2000 to 2015, the national savings rate rose from 40.3% in 2000 to 47.2% in 2015, and the child dependency ratio increased from 2000. The 32.6% of the population dropped to 22.6% in 2007, which was lower than the world average of 46%. The elderly dependency ratio rose from 9.9% in 2000 to 14.3% in 2007, which exceeded the world average of 13%.[7] The total dependency ratio data are obtained by adding the child dependency ratio and the elderly dependency ratio data. The total dependency ratio showed a downward trend from 2000 to 2010, from 42.6% in 2000 to 34.2% in 2010. The dependency ratio rebounded, and the total dependency ratio rose to 37.0% in 2015. Combined with the data scatter plot, it can be found that the child dependency ratio is negatively correlated with the national savings rate, while the elderly dependency ratio is positively correlated with the national savings rate. Since the child dependency ratio declines during the sample period, while the elderly dependency ratio rises, the two together lead to an

[7] The world average dependency ratio data is quoted from Wang Wei (2009).

**Table 1** Description of variable statistics

| Variables | Definition | Number of observations | Mean | Standard deviation | Minimum value | Maximum value |
|---|---|---|---|---|---|---|
| *S* | National savings rate | 480 | 47.94 | 8.55 | 17.80 | 65.90 |
| *Ydep* | Ydep child dependency ratio | 480 | 25.50 | 7.75 | 9.64 | 47.39 |
| *Odep* | dep elderly dependency ratio | 480 | 12.11 | 2.53 | 6.27 | 21.88 |
| *K/Y* | K/Y capital-output ratio 480 | 480 | 56.98 | 22.08 | 25.29 | 132.83 |
| *FDI* | FDI Foreign direct investment | 410 | 275.06 | 422.24 | 0.21 | 2485.86 |
| *Gov* | Government expenditure | 480 | 18.99 | 8.77 | 5.11 | 62.69 |
| *H* | Human capital | 480 | 8.68 | 1.11 | 6.23 | 13.39 |
| *GL* | labor growth rate | 480 | 5.17 | 7.35 | -28.69 | 38.46 |

increase in the national savings rate. Intuitively, the correlation between the child dependency ratio and the old age dependency ratio and the national savings rate is consistent with theoretical expectations. Of course, the scatter plot can only provide a rough judgment, and a rigorous quantitative analysis is required later.

The data used in this article are China's inter-provincial panel data from 2000 to 2015. The data include 30 provinces and municipalities (excluding Xizang, Hong Kong, Macao and Taiwan). Unless otherwise specified, the data used in this article are from the China Statistical Yearbook, China Population and Employment Statistical Yearbook, and China Labor Statistical Yearbook. Table 1 provides a statistical description of the variables (Fig. 1).

## 4 Empirical Research Results and Robustness Analysis

### *4.1 Basic Estimation Results*

We adopt different methods to estimate the effect of changes in population age structure on the national savings rate. First, the measurement mode without adding any control variables is used, that is, columns (1)–(3) in Table 2, followed by mixed OLS, fixed effects, and random effects estimation. The three estimation methods

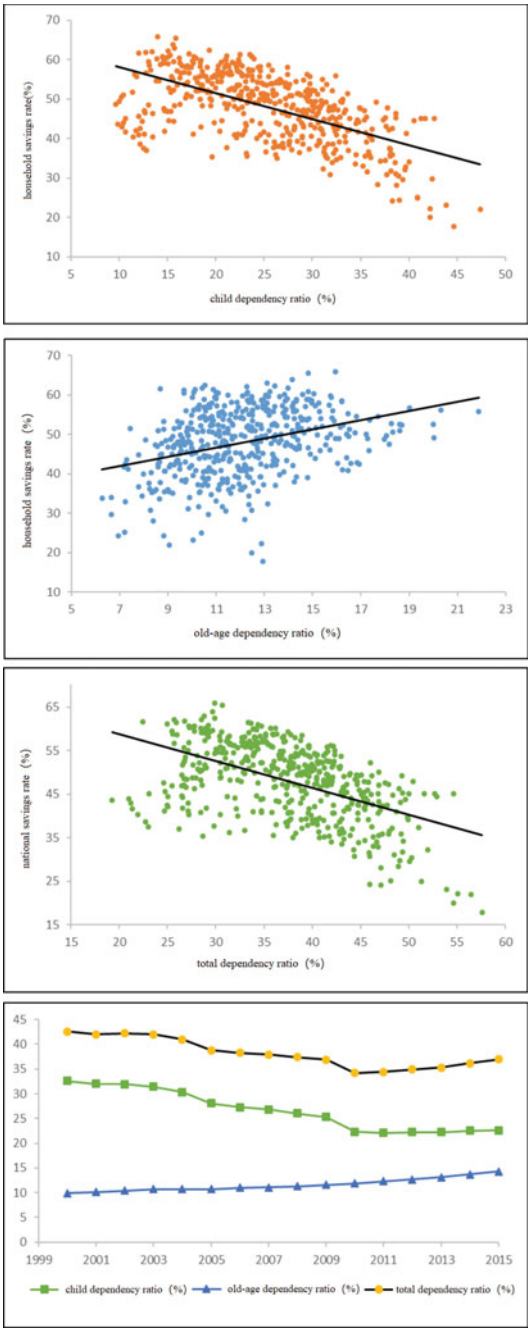


**Fig. 1** Scatter diagram and trend of the national savings rate and population age structure

are consistent: the child dependency ratio coefficient is significantly negative, and the elderly dependency ratio coefficient is significantly positive. Furthermore, we add a series of control variables (K/Y, FDI, Gov, H, GL) to verify the robustness of the estimate; see columns (4)–(6) in Table 2. The results show that these control variables have an explanatory effect on the overall national savings rate, and their signs are mostly in line with expectations. However, the estimated coefficients of the child dependency ratio and the elderly dependency ratio that we are concerned about have little change in various estimates. In general, in the six estimation modes, the estimated coefficients of the child dependency ratio are all negative, and all reach the 1% significance level, and the estimated coefficients are between −0.697 and −0.486; except for column (4), the estimated coefficients of the elderly dependency ratio are all positive, and both reach the 1% significance level, and their estimated values are between 0.387 and 0.949. In terms of the quantitative relationship (subject to estimate [5]), a decrease in the child dependency ratio by 1 unit will cause the national savings rate to rise by approximately 0.687 units, the elderly dependency ratio by 1 unit, and the national savings rate in the morning to rise by approximately 0.601 units. The decline in the total dependency ratio is an important factor in the rise of China's national savings rate.[8] This result confirms the previous theoretical expectations.

It would be very meaningful to analyze the influence of each control variable on the national savings rate and compare it with the results of the literature. The following can be discovered:

(1) Capital-output ratio (K/Y) coefficients are all significantly positive, indicating that an increase in the capital-output ratio will lead to an increase in the national savings rate. This point is consistent with the conclusions of literature research (Li Yang and Yin Jianfeng, 2005). Li Yang and Yin Jianfeng (2005) conduct theoretical analysis based on the Ramsey model and believe that the dynamic change in the capital-output ratio is consistent with the savings rate and that the savings rate is the product of the capital-output ratio and the capital growth rate.
(2) FDI estimation coefficients are negative, but not all are statistically significant. We believe that the increase in foreign direct investment has a substitution effect on national savings, which leads to a decrease in the national savings rate. This view is consistent with the research of Hua Guihong and Cheng Chunlin (2005).
(3) The impact of government fiscal expenditure on the national savings rate is all significantly negative, indicating that the reduction of government fiscal expenditure will lead to an increase in the savings rate. Many existing documents include government expenditure as an influencing factor of the savings rate (Loayza et al., 2000; Wang Wei, 2008; Xu Lifang et al., 2017). The increase in government fiscal expenditure can reduce income uncertainty, thereby reducing precautionary savings. The empirical results support this conclusion.

[8] Under the influence of the childbirth policy, the dependency ratio of the elderly has steadily increased while the child dependency ratio has been declining. Since the latter's decline is significantly greater than the former's increase, the overall dependency ratio is in a downward trend.

**Table 2** Basic estimation results

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Pooled OLS | FE | RE | Pooled OLS | FE | RE |
| *Ydep* | −0.601*** | −0.697*** | −0.684*** | −0.486*** | −0.687*** | −0.633*** |
| | (0.166) | (0.0526) | (0.0501) | (0.113) | (0.100) | (0.0754) |
| *Odep* | 0.475* | 0.949*** | 0.906*** | −0.271 | 0.601*** | 0.387*** |
| | (0.245) | (0.139) | (0.135) | (0.205) | (0.164) | (0.150) |
| *K/Y* | | | | 0.216*** | 0.106*** | 0.137*** |
| | | | | (0.0329) | (0.0207) | (0.0191) |
| *FDI* | | | | −0.00113 | −0.00180* | −0.00113 |
| | | | | (0.00108) | (0.000983) | (0.000905) |
| *Gov* | | | | −0.585*** | −0.220*** | −0.331*** |
| | | | | (0.136) | (0.0777) | (0.0623) |
| *H* | | | | −0.352 | −0.606* | −0.576* |
| | | | | (0.716) | (0.332) | (0.327) |
| *GL* | | | | 0.118** | 0.112*** | 0.116*** |
| | | | | (0.0443) | (0.0305) | (0.0308) |
| *Cons* | 57.51*** | 54.22*** | 54.41*** | 64.82*** | 61.35*** | 62.59*** |
| | (6.564) | (2.546) | (2.637) | (8.058) | (5.133) | (4.614) |
| R2_within | | 0.4375 | 0.4374 | | 0.4550 | 0.4480 |
| R2_between | | 0.3394 | 0.3406 | | 0.4036 | 0.5134 |
| R2_overall | | 0.3677 | 0.3683 | | 0.4239 | 0.4873 |
| *N* | 480 | 480 | 480 | 410 | 410 | 410 |

Note: ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively, similarly hereinafter

(4) The human capital estimation coefficients are all negative, but not all pass the significance test. The research conclusions of the literature are different. Yang Rudai et al. (2009) find that human capital has a significant positive impact on consumption, and increase in human capital will have significant negative effect on the growth of savings. Zhang Zhiyuan and Zhang Minghong (2016) concentrate their research on the relationship between human capital and household savings rates and believe that the increase in years of education would reduce the working years, thereby increasing the household savings rate. They use the system GMM to conduct empirical results on provincial panel data. Every increase in the number of years will increase the household savings rate by approximately 0.75%. The empirical results of this article find that the impact of human capital on national savings is not completely significant and does not support the above conclusions.

(5) The regression results of labor growth rate estimation coefficients are all significantly positive. This point supports Liu Shijie's (2010) research conclusion. Liu

Shijie (2010) proves through a theoretical model that an increase in the proportion of the working-age population will have a positive impact on the savings of the residential sector and verifies this conclusion using data from rural areas.

## *4.2 Robustness Analysis*

In the following, this article mainly examines the robustness of the effect of population age structure on the savings rate. To obtain robust results, this article mainly considers the impact of endogeneity and abnormal sample points on the test results.

(1) Endogenous problems
There are two main aspects to the endogeneity problem considered in this article:

First, the explanatory variable and each control variable may be related to the residual item; that is, the explanatory variable, the control variable and the national savings rate may be subject to the same or related shocks, which lead to endogenous problems. For this endogenous problem, we replace each explanatory variable and control variable in the model with their respective lag periods (Shao Min and Huang Jiuli, 2010). It is worth noting that the change in the age structure of the population is mainly due to the external impact of the family planning policy. Therefore, the child dependency ratio and the elderly dependency ratio all use the current period as the regression element, and each control variable uses the lag period as the regression element. We re-estimate with the fixed effect model in column (5) of Table 2, and the main results are shown in column (2) of Table 2. Due to the high correlation between the variables lagging one period and the current period, the estimation results in Table 2 are still credible and effectively avoid endogenous problems caused by the correlation between the current variables and residual items. The results show that the child dependency ratio and the elderly dependency ratio have an important explanatory power for changes in the national savings rate, but the impact of the child dependency ratio is slightly higher than the estimated result of the fixed-effect mode, while the elderly dependency ratio is almost the same.
Second, the national savings rate may have a two-way causal relationship between the explanatory variable and the control variable. For this, the problem of simultaneous endogeneity must be dealt with. On the basis of static identification, we add the one-period lag of the explained variable S. This process also represents the dynamic adjustment process of the savings rate, so the mode evolved into dynamic panel data, which is

$$S_{it} = \rho S_{i,t-1} + \beta_1 Ydep_{it} + \beta_2 Odep_{it} + \gamma Z_{it} + u_i + \varepsilon_{it} \tag{9}$$

To estimate the dynamic panel data, we apply the systematic GMM method proposed by Arellano and Bover (1995) and Blundell and Bond

(1998). It is worth noting that the internal instrumental variables of the system are used in the estimation process, and the explanatory variable is allowed to be weakly exogenous. The weak exogeneity here means that we must assume that the error term is not correlated with the explanatory variable in the current period and the lagging period but allows future feedback (Wang Wei, 2009).

The estimation methods of the dynamic panel mode include difference generalized moment (DIF-GMM) estimation and system generalized moment (SYS-GMM) estimation. The basic idea of DIF-GMM is to first calculate the difference of Eq. (9) and then use the explanatory variable lag period as the instrumental variable of the corresponding variable in the difference equation. However, scholars such as Blundell and Bond (1998) and Bond et al. (2001) pointed out that the DIF-GMM estimator is susceptible to the influence of weak instrumental variables, resulting in limited sample bias. To overcome this problem, Arellano and Bover (1995) and Blundell and Bond (1998) suggest another GMM estimator, the system generalized moment (SYS-GMM) estimator. Since the SYS-GMM estimator makes full use of the difference equation and the level equation, the lag period of the difference variable is added as a tool for the corresponding variable of the level equation. Generally, SYS-GMM is more effective than DIFF-GMM estimation. The test statistic for testing the overall validity of the instrumental variable is the Hansen statistic. In addition, it is necessary to check whether the random interference items have sequence correlations. In general, two-step estimation is better than one-step estimation. In view of this, this paper uses the two-step system generalized moment estimation in regression.

In the setting of instrumental variables, we do the following: since China implements strict family planning policies, we have reasons to treat the child dependency ratio and the elderly dependency ratio as exogenous variables, and other variables are treated as weak exogenous variables. We use the system "Internal tools" to test the lag value of weak exogenous variables as their instrumental variables. The Hansen value of the sample is 0.483, indicating that the overall instrumental variables are effective. The residual sequence correlation shows that the residuals after the difference have only first-order sequence correlation and no second-order sequence correlation. Therefore, the estimated results can determine the error of the mode. The items have no serial correlation. The overall significance test of the mode Wald test P value shows that the overall mode is very significant. From the results of the dynamic panel estimation, the one-period lag coefficient of the national savings rate is 0.413, which is less than 1, indicating that there is a convergence trend in the savings rate between provinces and municipalities in China. The estimated coefficient of the child dependency ratio that we focus on is significantly negative at the 1% significance level, which is − 0.334, and the coefficient of the elderly dependency ratio estimate is significantly positive at the 1% significance level, which is 0.110. This result is different from the previous one. The estimated results are similar, which

further strengthens the conclusion that the decline in the total dependency ratio is an important cause of the current increase in China's savings rate. Obviously, the conclusion of whether the two variables concerned in this article strengthen or weaken the national savings rate is dynamic, and the recognition still holds.

(2) The impact of abnormal sample points.
Due to the distinctive regional characteristics of economic development, there are also large differences in savings rates in different regions. For example, in 2000, the national savings rate of various regions in China fluctuated between 21.97 and 57.22%, and the distance between the two was more than 35 percentage points. By 2015, the gap between the two has shrunk, but it also reached a fluctuation range of 28.9 percentage points. This indicates that the sample data may have abnormal points. To test whether the estimated results of this article are affected by these abnormalities, we first calculate the percentages of the national savings rate of 30 provinces, municipalities, and municipalities at 10 and 90% and compare all samples below the 10% quantile and above 90%. The sample points of the quantile are eliminated. On this basis, the remaining sample data are estimated by a fixed-effect model. The results are shown in column (4) of Table 3. Both the child dependency ratio coefficient and the elderly dependency ratio coefficient are statistically significant, and the coefficient values are −0.680 and 0.539, respectively, which are close to the aforementioned basic identification results. Overall, our conclusions are still basically sound.

## 5 Conclusions

In recent years, the problem of the aging population has become increasingly prominent. In 2015, the population of elderly people aged 65 and above reached 144 million, accounting for 10.5% of the total population; in contrast, the proportion of children aged 0–14 has been declining and has gradually stabilized at approximately 16.5% since 2010. A high national savings rate, and changes in the age structure of the population, there are two objective phenomena that exist in the contemporary Chinese economy. This paper uses a theoretical model to show the connection between the two: increase in the elderly dependency ratio and decrease in the child dependency ratio will lead to increase in savings. We believe that this is exactly what happened in the Chinese economy. Empirical research using inter-provincial panel data from 2000 to 2015 supports the above view, confirming the significant effect of a rising elderly dependency ratio and a declining child dependency ratio on the rise of the national savings rate; even if other potential factors affecting the national savings rate are controlled, this effect is also significant and robust.

If we look more closely at the empirical research results, we can also find that the effect of the decline in the child dependency ratio on the increase in the national savings rate from 2000 to 2015 mostly exceeds the effect of the increase in the

**Table 3** Estimation results of robustness

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | FE | IV-Lag | SYS-GMM | Outliers |
| *Ydep* | −0.687*** | −0.770*** | −0.334*** | −0.680*** |
| | (0.100) | (0.108) | (0.0379) | (0.0985) |
| *Odep* | 0.601*** | 0.661*** | 0.110*** | 0.538*** |
| | (0.164) | (0.174) | (0.0333) | (0.163) |
| *K/Y* | 0.106*** | 0.0956*** | 0.0446*** | 0.107*** |
| | (0.0207) | (0.0224) | (0.00825) | (0.0203) |
| *FDI* | −0.00180* | −0.00181* | −0.00140 | −0.00174* |
| | (0.000983) | (0.00105) | (0.000871) | (0.000966) |
| *Gov* | −0.220*** | −0.170** | −0.133*** | −0.235*** |
| | (0.0777) | (0.0832) | (0.0234) | (0.0764) |
| *H* | −0.606* | −0.568* | −0.465*** | −0.612* |
| | (0.332) | (0.326) | (0.0800) | (0.326) |
| *GL* | 0.112*** | 0.0558* | 0.0773*** | 0.110*** |
| | (0.0305) | (0.0329) | (0.00602) | (0.0304) |
| $LS_{t-1}$ | | | 0.413*** | |
| | | | (0.0293) | |
| Cons | 61.35*** | 62.25*** | 39.87*** | 62.17*** |
| | (5.133) | (4.876) | (2.265) | (5.046) |
| *P* value of Hansen test | | | 0.483 | |
| *P* value of AR(1) test | | | 0.002 | |
| *P* value of AR(2) test | | | 0.965 | |
| F/Wald inspection | 0.000 | 0.000 | 0.000 | 0.000 |
| *N* | 410 | 380 | 392 | 406 |

Note: system GMM estimates, using heteroscedasticity robust standard error correction calculation to obtain the *t* value. The instrumental variables used in both the difference equation and the level equation are the child dependency ratio and the elderly dependency ratio. The remaining variables (including log(*LSt* − 1), the lag period of *K/Y, FDI, Gov, H, GL*) are only used for the difference equation as an instrumental variable, and the lag order is (1, 1)

elderly dependency ratio, although the latter is also a significant factor. However, we should pay attention to China's actual national conditions. The room for the child dependency ratio to decline is very limited, and the new family planning policy is changing the trend of China's child population structure, while the pace of China's aging is accelerating. Therefore, the impact of the child dependency ratio on the national savings rate may gradually weaken in the future, and it will be replaced by the deeper impact of the aging population. Under this circumstance, if other factors of China's economic form have not undergone substantial changes, it can be expected

that China's high savings status will be difficult to change in a long period of time in the future.

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# Informal Institutions and Healthy Care for the Elderly: Research on the Health Promotion Function of Social Capital


**Bowen Sun, Xinmu Wu, and Xuesong Li**

## 1 Raising of the Question and Literature Review

Health is an inevitable requirement for all-around development and an important symbol of the prosperity of the country and the happiness of the people. Health improvement is not only conducive to accumulating human capital and improving the efficiency of economic growth but also an important social goal to build a moderately prosperous society in all respects. Health problems often accompany the growth of age, and the increasing degree of aging in China poses a challenge to the health protection of middle-aged and elderly people. To improve the level of universal health, the State Council recently issued the Outline for Healthy China 2030, which put forward the strategic goal of "advancing the building of a healthy China" and made a series of formal institutional arrangements, such as improving the medical and health service system, promoting the reform of medical and health systems and mechanisms, and guaranteeing food and drug safety. Undoubtedly, the improvement of national health is inseparable from a comprehensive medical service security system. However, in the context of an unsound medical insurance system and the relatively lagging medical reform in China, the role of informal institutions of social capital, which are made up mainly of social networks, reciprocity norms, social norms, and social mutual trust, cannot be ignored in its promotion of health (Putnam et al. 1994), especially in a traditional "relational" society such as China, it is necessary to give full play to the health promotion function of the informal system of social capital, making it an important supplement to the formal medical and health service security system.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_12

Theoretically, social capital can be derived from individual-level social capital and community-level social capital, both of which can improve the living conditions of middle-aged and elderly people by providing marginal benefits to social networks. Generally, individual social capital is often based on family, geographical, and blood relationships to obtain support from relatives and friends and neighbors. Based on the healthy human capital model of Grossman (1972) and Maslow's hierarchy of needs theory, the depth and breadth of individual social capital is of great significance for improving one's own health, increasing individual labor efficiency, and promoting the formation of human capital. The increase in personal social networks and frequent participation in social activities can also meet the needs of individual emotions and belongings, thereby improving individual psychological and physical health. In comparison, social capital at the community level includes community social activity participation, social mutual assistance, and social information sharing (Rojas and Carlson 2006). In addition to providing emotional support to improve individual survival expectations and promoting the improvement of individual health (Wang and Chen 2015), collective community social capital can also promote the dissemination and sharing of health information and provide opportunities for community organizations to organize activities.

In empirical research, there are no consistent conclusions on the relationship between social capital and health: one view is that social capital can significantly improve the health of individuals. Xue and Liu (2012) use data from the China Health and Pension Tracking Survey (CHARLS) in 2008 and find that for every 1% point increase in the individual social capital index, the probability of self-rated health as good would increase by 0.21% points. Huang et al. (2015) use micro-data from a survey of farmers in Xihaigu, Ningxia Hui Autonomous Region, and concluded that social capital is positively correlated with residents' health and happiness indexes. In foreign studies, Rojas and Carlson (2006) use empirical analysis to conclude that the types of community infrastructures, the number of community organizations, and the improvement of community trust can significantly reduce the mortality of middle-aged people. However, some scholars have raised objections to this, thinking that the increase in social capital has a negative effect on health. Subramanian et al. (2002) believe that individual social capital and community social capital may have an interactive effect that affects health. The effect of individual social capital on health promotion depends on the level of community social capital. For people with a lower level of trust, a high level of community social capital has a negative impact on health. Some scholars believe that the relationship between social capital and individual health is not significant. Kennelly et al. (2003) analyze cross-sectional data of 19 countries in the Organization for Economic Cooperation (OECD) and find that there is no correlation between community social capital and life expectancy at the national level. Yip et al. (2007) study the impact of social capital on the health of residents in rural China and found that compared with cognitive social capital such as trust and social norms, the impact of activity participation and social network structural social capital is not significant. d'Hombres et al. (2010) research on the impact of social capital on self-assessed health in eight countries in the Commonwealth of Independent States based on data from the 2001 "Living Conditions, Lifestyle and

Health Survey" (LLH). The results show that personal trust in cognitive social capital significantly improved self-rated health, but the level of participation in activities in structural social capital had no significant impact on health.

In summary, from the research on the health promotion effect of the informal system of social capital, there is abundant research on the impact of social capital on health from the individual or community level, but there is a lack of research on the interaction effects of individual social capital and community social capital. In addition, few scholars have effectively dealt with the endogenous problems of social capital variables, leading to endogenous biases in the estimation results. In addition, most studies use a small number of data samples, which are prone to statistically biased estimates. In view of this, this study will use the 2011–2012 China Elderly Care Health Tracking Survey (CHARLS) to analyze the individual effects, community effects, and interaction effects of individual social capital and community social capital on health. Specific questions include whether the increase in social capital promotes the improvement of individual health. Is there a difference between individual-level social capital and community-level social capital in affecting health? Does the impact of individual social capital and community social capital on health depend on each other's basic level? In addition, the research also explores whether there is heterogeneity in gender, age, and marital status in the impact of social capital on individual health.

## 2 Research Design

### *2.1 Data Source*

The research data come from the 2011–2012 China Health and Senior Care Tracking Survey (CHARLS) database. The data survey was conducted by the National Development Research Institute of Peking University. The survey subjects were middle-aged and elderly people aged 45 and above in randomly selected households. The data include the economic and personal health aspects of individuals and households, which are of great significance to the study of the aging problem. Taking into account the complexity of the national data survey, CHARLS first conducted a presurvey of inland Gansu Province and coastal Zhejiang Province in 2008. The sample came from 95 communities/villages in 32 counties/districts, with a total of 2,685 people in 1,570 households. The sample feedback rate of the presurvey is 85%, and the high-quality data obtained in the survey confirm the feasibility of China's health and pension survey. On this basis, the CHARLS project conducted a national baseline survey from 2011 to 2012. To ensure sample representativeness, the CHARLS baseline survey data covered 450 villages and bureaus in 150 counties and districts

across the country. The survey respondents totaled 17,708 people in 10,257 households, which generally represent middle-aged and elderly people over 45 years old in China. The total feedback rate of the baseline survey data is 80.51%, and the response rate of the rural questionnaires is 94.15%, which is higher than 68.63% of the urban level to meet the data research requirements.

## 2.2 *Setting of the Measurement Model and Description of the Variables*

Taking into account the problem of biased estimation that may be caused by the endogeneity of social capital, the study uses the endogenous logit estimation model for regression analysis. Based on Grossman's (1972) healthy human capital formation model, the study established the following regression equation:

$$P(H_i = 1|X_i) = \beta_0 + \beta_1 ISC_i + \beta_2 CSC_j + \beta_3 ISC_i \times CSC_j + X\gamma + \varepsilon_i \quad (1)$$

In model (1), $i$ represents different survey individuals, and $j$ represents different survey communities. $P(H_i = 1|X_i)$ refers to the probability that the individual self-rated health is good or above, $X_i$ is an explanatory variable, $ISC_i$ and $CSC_j$ represent the $i$ individual social capital and $j$ community social capital, respectively, $X$ represents the control variable, and $u_i$ are the residual items. Based on theoretical assumptions, this research focuses on the coefficients of individual social capital, community social capital, and the interaction terms of the two, which are $\beta_1$, $\beta_2$ and $\beta_3$. This study will combine the estimation algorithm of the endogenous logit model to estimate the unbiased coefficient of the endogenous social capital variable $\beta_{2SLS}$, which can solve the estimation bias problem caused by endogenous social capital to a certain extent.

**The explained variable is the individual's self-rated health level**. Although self-rated health indicators cannot fully measure the overall level of an individual's physical or mental health, they are often used to evaluate an individual's subjective health level because of their high correlation with individual health and mortality (Idler and Benyamini 1997). The individual self-rated health data in this study come from question DA002 in CHARLS, "What do you think of your health? Is it good, good, fair, bad or very bad?" For the convenience of processing, the research defines people who answered fair, good, and very good as healthy and defined as 1, and those who answered bad and very bad as unhealthy and defined as 0.

**The core explanatory variables of the study are individual and community social capital**. The CHARLS survey did not involve the content of cognitive social capital such as "trust". Therefore, this study only considers structural social capital at the individual and community levels, including activity participation and community infrastructure construction. (1) Individual social capital. Individual social capital is generally measured by indicators such as the frequency of individual participation

in activities and the frequent interactions between neighbors, and there are no objections. This study uses the question DA056 "Did you participate in the following social activities in the past month?" for statistical analysis. Different from the study of Xue and Liu (2012), which excludes stock trading and the Internet from social activities, this research includes them, as stock trading and Internet access are not easily accessible for the majority of the sample subjects, which are middle-aged and elderly people over 45 years old, and their marginal effect on health cannot be ignored. The study adds up the frequency of participation in individual activities and conducts standardized treatment. (2) Community social capital. There are two different approaches to the measurement of community social capital: one method is to use the number and types of organizations in the community and the number of other entertainment, medical and sports facilities (Poortinga 2012); the other method uses "total" or "weighted average" processing on individual-level social capital (Mohnen et al. 2011). This study uses the first measurement method to define community social capital as the type of community infrastructure and group organization. The definition of "community" here includes the two connotations of "rural village collective" and "urban community". The reason why China's "community" is so defined that the village collective and urban community have a clear geographical boundary and are spatial carriers of the informal organization, and it is a geographical unit with close interaction between residents and a more consistent collective identity and collective action (Yu et al. 2008). In view of the limitations of CHARLS data, this study uses the types and numbers of institutions and activity venues in the community. Question JB029 is "does your village or community have the following institutions or activity venues?" Question options include sports facilities and recreational facilities. There are 14 items in total, such as activity places for the elderly and employment service centers, and their total options are standardized.

**Control variables** include gender, age, income, household registration, marital status, education level, smoking, social assistance, and medical insurance. The effect of the main variables on health has been confirmed (Rose 2000). Table 1 lists the specific definitions of the variables.

## *2.3 Descriptive Statistics and Correlation Analysis of Variables*

Table 1 shows the descriptive statistical analysis results of the overall sample and the stratified sample. The sample stratification is divided by gender, age, and marital status. China divides the elderly over 45 into four age levels, including middle-aged and elderly people (45–59), elderly people (60–89), long-lived people (over 90 years old) and centenarians (over 100 years old). According to the most recent classification of the World Health Organization (WHO), those under 44 are young people, 45–60 are middle-aged people, 60–74 are prospective elderly people, and those over 75 are seniors. With reference to different standards, considering that the

**Table 1** Descriptive statistics

| Variable | Variable definition | Total sample mean | Total sample standard deviation | Stratified sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | Female | Elderly | Middle-aged | Living alone | Other |
| | | | | 2898 | 1684 | 1844 | 2738 | 271 | 4311 |
| Self-rated health | Fair, good and very good = 1<br>Bad and very bad = 0 | 0.476 | 0.499 | 0.49 | 0.46 | 0.41 | 0.52 | 0.42 | 0.48 |
| Individual social capital | Individual social activity participation category total and standardization | − 0.00243 | 0.911 | 0.059 | 0.011 | − 0.08 | 0.07 | − 0.001 | 0.10 |
| Community social capital | Community organization or activity venue category total and standardization | 0.0001 | 1 | − 0.04 | 0.07 | -0.01 | 0.012 | -0.12 | 0.05 |
| Gender | male = 1, female = 0 | 0.607 | 0.488 | 1 | 0 | 0.57 | 0.63 | 0.40 | 0.65 |
| Age | Age | 62.23 | 10.000 | 60.08 | 61.38 | 71.6 | 52 | 63.2 | 60.14 |
| Annual income | ¥ (Yuan) | 14,284.6 | 20,796.8 | 21,442 | 10,043 | 17,684 | 12,275 | 13,345 | 15,573 |
| City | Urban City = 1,<br>Rural Area = 0 | 0.47 | 0.347 | 0.49 | 0.46 | 0.45 | 0.48 | 0.54 | 0.37 |
| Living Alone | Divorced, widowed, living alone or single = 1, others = 0 | 0.0571 | 0.232 | 0.036 | 0.09<br>0.054 | 0.08 | 0.05 | 1 | 0 |

(continued)

**Table 1** (continued)

| Variable | Variable definition | Total sample mean | Total sample standard deviation | Stratified sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | Female | Elderly | Middle-aged | Living alone | Other |
| | | | | 2898 | 1684 | 1844 | 2738 | 271 | 4311 |
| Undergraduate group | College and university = 1,others = 0 (control group: junior high school and below = 1, others = 0) | 0.0295 | 0.169 | | 0.035 | 0.02 | 0.04 | 0.033 | 0.06 |
| Postgraduate group | Master and Ph.D. degree = 1, others = 0 (control group: junior high school and below = 1, others = 0) | 0.0138 | 0.044 | 0.48 | 0.74 | 0.8 | 0.68 | 0.62 | 0.52 |
| Smoking | Smoking = 1, nonsmoking = 0 | 0.396 | 0.489 | 0.39 | 0.37 | 0.44 | 0.37 | 0.4 | 0.38 |
| Social assistance | Amount of financial assistance from relatives or friends | 0.0662 | 0.249 | 0.06 | 0.068 | 0.08 | 0.06 | 0.07 | 0.06 |
| Medical insurance | With medical insurance = 1,without medical insurance = 0 | 0.476 | 0.499 | 0.94 | 0.94 | 0.97 | 0.93 | 0.66 | 0.71 |

(continued)

**Table 1** (continued)

| Variable | Variable definition | Total sample mean | Total sample standard deviation | Stratified sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | Female | Elderly | Middle-aged | Living alone | Other |
| | | | | 2898 | 1684 | 1844 | 2738 | 271 | 4311 |
| Road | Asphalt road, cement road and highway = 1, others = 0 | –0.00243 | 0.911 | 0.72 | 0.71 | 0.7 | 0.7 | 0.95 | 0.94 |

*Note* According to the data of the CHARLS questionnaire

CHARLS surveys are all samples over 45 years old, this study defines those under 60 as middle-aged and those over 60 as old people. Living alone includes married living alone, married divorced, married widowed, and unmarried single. For the education indicators, the study sets them as grouping variables based on the level of academic qualifications, which are divided into three groups: university group (college and university), graduate group (master and doctoral) and others (junior high school and below), so only the university group is needed.[1] The two dummy variables of the graduate student group can reflect the marginal effects of different groups. After removing the relevant missing data, the effective sample of the study was 4582, which met the needs of further empirical analysis.

Furthermore, to obtain a more direct answer, the study conducts a Pearson correlation coefficient test on individual social capital, community social capital and individual self-rated health.[2] The results show that the correlation coefficients between individual social capital and community social capital and self-rated health are 0.0681 ($p < 0.01$) and 0.1019 ($p < 0.01$), respectively, indicating the positive correlation between social capital and health. The correlation coefficient between gender and health is 0.315 ($p < 0.01$), indicating that men have a higher probability of self-assessing health as good or better. The correlation coefficient between age and health is −0.116 ($p < 0.01$). As age increases, self-rated health tends to decrease. Living alone has a significant negative correlation with health, with a coefficient of −0.318 ($p < 0.05$), which reflects that living alone for various economic and social reasons has an adverse effect on individual health. In addition, the correlation coefficient also shows that living in a city, having a high income, having a university degree or above, and having medical insurance have a positive correlation with health. Smoking, having a master's degree or above, and receiving social assistance are negatively related to individual health. To explore the impact mechanism of health, we need to analyze it through a more refined quantitative regression model.

[1] There are three situations: when university group = 1, postgraduate group = 0, junior high school and below = 0, the coefficient of university group reflects the marginal effect of individuals with college and university education; when graduate group = 1, university group = 0, Junior high school and below = 0, at this time the coefficient of the postgraduate group reflects the marginal effect of individuals with postgraduate education; when the university group = 0 and the postgraduate group = 0, the coefficients of different variables in the equation reflect the marginal effects of individuals with a junior high school education and below. Therefore, setting the two dummy variables of university and postgraduate can meet the empirical requirements (Wooldridge 2015).

[2] Pearson correlation coefficient (Pearson correlation coefficient) is a linear correlation coefficient used to reflect the statistic of the linear correlation between two variables. The correlation coefficient is denoted by r, where n is the sample size, which is the observed value and mean value of the two variables, respectively. The value of R is between −1 and +1. If $r > 0$, it indicates that the two variables are positively correlated, that is, the greater the value of one variable, the greater the value of the other variable; if $r < 0$, it indicates that the two variables are positively correlated. This variable is negatively correlated, that is, the larger the value of one variable, the smaller the value of the other variable. The larger the absolute value of r, the stronger the correlation. It should be noted that there is no causal relationship here.

# 3 Empirical Results and Discussion

## *3.1 The Impact of Social Capital on Health: Full Sample Analysis*

In Table 2, model 1 returns the impact of control variables other than social capital on health as a benchmark; model 2 and model 3 add individual social capital and community social capital variables to test the impact of social capital on individual health effects and community effects; model 4 considers the simultaneous existence of individual effects and community effects; and model 5 adds interaction terms between individual social capital and community social capital variables to examine the interaction between individual and community social capital affecting health effects. The choice of instrumental variables needs to meet the two conditions of Cov (IV, SOC) $\neq 0$ and Cov (IV, v) $= 0$ (Wooldridge 2015). Through the overidentification test, the study uses the dummy variable of "existence of asphalt roads, cement roads and highways=1, others=0" as the instrumental variable of social capital and estimates the model based on the two-stage least squares method (2SLS). The F tests of the endogenous variables of community social capital are 14.7 and 19.4, respectively, exceeding the critical value of 10 proposed by Staiger and Stock (1997), rejecting the hypothesis of weak instrumental variables, confirming the effectiveness of instrumental variables, and the regression will obtain an unbiased estimate.

(1) Test of individual and community effects of social capital affecting health

For the endogenous logit model, the coefficients do not reflect the marginal effects of variables, but the relative magnitudes can be compared (Ai and Norton 2003). In Table 2, the results of model 2 and model 3 show that the individual effect of social capital is significantly positive ($\beta = 0.9915$), and the community effect is also significantly positive ($\beta = 0.1140$), both of which can pass the 1% significance test. However, the effect of individual social capital on health promotion is slightly lower than that of community social capital. In real life, the improvement of the individual effect of social capital is inseparable from the participation of individuals and the promotion of social networks. The expansion of social networks and the support of network resources can help individuals increase their tolerance to frustration and improve their mental health. Social capital affects health evaluation through the cultivation of harmonious community atmospheres and information sharing. The increase in community social capital means increasingly complete facilities and groups in communities and villages, and middle-aged and elderly people have more opportunities to obtain pleasure through participation in activities. In addition, health institutions and standardized groups have greatly promoted the dissemination of health information and subtly affected people's living habits and codes of conduct. These are all conducive to the improvement of self-evaluated health. The community effect is higher than the individual effect, which has strong policy implications, indicating that the social capital foundation of the current community is weak. If the

**Table 2** Regression results of individual and community social capital affecting health (reporting coefficient and OR value)

| Variable | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 |
|---|---|---|---|---|---|
| | Benchmark mode | Individual effect | Community effect | Independent effect | Interactive effect |
| Individual social capital | | 0.0915*** | | 0.0968*** | 0.0997*** |
| | | (1.0220) | | (1.101) | (1.1048) |
| Community social capital | | | 0.1140*** | 0.1160*** | 0.116*** |
| | | | (1.1207) | (1.1229) | (1.1229) |
| Individual social capital × community social capital | | | | | −0.0003 |
| | | | | | (0.9997) |
| Gender | 0.0994** | 0.1030** | 0.1100** | 0.1120** | 0.1130** |
| | (1.105) | (1.1086) | (1.1162) | (1.1185) | (1.1196) |
| Age | −0.0111*** | −0.0099*** | −0.0114*** | −0.0103*** | −0.0103*** |
| | (0.989) | (0.990) | (0.9886) | (0.9897) | (0.9897) |
| Revenue | 0.0790*** | 0.0840*** | 0.0790*** | 0.0740*** | 0.0750*** |
| | (1.082) | (1.0876) | (1.0822) | (1.0768) | (1.0778) |
| City | 0.0400*** | 0.0420*** | 0.0380*** | 0.0440*** | 0.0340*** |
| | (1.041) | (1.0429) | (1.0387) | (1.0449) | (1.0345) |
| Undergraduate group | 0.0989 | 0.0807 | 0.0069 | – 0.0057 | – 0.0051 |
| | (1.104) | (1.0840) | (1.0069) | (0.9943) | (0.9949) |
| Graduate group | −0.0493 | −0.0560 | −0.0676 | −0.0707 | −0.0703 |
| | (0.952) | (0.9455) | (0.9346) | (0.9317) | (0.9321) |
| Smoking | 0.0742* | 0.0728* | 0.0998** | 0.0974** | 0.0969** |
| | (1.077) | (1.3231) | (1.1049) | (1.1023) | (1.101) |
| Living alone | −0.1610* | −0.1560* | −0.1200 | −0.1190 | −0.1190 |
| | (0.8513) | (0.8555) | (0.886) | (0.8878) | (0.8878) |
| Social assistance | −0.0555 | −0.0634 | −0.0351 | −0.0413 | −0.0419 |
| | (0.946) | (0.9385) | (0.9655) | (0.9595) | (0.9589) |
| Insurance | −0.1120 | −0.1360 | −0.1130 | −0.1350 | −0.1350 |
| | (0.894) | (0.8728) | (0.8931) | (0.8737) | (0.8737) |
| Constant | 2.203*** | 0.7340*** | 0.7990*** | 0.7490*** | 0.7500*** |
| | (0.1640) | (2.0834) | (2.2233) | (2.1148) | (2.117) |

(continued)

**Table 2** (continued)

| Variable | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 |
|---|---|---|---|---|---|
| | Benchmark mode | Individual effect | Community effect | Independent effect | Interactive effect |
| Observations | 4582 | 4582 | 4582 | 4582 | 4582 |

*Note* ***, **, and * represent passing the test at the 1, 5 and 10% significance levels, respectively; the OR value in the brackets;

government wants to improve the overall social capital level, it should focus on the construction of "hardware", such as community public service infrastructures.

(B) Test of the interaction effect of social capital on health

Model 5 shows the interaction effect of individual and community social capital. The results show that the coefficient of the interaction between individual social capital and community social capital is negative but not significant ($\beta = -0.0003$), confirming that social capital, at the individual and community levels, has no interactive effect that promotes health. This means that the increase in community social capital does not significantly affect the health effect of individual social capital, and the health effect of community social capital does not depend on the level of individual social capital. It reflects the influence of individual social capital and community social capital on individual health. The negative coefficient of the interaction term means that the current level of community social capital even plays a role in inhibiting the function of individual social capital. The above analysis shows the lack of interaction between the participation of individual social activities and the construction of community infrastructures. The reasons can be traced from the following two aspects: one is the insufficient supply of community social capital caused by the backwardness of rural public service facilities, and the other is the separation between the individual and the community under the developed conditions of the urban social network. Moreover, there are differences in the reasons for the impact in rural and urban areas, specifically speaking:

For rural areas, due to the lagging supply of formal security system such as medical care and social security provided by the state, the health protection of rural middle-aged and elderly people, especially the elderly, mainly depends on the accumulation of traditional personal social networks such as support from relatives and friends and mutual assistance among neighbors. The backward construction of rural public service infrastructures and the insufficient supply of community social capital have led to a lack of "hardware" infrastructures for the interaction between individuals and communities.

In cities, the mutual independence of individual social capital and community social capital has a profound social background: with the continuous advancement of China's market-oriented reforms, the formation of personal "social networks" and the relationship between "community trust and community organization" have experienced three stages of high integration, separation from each other and reintegration: the first is the **high integration stage.** In the early stage of market reform, the level

of economic development was relatively backward. Under the background of the dual division of urban and rural areas, the cultivation and development of social networks faced institutional obstacles. The state-owned economy and collective economy occupy an absolute dominant position. The expansion of urban residents' social networks is often inseparable from the "worker-factory-community" pattern. In a relatively closed living and production environment, individuals and communities are highly integrated; although social capital is relatively low, the interaction between the two is relatively strong. The second stage is the **separation from each other stage**. With the continuous advancement of China's market-oriented reforms, the social network that traditionally relies on kinship and geographic relationships has been gradually weakened or replaced by market civilization and contract systems. The formation of individual social networks is no longer limited by geographic scope. The "strong relationship" between individuals and the community is weakened by the "social contract" relationship. It is precisely because of this "separation" attribute that the level of impact of individual social capital on health is gradually weakened, and community social capital is also public. The impact of sexual and collective "capital" on health is relatively independent and does not depend on the level of the individual's social network, causing the interactive effects that affect health to gradually become insignificant. The third stage is the **reintegration stage**. With the further advancement of urbanization and the influx of a large number of rural people into cities, the social integration of new immigrants is inevitable. The elderly are relatively uncomfortable living in urban communities and get stuck with identity issues, such as not being a master or a servant of the city. The problem of insufficient supply of community service facilities and informal organizations and groups needs to be solved urgently to realize the cultivation of urban social networks and new urban immigrants.

(C) Interpretation of control variables

Among the control variables, the self-rated health level of male was higher than that of female. This is inseparable from the Chinese traditional division of women's family role. Women tend to take on more tasks related to housework and children's education, but the negative impact of the social pressure of invisible employment discrimination on their self-assessed health cannot be ignored. The second point is that the older the individual is, the lower the self-evaluated health level. This is easier to understand. With aging, the body's function will gradually decline, which will have a greater impact on the individual's mental self-evaluated health. The third point is that the higher the income is, the higher the self-evaluated health level. For every ¥10,000 increase in income, the probability of self-evaluated health as "good" will increase by 7–8% points. People with a higher income level will also have the ability to obtain corresponding medical resources. The stronger it is, the bigger help it will be. The fourth point is that, from the perspective of residence, the health level in urban areas is significantly higher than that in rural areas because cities often have more complete medical and social security systems, and access to medical resources is more convenient (Zhou et al. 2014). In addition, living alone is not conducive to the evaluation of health, especially in rural areas where the

problem is more serious. One possible explanation is that a large number of young and middle-aged laborers flock to cities and developed areas, and only the "993861" (namely, the elderly, the women and the children) troops stay in rural areas under the background of rapid urbanization. Because of the lack of medical resources, the health problems of the empty-nest elderly, left-behind children and women are worrisome. From the perspective of education level, the self-evaluated health of the group at college and above is relatively high, while the self-evaluated health of the group with a master's degree and above is relatively low. In addition, studies have found that smoking is beneficial for self-evaluated health, mainly because of the subjective nature of self-evaluated health indicators. Even if smoking is harmful to the physiological indicators of the objective body, the subjectively harmful effects of smoking on individual health have not been taken seriously. In other aspects, the social relatives' and friends' assistance and insurance indicators are not significant, which may be related to the low variability of the sample.

### *3.2 The Heterogeneity of Social Capital Affecting Individual Health: Sub-sample Estimation*

To further analyze the differences in the health effects of social capital under different genders, ages, and marital statuses, the study regressed a stratified sample. The results further confirmed the existence of individual effects and community effects of social capital, and the interaction effects are not in different modes. The results are shown in Table 3.

(1) The gender difference of social capital affecting health

Model 1 and model 2 report the regression results of the male and female samples. The health promotion effect of the individual social capital of female is higher than that of male ($0.041 > 0.027$), and the health promotion effect of community social capital is also higher than that of male ($0.0508 > 0.0458$). Gender differences are one of the important factors affecting individual health. In 2005, the World Health Organization discussed the impact of "structural driving factors", including gender, on the living environment and health of individuals, confirming the impact of gender differences, and proposed that gender should be included in health promotion policies, considering the traditional social division of labor and family role for female and their low level of social interaction and social capital. The data also show that, with the same level of social capital, females' individual social capital (0.011) is less than that of male (0.059). The marginal effect of the increase in health promotion is more obvious. In addition, compared with male, female is generally burdened by housework activities and have relatively fewer opportunities to participate in social activities and form individual social networks. Once they withdraw from complicated family affairs, the frequency and quality of their participation in social activities will also be higher. For males, it has a greater impact on individual health promotion.

**Table 3** The heterogeneity of social capital affecting health

| Model | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Variable | Male | Female | Elderly | Middle-aged | Living alone | Others |
| Individual social capital | 0.027** | 0.041*** | 0.033*** | 0.035*** | −0.0340 | 0.0356*** |
| | (0.0108) | (0.0137) | −0.016 | −0.010 | (0.0417) | (0.00866) |
| Community social capital | 0.0458*** | 0.0508*** | 0.038*** | 0.054*** | 0.0422 | 0.0481*** |
| | (0.00989) | (0.0125) | −0.013 | −0.010 | (0.0364) | (0.00783) |
| Individual social capital × community social capital | −0.0014 | −0.0013 | −0.003 | −0.013 | −0.0443 | −0.0027 |
| | (0.994) | (0.934) | 0.706 | 0.746 | (0.932) | (0.844) |
| Gender | | | 0.046* | 0.043** | −0.0737 | 0.0501*** |
| | | | −0.026 | −0.020 | (0.0686) | (0.0164) |
| Age | −0.00427*** | −0.00367*** | −0.004** | −0.004* | −0.00206 | −0.00409*** |
| | (0.00104) | (0.00114) | −0.002 | −0.002 | (0.00309) | (0.000791) |
| Revenue | 0.1240*** | 0.0540*** | 0.077*** | 0.086*** | 0.0720*** | 0.0440*** |
| | (0.0132) | (0.0144) | −0.015 | −0.014 | (0.0127) | (0.0153) |
| City | 0.0420*** | 0.0360*** | 0.036*** | 0.047*** | 0.031*** | 0.0360*** |
| | (0.0048) | (0.0044) | −0.005 | −0.005 | (0.0020) | (0.0016) |
| Living alone | −0.0974** | 0.0217 | −0.005 | −0.053 | | |
| | (0.0490) | (0.0413) | −0.044 | −0.046 | | |
| Undergraduate group | 0.0324 | −0.0678 | 0.048 | −0.020 | −0.189 | 0.00916 |
| | (0.0397) | (0.0642) | −0.060 | −0.041 | (0.179) | (0.0343) |
| Postgraduate group | −0.0290 | −0.00682 | −0.004 | −0.028 | −0.00274 | −0.0220 |
| | (0.0194) | (0.0282) | −0.026 | −0.020 | (0.0723) | (0.0163) |
| Smoking | 0.0222 | 0.0505** | 0.019 | 0.040** | −0.0132 | 0.0342** |
| | (0.0190) | (0.0252) | −0.024 | −0.020 | (0.0651) | (0.0156) |
| Social assistance | −0.0407 | −0.0750 | −0.051 | −0.063 | −0.0846 | −0.0549* |
| | (0.0411) | (0.0472) | −0.046 | −0.042 | (0.121) | (0.0304) |
| Medical insurance | −0.0853** | 0.0218 | −0.024 | −0.061 | 0.0465 | −0.0513 |
| | (0.0386) | (0.0515) | −0.049 | −0.040 | (0.144) | (0.0316) |
| Constant | 0.836*** | 0.630*** | 0.698*** | 0.774*** | 0.556** | 0.744*** |
| | (0.0727) | (0.0884) | −0.129 | −0.131 | (0.240) | (0.0591) |
| Observed sample | 2898 | 1684 | 1844 | 2738 | 271 | 4311 |

(continued)

**Table 3** (continued)

| Model | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Variable | Male | Female | Elderly | Middle-aged | Living alone | Others |
| Total sample | 4582 | | 4582 | | 4582 | |

*Note* ***, **, * represent significance at the 1, 5, and 10% levels, respectively

From the perspective of welfare economics, the individual and community effects of women's social capital improvement are higher than those of men, indicating that there are still relatively large differences in eliminating women's employment discrimination. There is still space for giving play to the marginal effects of women's social capital, protecting women's social rights and increasing social welfare.

(B) The age difference of social capital affecting health

In model 3 and model 4, the health promotion effect of social capital of middle-aged people under the age of 60 is more obvious. The coefficient of individual social capital ($\beta = 0.0354$) and the coefficient of community social capital ($\beta = 0.0530$) should be significant. The individual social capital coefficient ($\beta = 0.0327$) and community social capital coefficient ($\beta = 0.0382$) of the elderly over 60 years old indicate that the individual and community effects of middle-aged people's social capital are more prominent. The impact of social capital on health has two aspects: resource acquisition and social pressure. Middle-aged people are often in a more glorious career harvest period and have a relatively stable social network and social capital stock. The improvement of the quality of life in this period is inseparable from the support of social network resources. Compared with the earlier periods, the role of social relations has begun to dominate, although participation in social activities and the maintenance of social relations will bring certain pressure, but on the whole, the resource acquisition effect of social capital is greater than the pressure creation effect. However, for the elderly over 60 years old, the focus of their lives after retirement generally changes from work to family. Since the previous work relationship network of relatives and friends is still relatively mature, the marginal effect of social capital is not prominent.

(C) The differences in marital status of social capital affecting health

The estimated coefficients of model 5 and model 6 in Table 3 show that the health promotion effects of individual social capital and community social capital in the non-solitary sample are more obvious, and the coefficients of individual social capital ($\beta = 0.0356$) and community social capital ($\beta = 0.0481$) both pass the 1% significance test, while the social capital health promotion effect of individuals living alone is not significant, and the individual social capital coefficient ($\beta = -0.034$) and the community social capital coefficient ($\beta = 0.0422$) cannot pass the significance test. The solitary groups in the research sample include four groups: divorced, married living alone, widowed, and single. Different groups have different social capital effects. For divorced groups, the impact of social capital on health has a process of

first suppression and then increase. In the short term, divorced people face social emotional loneliness and economic difficulties, resulting in a sharp decline in social activity participation, deterioration of health and an increase in the crime rate. In the long run, after experiencing a difficult period of material and psychological change, social network relationships will be reorganized and strengthened, the frequency of participation in individual social activities and the probability of quality improvement will continue to increase, and the physical and mental health of individuals will also improve. For married people living alone, the health effect of social capital is relatively low, and it is more pronounced in rural areas, indicating that in the process of rapid urbanization, rural young and middle-aged laborers migrate to cities and the problem of empty-nest elderly and left-behind women is prominent, coupled with the relatively backward medical and health resources, the formation of social capital mainly relies on the maintenance of traditional kinship, geographical and blood relationships; therefore, the effect of social capital on health is not outstanding. In addition, the single group has fewer individuals with less than 1% of the sample, and the health effects of their social capital are not within the scope of this study.

## 4 Conclusion and Policy Discussion

The results of this study show that both individual social capital and community social capital have a significant role in promoting self-rated health, and community social capital has a higher health promotion effect. However, due to the backwardness of rural public service facilities, individual and community social capital lacks promotion on the basis of healthy interaction. In addition, the study also confirms that the health promotion effect of social capital differs by gender, age, and marital status. Hence, the following policy implications are proposed.

First, we fully recognize the positive role of social capital as an informal system in promoting the health of the whole population and incorporate it into the policy toolbox for the promotion of the Healthy China Strategy. With the promulgation of the central 2030 Healthy China Plan, the healthy development of the Chinese people in the next 15 years will become the focus. In the process of advancing the implementation, a complete medical and health service system is a prerequisite for health protection. However, at the same time, because medical and social security have not yet achieved full coverage in remote towns and rural areas, the social capital formed by support and the geographical network relationship still plays a key role in health and elderly care. Therefore, local governments at different levels should be aware of the importance of social capital and incorporate the cultivation of social capital into the evaluation system for the construction of a harmonious society.

Second, government investment and subsidies should be increased, and the construction of community public service infrastructures, nongovernmental organizations and social groups should be actively promoted. The research results prove that the increase in the types and frequency of individual activity participation,

as well as the community medical and entertainment infrastructures and organizational groups, can provide individuals with emotional support and mutual assistance, which is conducive to the improvement of self-evaluated health. The improvement of community infrastructures has a greater effect on health promotion. Therefore, it is necessary to further increase the construction of sports venues, entertainment venues, libraries and various nongovernmental organizations in communities, especially in rural areas; establish community health service information platforms; and update and disseminate community disease prevention and epidemic prevention information in a timely manner. In this way, it will help to reduce information asymmetry, increase residents' attention to the improvement of individual health, create convenient conditions for residents to participate in community activities, improve the social integration of residents' lives, and create conditions for the health promotion and interaction of individual social capital and community social capital.

Third, differentiated social capital cultivation policies should be implemented as the measurements vary from person to person and from place to place. Women, elderly, groups living alone, and rural low-income groups should enjoy the necessary policy preference for social capital cultivation. Studies have shown that males' self-rated health is higher, but females' social capital has a higher health-promoting effect than males'. Affected by the traditional social division of labor, women play a key role in the family and are often burdened by household chores. However, once women have more opportunities to participate in social activities, the marginal effect of the increase in their social capital is often higher than that of men. Therefore, the role of community committees, social women's federations, and mutual welfare organizations should be used to improve women's social networks, and unreasonable gender discrimination clauses should be further eliminated to improve women's family and social status. For middle-aged and elderly people, the older the age is, the worse the self-rated health. The health promotion effect of the social capital of middle-aged people is higher than that of elderly people. Therefore, the implementation of the policy needs to follow the recently promulgated Opinions of the Central Committee on Further Strengthening and Improving the Work of Retired Cadres, encouraging the establishment of elderly organizations, elderly associations and other organizations, and creating a good environment for the elderly to re-employment to support retired professional and technical personnel, especially old experts, to further play their role in serving and promoting economic construction and technological progress. In addition, living alone is not conducive to individual health evaluation, and the social capital health promotion effect of individuals living alone is low. Targeted support should be given to groups such as widowed living alone or rural empty-nest elderly and left-behind women. The study also confirms that an increase in income is conducive to the improvement of individual health. Therefore, implementing multiple targeted poverty alleviation strategies, improving the economic level of rural low-income groups, and retraining the unemployed are also important strategies for promoting the implementation of the Healthy China Strategy.

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# The Reform of the Pension System Under the Background of Population Aging in China


**Yueqiang Pan, Haina Jiang, and Xipeng Ma**

In the report of the Nineteenth National Congress of the Communist Party of China, it was proposed that a multilayered social security system covering all people integrated between urban and rural areas with clear rights and responsibilities and moderate protection and sustainability should be comprehensively built. Social security is the core of the social security system and consists of pension insurance, medical insurance, unemployment insurance, work injury insurance and maternity insurance. In 2016, social security expenditures were ¥4.69 trillion, of which pension insurance expenditures were ¥3.40 trillion, accounting for 72.5% of total expenditures. It can be seen that pension insurance is the most important component of social insurance.

With the continuous improvement of living standards and the extension of life expectancy, the "silver wave" of the aging problem has become increasingly serious, which inevitably impacts the pension system. The Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly clearly stipulates that "proactively responding to the aging of the population is a long-term strategic task of the country".

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_13

# 1 The Status Quo and Characteristics of Population Aging in China

## *1.1 The Status Quo*

Generally, according to the standards of the United Nations, when a country or region's elderly population over 60 years old accounts for 10% of the total population, or the elderly over 65 years old accounts for 7% of the total population, it means this country or region has entered an aging society.

In the fifth national census in 2000, the total population of China was 1265.83 million, of which 88.11 million were over 65 years old, accounting for 6.96% of the total population. This indicates that China has entered an aging society. According to the Statistical Communique of the People's Republic of China on the 2017 National Economic and Social Development published by the National Bureau of Statistics, at the end of 2017, the population of China aged 60 and over was 209 million, accounting for 17.3% of the total population; the population aged 65 and over was 158.31 million, accounting for 11.4%. According to the 13$^{th}$ Five-Year Plan for the Development of the National Aging Career and Pension System issued by the State Council in 2017, it is estimated that by 2020, the number of people over 60 years will increase to approximately 255 million, accounting for 17.8% of the total population; the number of the elderly living alone and empty-nest will increase to approximately 118 million, and the elderly dependency ratio will increase to approximately 28%.

Aging reflects the proportion of the elderly in the total population, which is closely related to many factors, such as birth rate, population mortality, and life expectancy. With the continuous development of the economy and the improvement of medical standards and related guarantees, the average life expectancy of China has increased significantly (as shown in Fig. 1). Compared with the average life expectancy in 1981, it increased by nearly 9 years in 2015. Especially from 2000 to 2015, in just 15 years, it increased by nearly 5 years.

In addition, to a certain extent, the issue of population aging can also be reflected from the perspective of the elderly dependency ratio. During the ten years from 2007 to 2016, the elderly dependency ratio continued to increase, and the rate of increase also increased (as shown in Fig. 2).

## *1.2 Characteristics of Population Aging in China*

(1) Rapid growth

China had basically entered the threshold of an aging society in 2000, with people aged 65 and above accounting for 6.96% of the total population. This figure increased to 11.4% at the end of 2017, which amounts to an average annual growth of 0.26% points, much higher than the 0.02% points per year from 1950 to 1980. Moreover, the

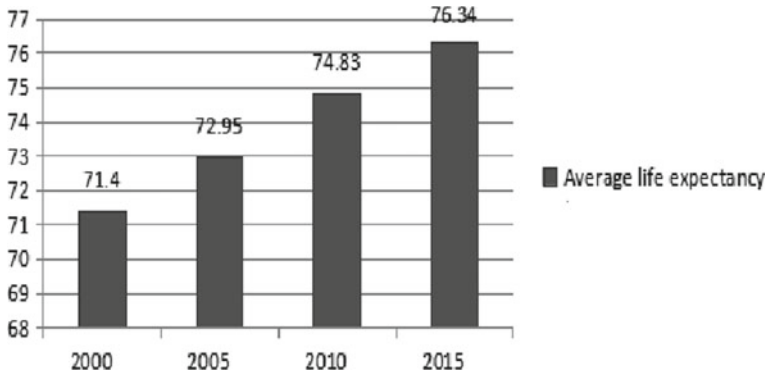


**Fig. 1** China's average life expectancy (years) from 2000 to 2015. *Source* China Statistical Yearbook 2017

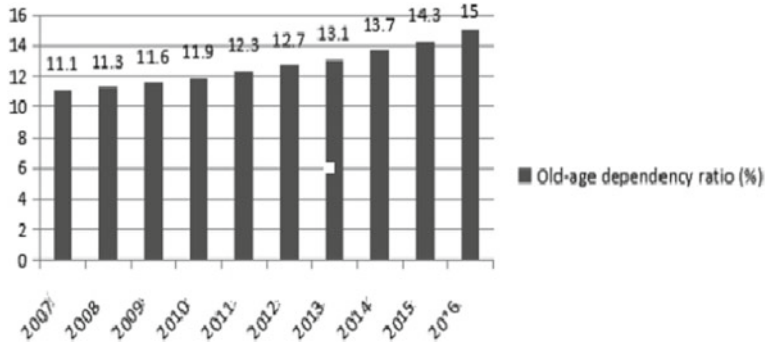


**Fig. 2** China elderly dependency ratio from 2007 to 2016. *Source* 2007–2016 China Statistical Yearbook

growth speed increased rapidly, with an average annual growth rate of 0.425% from 2013 to 2017. There was 0.6% more of the proportion of the elderly aged 65 years and above in 2017 than in 2016, and 2017 experienced the highest increase rate. In addition to the comparison with the past, the population aging in China also needs to be put in comparison with other countries (see Table 1). If estimated by the average annual growth rate of 0.425% from 2013 to 2017, with the data of 11.4% at the end of 2017, the proportion of people aged 65 and above will reach 14% in 2024. The aging speed is much faster than that of several developed countries and closer to the rate of Japan.

(B) Large population increments

The large population increment in China is inseparable from the large population base and rapid growth. In 2016, the population aged 65 years and above exceeded 150 million for the first time, and in 2017, the number was 8.28 million more than that in 2016. The increment in 2017 was almost twice that of 2013, peaking in history

**Table 1** Comparison of the speed of population aging in several countries

| Country | Time for reaching the proportion of the population aged 65 and above | | Time required (years) |
|---|---|---|---|
| | 7% | 14% | |
| Japan | 1970 | 1996 | 26 |
| United Kingdom | 1930 | 1975 | 45 |
| Germany | 1910 | 1975 | 66 |
| Sweden | 1890 | 1975 | 85 |
| France | 1865 | 1980 | 115 |

*Source* Wu Cangping, *Social Gerontology*

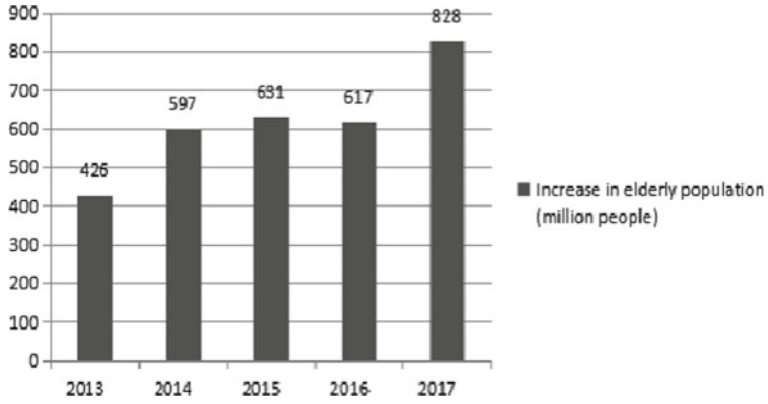


**Fig. 3** Population increment of the population aged 65 years and above in 2013–2017. *Source* 2013–2017 National Economic and Social Development Statistical Bulletin

(as shown in Fig. 3). At the same time, in 2017, the number of new people aged 60 and above in China increased by 10 million, posing even more severe challenges to China's pension insurance.

(C) More serious aging in rural areas than in urban areas

Generally, the degree of aging in urban areas is higher than that in rural areas because the former have better medical services, a sounder security system, and a longer life expectancy than the latter. This is the opposite in China. The aging degree in rural areas is more serious than that in urban areas. According to the sixth national census in 2010, the proportion of the population aged 65 and above in urban areas was 7.8%, which was 1.38% points higher than that of the fifth census, while the proportion in rural areas was 10.06%, which was 2.56% points higher than that of the fifth census. The main reason is the huge difference between urban and rural areas formed by long-standing dual system structures. Large numbers of young and strong rural laborers migrate to work in cities and towns, diluting the aging population in urban areas

while at the same time increasing the aging problem in rural areas. In 2017, the population separated from their households was 291 million, of which 244 million were floating population, 30 million and 24 million more than the sixth census in 2010. There was only 60 million floating population nationwide in 2000, and it grew by more than 300% in 2017.

(C) Distinct regional difference

Objectively speaking, the regional disparity of population aging in China follows the rule of decreasing from east to west. For example, Guangdong, a major economic province in the eastern coastal area, eased aging pressure due to the influx of young and middle-aged labor. According to the sixth national census in 2010, the five most aging regions are Chongqing, Sichuan, Jiangsu, Liaoning and Anhui; the five younger regions are Guangdong, Xinjiang, Ningxia, Qinghai and Xizang. In 2016, Chongqing and Sichuan had the highest elderly dependency ratios, 19.79% and 19.47%, respectively, which was almost twice the ratio of 10.18% of Guangdong. It was only 7.01% in Xizang.

## 2 The Historical Evolution of the Pension Insurance System in China

Pension insurance provides stable and reliable income for the elderly. The pension insurance system in China has undergone many reforms since the founding of the People's Republic of China. It is of great importance to have a fuller examination into the problems existing in the current pension insurance system and to understand its historical evolution and the purpose of each reform.

Regulations of the People's Republic of China on labor Insurance promulgated by the Government Administration Council in 1951 created a precedent for pension insurance. At that time, all the expenses were borne by the enterprises or the capital; the Interim Measures for the Retirees of State Personnel promulgated by the State Council in 1955 established a pension system for civil servants; Interim Regulations on the Retirement of Workers and Employees promulgated by the State Council in 1958 merged the retirement system for enterprise, as well as administrative and state institutions, which was the largest overall plan for the pension system in China thus far.

Interim Measures on Workers' Retirement and Resignation and Interim Measures on the Placement of Old, Weak, Sick and Disabled Cadres promulgated by the State Council established two different insurance systems for cadres and workers, laying the groundwork for a "dual track system". Interim Provisions on the Implementation of the Labor Contract System in State-owned Enterprises in 1986 introduced the mode of individual payment, which also laid the foundation for the future implementation of the unified accounting mode.

In 1991, the State Council promulgated the Decision on the Reform of the Pension Insurance System for Enterprise Employees, establishing a system that combines

basic pension insurance with supplementary insurance for enterprises and individual savings. This system changed the way that pension insurance is completely underwritten by the state and enterprises to jointly burdened by the state, enterprises and individuals, marking the beginning of social pooling. In the same year, the County-level Rural Social pension Insurance Plan (commonly known as Old Rural Insurance) issued by the Ministry of Civil Affairs marked the development of rural pension insurance in China, and more people were added to it.

In 1995, the State Council issued the Notice on Deepening the Reform of the Pension Insurance System for Enterprise Employees, promulgating that the expenses for basic pension insurance are shared by enterprises and individuals, a combination of social pooling and personal account.

In 2009, the State Council issued the Guiding Opinions on the Pilot Program of New Rural Social pension Insurance (commonly known as New Rural Insurance). New rural insurance consists of three parts: individual payments, collective subsidies, and government subsidies, while old rural insurance is actually a saving mode consisting of individual payments. In 2011, the State Council issued Guiding Opinions on Launching Pilot Social Pension Insurance for Urban Residents, targeting non-employed urban residents who do not meet the conditions for participating in basic pension insurance. In 2014, the State Council promulgated the Opinions on Establishing a Unified Basic Pension Insurance System for Urban and Rural Residents, which decided to merge the new rural social pension and the urban residents' pension, establishing a unified pension system.

In 2015, the State Council issued the Decision on the Reform of the Pension Insurance System for Staff of Government Institutions (commonly known as the integration of the pension insurance system), reforming the current pension system for staff of government institutions with reference to the system for enterprise employees and implementing the mode of integrating social pooling and personal account. However, the integration is not complete, and the operation and accounting for these two systems are separate, as are their funds.

In 2017, the State Council issued the 13th Five-Year Plan for National Aging Career Development and Pension System Construction Plan, which proposed improving the basic system that combines social pooling and personal account and building a multilevel pension insurance system that includes occupational annuities, corporate annuities and personal savings. In 2018, the Ministry of Finance, the State Administration of Taxation and other departments issued the Notice on the Pilot Program of Individual Tax Deferred Commercial Pension Insurance to further promote the development of the "third pillar", marking a new era for commercial pension insurance.

## 3 Risks Faced by the Pension Insurance of China Against the Background of Aging

Population aging is not a unique phenomenon in China; it has become a challenge faced by many countries worldwide and has different impacts. Under the background of population aging, the pension system has the following problems and risks.

### *3.1 Heavy Reliance on Financial Subsidies*

Aging in China is a relatively serious problem, considering the growth rate, the large increment and the absolute number of the aging population. According to the statistics report on human resources and social security development from 2010 to 2016 released by the Ministry of Human Resources and Social Security, the fund collection income and expenditure scale of the pension system of China is shown in Fig. 4. We can see that in 2013, the collection income was lower than the fund expenditure, and in the following years, the growth rate of collection income has been lower than the fund expenditure. This has intensified the situation in which pension insurance cannot cover expenditures and relies heavily on financial subsidies.

Specifically, the capital income of pension insurance for urban employees is mainly from the contributions of enterprises and employees, and the deficit is then subsidized by the finances. In recent years, the scale of financial subsidies for basic

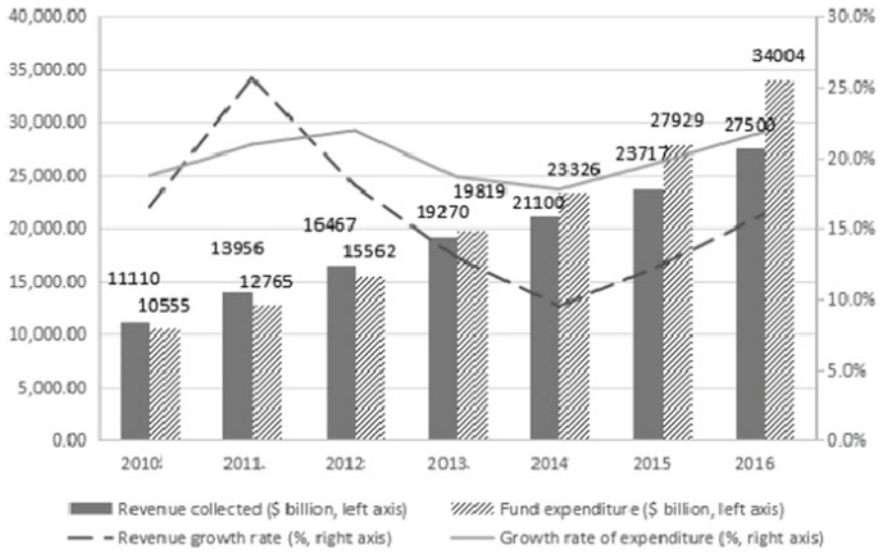


**Fig. 4** The scale of income and expenditure and its growth rate (2010–2016). *Source* Statistical Bulletin on the Development of Human Resources and Social Security from 2010 to 2016

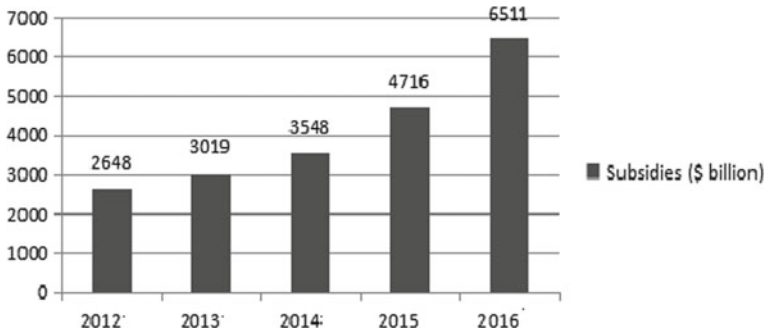


**Fig. 5** Amount of the financial subsidies of the basic pension insurance for urban employees in China (2012–2016). *Data source* Statistical Bulletin on the Development of Human Resources and Social Security from 2010 to 2016

pension insurance for urban employees in China has also continued to expand (as shown in Fig. 5). In 2016, fiscal subsidies reached ¥651.1 billion, nearly ¥180 billion more than the 2015 fiscal subsidies, an increase of 38%, and more than double the total fiscal subsidies in 2013. In addition to the large amount of financial subsidies and the rapid increase in the amount of subsidies, the proportion of financial subsidies to the total income of the basic pension insurance fund for urban employees is also increasing. In 2016, financial subsidies accounted for 18.6% of the total income of the fund that year, 2.5 percentage points higher than in 2015. The pension insurance for urban and rural residents relies more on financial subsidies, and the government pays basic pensions to insured persons who meet the conditions for receiving pension insurance for urban and rural residents. In 2016, the basic pension insurance fund income of urban and rural residents was ¥293.3 billion, of which personal contributions were only ¥73.2 billion, accounting for only 25% of fund income.

## *3.2 Serious Problem of Empty Account*

The current pension mode of China combines social pooling and personal account. In the basic pension insurance for urban employees, 8% of personal wages enter the personal account to implement the fund accumulation system, and 20% paid by enterprises enter the pooled account to implement the pay-as-you-go system. In 1997, the pension system underwent a transition from a simple pay-as-you-go system to a hybrid mode of a pay-as-you-go system and a fund accumulation system. For those who retired before the transition, pensions will still be paid in accordance with the original regulation; for those who work before the transition and retire after the transition, not only the working years before the transition are regarded as contributions, but there are additional transitional pensions after retirement. When the overall account is not enough to pay the current pension, a part of the funds in

the personal account will be used to pay, and the personal account will be empty. According to the China Pension Development Report 2016, the empty account of basic pension insurance for urban employees in 2015 was ¥ 4.7 trillion, while the fund balance that year was ¥3.5 trillion.

Meanwhile, with the expansion of the elderly in China, future pension payments will be higher, which will further intensify pension payment pressure. Therefore, personal empty account causes certain hidden dangers, and the expansion of the elderly has increased payment pressure.

### *3.3 Low Level of Overall Planning*

Regional and urban-rural differences, these two basic characteristics of population aging in China require a strong ability of fund raising, resource coordination and adjustment to achieve risk dispersion and burden balance.

At present, the low level of overall planning makes it impossible for pension insurance funds to be deployed nationwide. For places with insufficient pensions, subsidies can only be provided through financial transfer payments, while for places with surplus pensions, investment is not an option considering the future risks; the funds shall be deposited in special financial accounts, with only the interest in demand. At the same time, the low level of overall planning will also hinder the free flow of the population.

The lower the overall planning ability of the pension, the weaker its ability to resist risks, and the worse the fairness. However, regional differences have deepened the need for strong overall planning and coordination because large-scale pension insurance coordination needs to involve the interests of different levels of economic development and different levels of people; thus far, a nationwide pension insurance coordination has not been established.

### *3.4 Slow Development of the Enterprise Annuity System*

As an important part of the pension insurance system, the enterprise annuity has made considerable achievements. However, it still has not met the expectations at the beginning of the policy formulation. Especially in recent years, its development has been extremely slow and has almost fallen into stagnation. According to the 2016 Human Resources and Social Security Development Statistical Bulletin issued by the Ministry of Human Resources and Social Security, at the end of 2016, 76,300 enterprises established enterprise annuities, with an increase of 1.1% over the previous year; the number of participating employees was 23.25 million, an annual increase of 0.4%. The number of participating employees in 2015 was 23.16 million, an increase of only 1.0% over 2014. In addition, at the end of 2016, the employees participating

in the enterprise annuity system accounted for only 8.36% of the employees participating in the basic pension insurance for urban employees, which means that more than 91% of the employees participating in the basic pension insurance for urban employees were not covered by the enterprise annuity. The slow development of enterprise annuities is related to many factors, such as corporate burdens, preferential tax policies, capital markets, and labor supply and demand. As the second pillar of the enterprise annuity system, the slow development makes it difficult to be an effective supplement to the first pillar, especially compared with the United States and other countries, and the gap is greater, which has further caused the situation of a continuous decline in the replacement rate of China's pension insurance.

### *3.5 Great Pressure to Reduce Pension Insurance Rates*

The pension insurance rate of China is not only the highest among social security rates but also the highest in the world. Under the background of stable and normal economic development, higher pension insurance rates will increase labor costs for companies and cause evasion of payment. An excessive reduction in the pension insurance rate will reduce the current collection income. For some provinces struggling to make ends meet, the situation will be even worse.

## 4 How to Further Improve Pension Insurance in the Context of Aging

Aging is both a challenge and an opportunity. In view of the shortcomings of the pension insurance summarized above, the pension insurance system can be improved by the following aspects.

### *4.1 Multichannel Investment of Pension Insurance Funds Must Be Stabilized and Increased*

The entry of pension insurance funds into the market is an international practice for appreciation. In China, pension insurance funds have officially entered the market since 2015, marking that China has begun to increase the pace of exploring the appreciation of pension insurance funds.

There are certain risks in the investments of pension insurance fund investments, therefore, "stability" is the primary consideration in the process of pension preservation and appreciation. With stability, we can consider how to achieve a high value-added pension insurance fund to resist the impact of inflation to truly guarantee the

living standards of the elderly. In addition to entering the market, pension insurance funds can try a variety of ways to maintain and increase value, such as large-scale infrastructure construction projects with long-term benefits.

On the basis of expanding the investment channels of pension insurance funds, the coordination level, supervision and auditing and other related systems cannot be ignored. Only by rationalizing the system level can the pension insurance fund be stable.

## *4.2 Prevent Debt Crises and Ease the Pressure of Pension Insurance Payments*

The existence of an "empty account operation" and the expansion of the elderly increase the future payment pressure. To prevent the emergence of the pension insurance debt crisis, we have to block on the one hand, and, to ease on the other hand.

To cope with the problem of empty account in personal account, China began a pilot project in Liaoning in 2001 to implement personal account. The social pooling fund and the personal account fund were collected separately and operated independently. Subsequently, the scope of this pilot work was expanded to 13 provinces and cities, but the effect was not obvious, and the scale of empty account became increasingly larger. In particular, Liaoning, which was the first to start the pilot, temporarily borrowed money from actual personal account and returned to the old path. The Decision of the Central Committee of the Communist Party of China on Several Major Issues of Comprehensively Deepening Reform adopted by the Third Plenary Session of the Eighteenth Central Committee of the Communist Party of China proposed that the basic pension system that combines social pooling and personal account should be adhered to and that the personal account system should be improved, and this has become the goal of the next stage. The nominal account system may become a new direction of reform considering the situation that it is difficult to continue to implement personal account. The financing method of the nominal account is the pay-as-you-go system, and the pension benefits are calculated on the basis of the payment records and the accounting interest rate on the benefit calculation. It has good incentives and sustainability and can achieve the principle of actuarial balance.

Delaying retirement age can ease pressure on pension insurance payments. The current general retirement age in China is 60 for male, 55 for female officials, and 50 for female workers. As China's population structure and life expectancy have undergone significant changes, extending the previous retirement age will bring too heavy a burden on the pension insurance fund. Although the specific plan for delaying retirement has not yet been announced, it has basically become a consensus, and the most fundamental principle policy determined by the Ministry of Human Resources and Social Security is "small steps, slow and gradual progress". In addition, Mr. Li Yining believes that a new trend of China's population aging lies in the improvement

of population quality during the aging process. In the process of delaying retirement, the elderly, with rich work experience and life experience, can help organizations develop better and guide young people to grow better.

## *4.3 Establish a "Horizontal" and "Vertical" Pension Insurance Coordination Mechanism*

The level of overall planning and coordination is directly related to the sustainability and implementation effect of the pension, especially in the process of the deepening of the aging process. The establishment of an effective pension coordination mechanism can enhance the mobility of resources and ensure fairness. It is believed that the overall pension insurance needs to be led and guided by the government, and an overall coordination mechanism combining horizontal and vertical aspects should be constructed.

From the vertical aspect, a national overall plan for pension insurance should be established. Two steps are included: the first step is to realize the overall planning of pension insurance at the provincial level and then extend to the whole nationwide; the second step is to build a nationwide pension insurance coordination mechanism. At present, although every province has established a provincial-level adjustment fund system, there are few provinces that can achieve unified revenue and expenditure at the provincial level, and unit payment rates and treatment calculation methods are not uniform across the country. In addition, the advantage of the two-step overall planning approach is that it can better consider the situation of each province and stimulate the enthusiasm of local governments. After achieving provincial-level overall planning, a national adjustment fund will be established to gradually realize national system unification and realize national overall planning.

From the horizontal aspect, the relationship between pension insurance and other social security needs to be handled well. Pension insurance is an important part of social security, and it can provide stable income protection for retirees. Medical insurance can reimburse certain medical expenses, reduce medical expenses, and increase protection for the elderly. Social security measures such as social welfare and social assistance can also provide relief to the elderly in need and increase security to a certain extent. A sound social security system will reduce the pressure on pension insurance, and provide more resources to concentrate on covering more people and cope with other problems that exist in pension insurance. Some problems are difficult to solve from the perspective of pension insurance alone, but if they can be "horizontally" integrated with other social security and from a higher perspective, the top-level design will be solved.

## 4.4 Promote the Long-Term Development of Enterprise Annuities

Although the development of China's enterprise annuity has been relatively slow in recent years, as long as the right medicine can be prescribed and sufficient patience is maintained, it will definitely develop well. First, we must further increase relevant tax incentives. The key to the success of corporate annuities in the United States lies in preferential tax policies. China issued the Notice on Issues Concerning Individual Income Taxes on Enterprise Annuities and Occupational Annuities in 2013, implementing the EET mode commonly used internationally, but the incentive effect is not obvious, and has not reached the expected effect. In the next step, we can consider continuing to increase the preferential tax policy. In the payment link, we can further increase the proportion of pretax expenses paid by enterprises and individuals, and intensify the preferential strength for enterprises, for they are the main body of enterprise annuity operations and play a decisive role. In the collection process, the tax should be appropriately reduced to 45%, for the cost of one-time collection is too high.

Second, the barriers to entry for enterprise annuities should be lowered. The Enterprise Annuity Measures promulgated by the Ministry of Human Resources and Social Security and the Ministry of Finance in 2017 required enterprises to participate in basic pension insurance and fulfill payment obligations in accordance with the law, as the enterprises have the corresponding financial affordability. Compared with the 2004 Trial Measures for Enterprise Annuities, the condition that a collective consultation mechanism should be established has been removed. However, there is still room and scope to lower the threshold, to encourage more private enterprises to establish enterprise annuities, and prevent enterprise annuities from becoming a club of the rich.

## 4.5 Consolidation of the Fundamental Can Better Play the Protective Role of Pension Insurance

As a universal security service, pension insurance guarantees basic living needs of the people, therefore, a correct understanding of pension insurance should be established. At the same time, this article believes that the fundamental solution to this problem is to consolidate and increase income and make people become richer.

A separate analysis of pension insurance divides the relationship between pension insurance and economic development. As a social security measure, pension insurance is fundamentally dependent on economic development and income growth. According to the data published in the Annual Report on China's Social Security Development 2016, overall pension insurance balances are large in the east and small in the central and western regions. Taking Heilongjiang Province as an example, its dependency ratio is the lowest, while the pension insurance fund balance is negative,

and its economic development speed is relatively slow, thus falling into a vicious circle.

Therefore, against the background of aging, economic development is the core strategy to solve the problems of pension insurance. Under this premise, various measures can be used to maintain and increase the value of pensions: delay the retirement age, improve the personal account system, coordinate the national pension insurance, establish a sound pension security system, and encourage the development of the pension market.

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# The Impact of Population Aging on Income Distribution


**Shengbo Wang, Haiyuan Wan, and Yangyang Shen**

## 1 Status Quo and Trends of Population Aging in China

As an important trend and an increasingly larger issue that most countries around the world are concerned about today, population aging is extensively and profoundly affecting all aspects of society. As the largest developing country in the world, China has ushered in an aging population when its economic development is still relatively low, a fact that will have profound impact on the income distribution and other economic and social issues now and for a long time to come.

### *1.1 The Prominent Trend of Population Aging in China*

According to international standards, the population aged 60 and above accounts for 10%, and the population aged 65 and above accounts for 7%, marking the criteria for entering an aging society. In the history of the development of the People's Republic of China, the proportion of the elderly in the early days was still very low, although it has been increasing. For example, the proportion of people aged 60 and above in the total population was 7.3% in 1953 and then increased to 10.3% in 2000 and 13.3% in 2010. According to the standards of the United Nations, the population aged 60 and above accounting for 10% of the total population means the society has entered an aging one. In 2000, the population of China aged 60 and above reached 10.3%, indicating that China has already formally entered an aging society.

In China, the proportion of the population aged 65 and above in the total population was only 4.4% and 3.6% in 1953 and 1964, respectively; with the decline in the

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_14

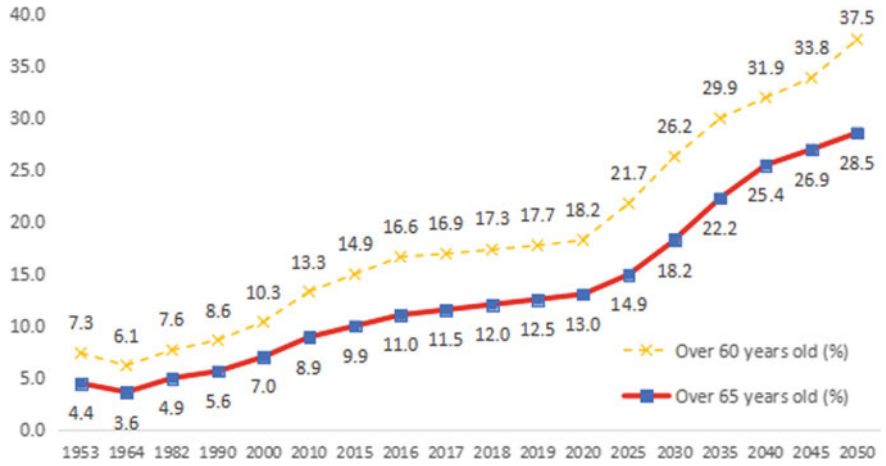


**Fig. 1** The age structure of the population in previous censuses. *Data source* The data before 2010 are derived from the previous census data, and the data after 2011 are predicted by the population prediction software PADIS of the National Health and Family Planning Commission, combined with Zhang Chewei's use of 2010 Census Data

mortality rate and birth rate, it increased to 4.9% in 1982 and 5.6% in 1990. As the number and proportion of the elderly continue to increase and the process continues to accelerate, the age structure begins aging. The fifth census in 2000 showed that the population aged 65 and above reached 88.21 million, accounting for 7.0% of the total population; China has officially entered the ranks of aging countries. In the sixth census in 2010, the proportion reached 8.9%.

Therefore, China has officially entered an aging society based on both indicators. The aging has accelerated since 2010. The proportion of the population aged 60 and above and aged 65 and above reached 17.3 and 12.0% in 2018, which means that China has entered a relatively seriously aging society. It is forecast that the number of people aged 65 and above will account for 14.9% in 2020 and will reach a historical high of 28.5% in 2050, which means that China has become a severely aging country (Fig. 1).

## *1.2 Continuous Increase in the Proportion of the Elderly*

Advanced age is another significant feature of population aging in China. At the time of the first census in 1953, the proportion of people aged 80 and above accounted for only 4.37% of the population aged 60 and above, but in 2010, it rose to 11.68%, which means that there is one elderly person over 80 years old in every 10 people over 60 years old. The average annual growth rate of the population aged 80 and above in China reached 5% from 1982 to 1990, which was faster than the growth

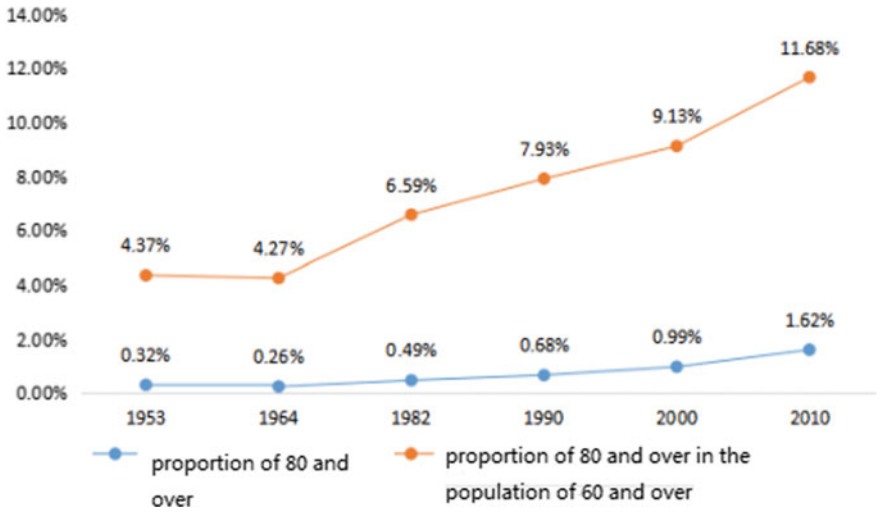


**Fig. 2** Proportion of the population aged 80 and above in previous censuses. *Data source* The data before 2010 are derived from the previous census data, and the data after 2011 are predicted by the population prediction software PADIS of the National Health and Family Planning Commission, combined with Zhang Chewei's use of 2010 Census Data

rate of the population aged 60 and above, which was 4.1% from 1990 to 2010, faster than the world average and the average of developed countries. As life expectancy increases, the degree of aging will continue to deepen (Fig. 2).[1]

To a large extent, aging means disability. As age increases, the health of the elderly will continue to weaken. Statistics from the former Ministry of Health show that the prevalence of chronic diseases in the elderly aged 60 and above is 3.2 times that of the entire population, and the disability rate is 3.6 times that of the entire population. The number and proportion of disabled elderly people have been increasing in recent years; there were approximately 33 million in 2010, accounting for 18.54% of elderly people aged 60 and above; it will continue to rise after that. By 2014, the population aged 60 and above reached 210 million, of which nearly 40 million were disabled (dementia) and semi-disabled (dementia), accounting for 19.05%. In addition, according to the prediction of the Office of the National Working Committee on Aging, the elderly will reach 400 million by 2035, and the number of disabled and semi-disabled elderly will further increase.

[1] Sun Qixiang, Zhu Nanjun. Analysis of China's Population Aging. *China Finance*, 2015(24).

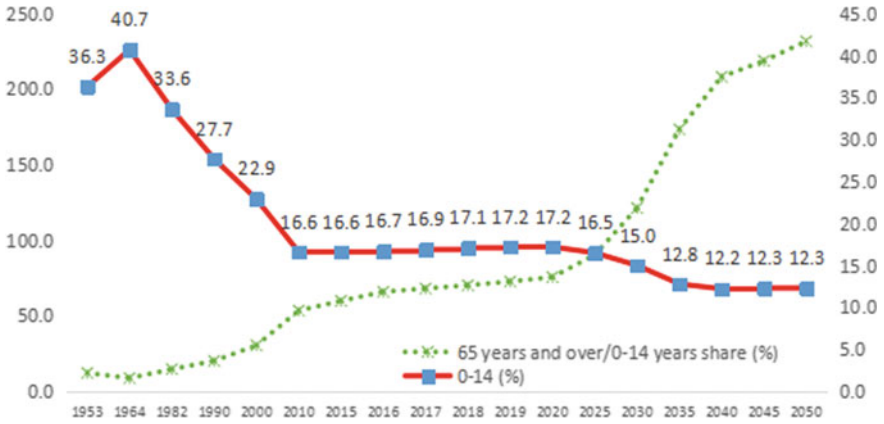


**Fig. 3** Proportion of the population aged 0–14 and 60 and above in previous censuses. *Data source* The data before 2010 are derived from the previous census data, and the data after 2011 are predicted by the population prediction software PADIS of the National Health and Family Planning Commission, combined with Zhang Chewei's use of 2010 Census Data

## *1.3 Rapid Decline of the Proportion of Children and Adolescents*

In addition to the accelerated increase in the elderly population, the proportion of children aged 0–14 has also dropped significantly. Previous censuses showed that the proportion of the population aged 0–14 in the total population dropped from 36.3% in 1953 to 16.6% in 2010, a drop of more than half. By 2018, the proportion of the population under the age of 14 dropped to 17.1%, and by 2035, this proportion will further drop to 12.8%. It is also an important manifestation of the aging structures of the population (Fig. 3).

## *1.4 Insufficiency of Labor Supply*

In terms of the proportion of the working-age population in the total population, China is still in a period of relatively abundant labor supply, with a proportion of 71.6% in 2017. However, this proportion will gradually decline in the future to approximately 70% by 2020 and 67% by 2030. If the beginning of a decline in the proportion of the working-age population in the total population is defined as the point in time when the demographic dividend disappears, then it can be said that China has passed the turning point. The decline in the proportion of the working-age population will inevitably lead to a further increase in pension burden (Fig. 4).

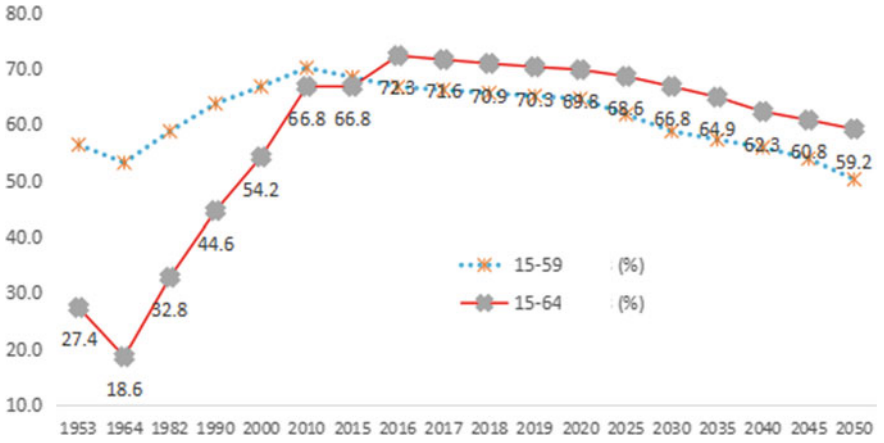


**Fig. 4** Proportion of the working-age population in the total population. *Data source* The data before 2010 are derived from the previous census data, and the data after 2011 are predicted by the population prediction software PADIS of the National Health and Family Planning Commission, combined with Zhang Chewei's use of *2010 Census Data*

## 2 The Impact of Population Aging on Macro Income Distribution

### *2.1 Increase in Labor Income Share*

The most direct manifestation of population aging is the relative decline in the proportion of the working-age population, which means a relative reduction in labor resources and a decline in labor supply. The proportion of the working-age population aged 15–64 to the total population was 72.3% in 2016, but this proportion will gradually decline in the future to approximately 70% in 2020, 67% in 2030, and less than 60% in 2050.

In terms of the total supply and demand of the labor market, if labor demand does not change significantly, the labor supply will be seriously insufficient, which will lead to an imbalance in the relationship between labor factors, and labor prices or labor costs will continue to rise. In particular, the wage level of employees employed in labor-intensive industries will rise significantly. Therefore, in the relative share of capital and labor, the share of labor factors will also increase. According to data from the National Bureau of Statistics, the labor remuneration as a proportion of national income has increased in recent years; it increased by 11.7% annually from 2009 to 2013, and it is accelerating. The proportion of labor remuneration in GNI increased from 49% in 2011 to 53.4% in 2016, which shows that labor costs have indeed increased rapidly in recent years.

## 2.2 Continuous Narrowing of the Wage Gap

As the aging of the population continues to deepen, the population of working age gradually decreases, resulting in a scarcity of labor and a general increase in wages. According to data from the National Bureau of Statistics, the ratio of the average wage of urban employees to per capita GDP has been stable for more than ten years in this century, with a significant increase in recent years from 1.19 times in 2011 to 1.21 times in 2014. The monitoring data of migrant workers from the National Bureau of Statistics showed that there has been an accelerated growth trend since 2000 in the wage of migrant workers whose income is mainly determined by market, and the annual growth rate remained approximately 20% in 2010 and 2011, although it has slowed down after 2012 but maintained an annual growth rate of approximately 10% in 2014, far exceeding the GDP development level of the same period.

Therefore, the wage gap in China has been continuously falling in recent years. The wage gap as measured by the Gini coefficient rose from 0.230 in 1988 to 0.301 in 1995 and 0.345 in 2002 at the earliest; however, as population aging began to accelerate approximately 2000, the wage gap in urban areas also declined, and the Gini coefficient dropped from 0.342 in 2005 to 0.336 in 2013, showing a steady downward trend overall.

## 2.3 Increase in the Proportion of Redistribution Expenditure

According to the status quo of social security development, the economic and social costs of the aging population are increasing year by year, and the proportion of the cost of pension, medical care, daily care and services of GDP will increase from 6.97% in 2015 to 21.77% in 2050, an approximately 14.8% increase (Research Group on National Strategies for Response to Population Aging, 2014). On the whole, the aging population of China will be an economic and social burden for a long time. As the elderly continues to increase, the financial burden will increase, and the government will have to increase taxes and social insurance contributions, which will increase the burden on the people and place higher demands on redistribution expenditures, and further restrain household and personal consumption demand (Fig. 5).

## 2.4 Decline in Redistribution and Adjustment Ability

The pension system of China stipulates that retirees do not need to pay, and in-service employees subsidize retired employees. In the context of accelerated population aging, the proportion of the elderly has increased, and the per capita contributions of the second and third generations must be increased to ensure the sustainability of the social security system; considering that the rate of increase in per capita

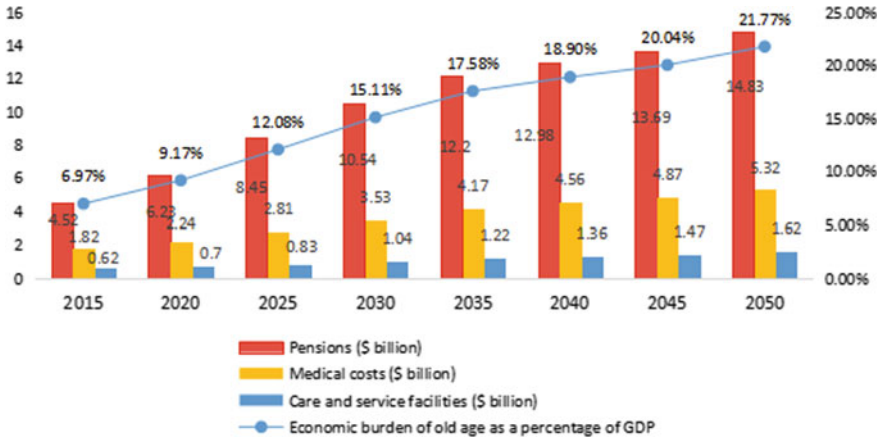


**Fig. 5** Estimated economic cost of population aging in 2015–2050 (price of the year). *Data source* According to the Research Group on National Strategies for Response to Population Aging, Li Jun, etc., *Research on Population Aging and Sustainable Economic Development*. Hualing Publishing House in March 2014

medical expenses is higher than the rate of increase in per capita income, such "systematic redistribution" is even more unsustainable. In addition to enjoying pension income, retired elderly people tend to take up more medical services and higher medical expenditures with worse physical health. They are more likely to be beneficiaries of medical insurance, especially the basic medical insurance system for urban employees, because it relies on the payment of both employers and employees, so there is less turnover room. According to data from the Ministry of Human Resources and Social Security, there were 225 coordinating areas in China where the funds for urban employee medical insurance were not paid for, accounting for 32% of urban employee coordinating areas. Among them, 22 areas have spent all the funds accumulated over the years. Therefore, the basic medical insurance fund for urban employees will not cover the expenditures in the current period in 2017, and there will be a serious deficit of ¥735.3 billion in the accumulated balance of the fund by 2024.

In general, as the proportion of the elderly continues to expand, the current financing arrangements of the social security system are not conducive to improving the income distribution of the entire population and will inevitably increase the burden on young people, increasing the average per capita age of employees ratio rising and will eventually significantly affect the sustainable development of the social security system, which is also not conducive to the role of social security in favoring low-income groups and improving the effect of income distribution.

### 2.5 Continuous Widening of the Income Gap

For the large-scale rural population and urban low- and middle-income residents, when the individual has passed retirement age and has no other income, the extremely low rural endowment insurance makes it impossible to cope with reasonable consumption needs. Therefore, neither the new rural endowment insurance nor the urban residents' endowment insurance system can guarantee their basic life. As a result, their actual disposable income will drop significantly or even appear to be a large amount of negative income. In the distribution of the entire national economy, if there is a large amount of negative disposable income, according to the nonlinear characteristics of the Gini coefficient, this will significantly increase the income distribution gap.

In fact, an important turning point appeared in the population development process approximately 2010. That is, the size and proportion of the working-age population have started to decrease significantly. In 2014, the population aged 15–64 was reduced to 1.13 million compared with 2013. This has led to a decline in the working-age population and labor participation rate. The real labor supply is actually falling at a faster rate. The transfer income of family members on which the elderly depend for survival and development will significantly decline. In 2002, 29.6% of the disposable income of the elderly came from the transfer of family labor members, but in 2007, it dropped to 25.8%, and in 2013, it further dropped to 23.4%.

## 3 The Impact of Population Aging on Micro Income Distribution

### 3.1 Continuous Decline of the Disposable Income of the Elderly

Reasonable consumers should arrange their own consumption and savings according to their income and optimally allocate their expected total income at different age stages to maximize utility. Therefore, the consumption of a person in his early and later periods is higher than his income, and negative savings are made. On the whole, when the age structure of the population is at the most productive stage, sufficient labor supply and a high savings rate will provide an additional source of stable social development, while the working-age population is insufficient or the proportion of the elderly is large, the age structure of the population is no longer productive as a whole, the welfare and income levels created by the society will decline as a whole, and the average disposable income of the society will also decline steadily.

From the individual's point of view, because the income levels of the elderly, especially the advanced elderly, are relatively low, and with the increase in social aging, the proportion of the low-income group in the entire society has continued

to expand. Especially for a society with a relatively high proportion of the elderly population, the medical expenses rise rapidly as the expansion of the elderly and the rapid increase in the average medical expenses. From this perspective, the disposable income of the elderly will also continue to decline.

### *3.2 Decreased Function of Household Redistribution*

As the proportion of the elderly continues to increase, the dependency ratio of the elderly will also increase, which means that fewer working-age populations have to support more elderly people, this will inevitably increase redistribution expenditures and increase the burden on families. According to the national census data over the years, the average family size in China has dropped from 4.33 people in the first census in 1953 to 3.10 people in the sixth census in 2010 and is predicted to be further reduced to 2.61 people in 2030 and 2.51 people in 2050. Family miniaturization and the declining birthrate are continuing trends.

With the gradual shrinking of the family structure, the redistribution function of the family has gradually weakened, and the "4-2-1" family structure has increased. The number of elderly people who need support is much larger than the number of young people, making the traditional family pension mode difficult to carry on. Aging will also bring about a sharp increase in the cost of medical and healthcare. As the family size shrinks, the family's ability to care for the elderly declines. The older the population is, the higher the cost of maintaining welfare and health. In the future, society and families will face a heavy burden of healthcare.

### *3.3 Widening Gap of Inter-generational Income*

With the acceleration of aging, the "4-2-1" family structure has greatly increased the inter-generational burden, and young family members are facing tremendous pressure. According to the experience of developed countries, the per capita medical expenditure of elderly people aged 65 and above is approximately 3–5 times that of young people,[2] especially the medical expenses of elderly people aged 75 and above, which account for a higher proportion, including expensive technology, hospitalization and long-term care. Generally, from the perspective of the life cycle, 60-year-old newly retired seniors have the highest wealth level in their lifetime. Later, with the increase in pension and consumption expenditures, the wealth level will gradually decrease to the lowest level. As the proportion of the 75-year-old population continues to expand rapidly, the proportion of low-income groups in the entire society will also increase.

[2] He Zhenyu, Li Xin. It is expensive to see a doctor. Is the medical industry sick?. *Oriental Morning Post* (Shanghai), 2015-07-07.

As individuals grow older, especially after entering working age, changes in personal savings will first rise and then decline. If the proportion of the elderly in the total population continues to increase, then the transfer income from the working-age population will continue to decline, especially because the working-age population's dependency ratio is relatively large, and the economic burdens, such as upbringing and support, are relatively heavy. This will increase household expenditures and increase the proportion of household savings, coupled with the various rigid expenditures of the elderly population, which will make the final disposable income significantly decline. On the whole, because the wages and income of the working-age population are increasing, while the income of the elderly is declining, the income gap between generations will eventually expand.

### *3.4 Further Increase in Pressure on Household Income and Expenditure*

With the deepening population aging, the total pension required by the elderly is rising sharply, and various forms of pension expenditure will increase. However, with the acceleration of aging, the income of the elderly cannot guarantee pension expenditures. The amount of income and expenditure of the pension system has doubled.

According to the forecast by the Research Group on National Strategies for Response to Population Aging (2014), the proportion of household pension expenditure in China's total household income is approximately 5.2%. With the continuous deepening of the population aging, the amount of pension expenditure in China will also increase and will be close to 15% by 2050. This puts huge pressure on pension expenditures for families. In recent years, with the slowdown of China's macroeconomic growth trend, the wage income growth rate of the working-age family population has slowed down significantly. If this is coupled with the increase in the proportion of the elderly and the significant increase in per capita pension expenditure, the family's income and expenditure will rise further.

## 4 Strategies to Cope with Population Aging and Widening the Income Gap

### *4.1 Develop the Elderly' Labor Resources*

China is ushered in the aging of the population at a stage when China's economy is still underdeveloped and the pension system is unsound, a fact which is bound impact China's economy and society and many other fields, such as the structural shortage of labor and the rise in the elderly dependency coefficient. The burden of social

pension has increased, and medical resources are in short supply. Therefore, actively developing the human resources of the elderly and promoting the development of the silver economy conform to the common interests of the entire society. This is of great practical significance for solving the problem of the widening of the income distribution gap caused by an aging population.

Elderly retirees often have accumulated rich experience in technology and management after decades of experience, and with the improvement of living standards and the advancement of medical technology, they have a long period of time after retirement and are still in a very healthy state to engage in corresponding work. Developing the human resources of the elderly can not only provide experienced labor resources and increase labor productivity but also effectively alleviate the downward trend of labor supply. It can, on the one hand, effectively increase the income level of the elderly, reduce the support burden of the working-age population, and narrow the income gap between families with and without the elderly; on the other hand, it can also, to a large extent, reduce the level of income gap between generations and provide the possibility to reduce the income gap between the working-age population and the elderly population.

## *4.2 Improve the Adjustment Effect of the Redistribution Policy*

At present, the level of income disparity in China ranks among the highest in the world. The widening disparity in income distribution and unfair income distribution have also become the focus of everyone's concern. Apart from the large initial distribution gap caused by marketization factors, the redistribution policy system has not played the role of narrowing the gap. Among the three main types of redistribution policy system in China, in addition to targeted poverty alleviation policies and subsistence allowance policies and other fiscal transfer payment systems that have significantly narrowed the distribution gap, the effects of other redistribution, such as social security policies and tax policies, are not obvious.

First, China has no direct tax system, such as inheritance tax and real estate tax, and cannot restrain the extremely high property distribution gap. The personal income tax mainly regulates low and medium income and labor income. Second, for the social security system, pension insurance as a whole still widens the distribution gap. The higher the income level, the more the payment amount, and ultimately more benefit from the system; for the medical insurance system, it is even more profitable. To a large extent, the initial distribution gap has been significantly enlarged. For the housing provident fund system, in addition to covering middle- and high-income employees in urban areas, the policy also further increases the income advantage of high-income groups through the design of a symmetrical return system, which is a significant expansion of the income distribution gap. Therefore, the next step is to improve the social security system, strengthen tax transfer payments, increase

transfer payments between families, improve the income distribution pattern through multiple channels, increase the income level of the elderly, and narrow the income distribution gap.

## 4.3 Delay the Retirement Age and Increase the Guarding Strength for the Elderly

Timely delaying the retirement age is an important measure for many developed countries to cope with the aging of the population and ease the pressure of pension payments. Judging from the international experience or the current situation of economic and social development, the current retirement age or pension age in China is relatively young. At present, China has the necessity and urgency to delay the retirement age. Although there are still many controversies about delaying the retirement age or delaying the age of receiving pensions, delaying retirement age is a general trend and a necessary path for China, but this process must be carefully designed and proceed step by step, and the relationship between all parties should be carefully handled.

The protection provided by the financial resources and corporate benefits for the elderly is limited, and there is pressure to further increase the level of protection. The essence of social security is inclusive and fair. For a country with a large population and a large gap between the rich and the poor, the formulation and implementation of pension and social security policies must focus on the elderly, low-income groups.

## 4.4 Improve the System Design of Social Security

In terms of financing, the contribution rate of social security projects should be adjusted appropriately to increase the component of social pooling and reduce the proportion of personal account payments to enhance the mutual aid function of the social security system. In terms of the payment base, the upper and lower limits of payment can be eliminated, and progressive payment methods can even be explored; that is, the higher the income is, the higher the payment ratio. This method helps low-income groups reduce the burden of payment, increase the proportion of high-income groups, and reduce the regressivity of social security contributions.

In terms of treatment, a scientific compensation and adjustment mechanism should be established. In terms of endowment insurance, it is necessary to improve the existing treatment determination mode that combines fixed payment and payment determination, and to explore the establishment of a moderate minimum treatment guarantee mechanism. Regarding the medical insurance system, we should improve the personal account system, gradually incorporate personal account funds into outpatient overall planning, lower or abolish the deductible line, and raise or abolish

the ceiling line. In addition, while adhering to the improvement of the overall level of treatment, a differentiated treatment adjustment mechanism should be established, focusing on improving the social security level of the elderly population.

## *4.5 Perfect Family-Based Social Welfare System*

As rapid population aging affects the income distribution system in all aspects, it is necessary to alleviate the contradiction between the decline in the disposable income of the elderly and the increase in the demand for the elderly, the contradiction between the improvement of macro-distribution and the deterioration of the micro-distribution gap, and the contradiction between the narrowing of the wage gap and the widening of the income gap. We all need to start from the micro-mechanism of the family, formally clarifying and gradually adjusting the scope of social welfare policies, and establishing a family support system under the conditions of aging as soon as possible.

It is recommended that on the basis of guarantee the "five-guarantee elderly" (referring to the childless and infirm rural residents who can receive guarantees of food; clothing; medical care; housing and burial expenses from the government) and the "three-no elderly" (referring to the urban-resided elderly aged 60 and above who are unable to work, have no means of livelihood, no supporters or dependents, or whose supporters or dependents are genuinely unable to provide support or maintenance) in urban areas, all low-income elderly people who are completely disabled should be included in the social welfare support system, and support standards should be appropriately raised. In areas where conditions permit, the scope of moderate inclusive benefits can be gradually expanded to low- and middle-income elderly who are completely disabled, low-income elderly people who are partially disabled and empty-nest elderly who are actually unattended. In accordance with the actual needs of the elderly, local financial conditions and the actual situation of the family, all localities determine the ratio of centralized support and decentralized support and establish a family support standard adjustment mechanism linked with urban and rural subsistence allowances, minimum wages, and child welfare standards. In addition, it is also important to help families improve their ability to adapt to aging, accelerate the collection of personal income tax, complex wages and salaries and one-time labor income tax on the basis of family units, and reduce the burden on families with a heavier support burden, as well as encourage disabled elderly people and major caregivers to provide special subsidies for purchasing family health and housekeeping services, etc.

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# Empirical Volume

# A Comparative Study of the Pension Mode in First, Second-tier Cities and Third, Fourth-tier Cities in China

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## 1 The Status Quo and Development of the Pension Market in China

### *1.1 Overview of the Scale and Service Types of the Pension Market in China*

As the base of the elderly expands and the degree of aging continues to increase in China, the scale of the pension market will continue to grow. According to the State Council's 13th Five-Year Plan for the Development of the Aging Industries and the Construction of the Pension System, it is estimated that in 2020, the number of people aged 60 and above will increase to approximately 260 million, accounting for approximately 17.8% of the total population; at the same time, the elderly dependency ratio will increase to approximately 28%; it is estimated that the elderly will reach 360 million, accounting for 25.5% of the total population by 2030.[1] China will become the most aging country in the world.

From the supply side, as shown in Table 1, there were 33,043 pension organizations nationwide in the statistics of the national pension organization in 2014. The regional

[1] See Wang Jingling and Hualong, "Study on the Necessity of Applying PPP Mechanism to the Construction of Pension Institutions in China", *Economic Research Reference*, 2014(52).

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_15

distribution differed significantly, characterized as "plentiful in eastern regions and scarce in western areas". Figure 1 shows that the distribution is positively correlated with the total economic output of the region as a whole (except Anhui, Jiangxi, Fujian, etc.), but from the demand side, the contradiction between supply and demand is relatively significant. In most provinces, pension institutions cannot completely match the needs of local elderly people. On the other hand, service capabilities and profitability are also very different. The average size of pension institutions is 102 beds, and the city with the largest average size is Beijing, which has 284 beds. Eighty-seven percent of the pension institutions provide daily care as the main service, only approximately 10% provide nursing and rehabilitation, and approximately 3% of the institutions provide hospice care. According to the survey data of the "National Survey on the Basic Status of Private Elderly Service Institutions" from the National Office for Aging, more than half (51%) of the institutions can only maintain balance, 40% are in a state of loss for many years, and only 9% can profit. The institutions with a profit rate below 5% accounted for 78%, operating at marginal profits.

The pension market can be divided horizontally into three categories: the housing market, the service market, and the consumption market. Each segment has subdivisions. For example, the service market includes the health care service market, financial insurance service market, and cultural consulting service market. Vertically, as shown in Table 2, the pension market can be divided into three major industrial clusters: core industries, subsidiary industries, and derivative industries. The "core industry" meets the basic survival needs of the elderly and consists of the housing industry, medical care industry, pension service industry and elderly products. The "subsidiary industry" is the upstream industry, such as the upstream housing design

**Table 1** Number of pension institutions in each province (autonomous region) in 2014 (except for Hong Kong, Taiwan and Macao)

| | | | | | |
|---|---|---|---|---|---|
| Southwest | 4682 | North China | 3788 | Northeast | 3444 |
| Sichuan | 3409 | Hebei | 1283 | Liaoning | 1663 |
| Chongqing | 900 | Shanxi | 833 | Heilongjiang | 983 |
| Yunnan | 495 | Inner Mongolia | 734 | Jilin | 798 |
| Guizhou | 59 | Beijing | 592 | | |
| | | Tianjin | 346 | | |
| Northwest | 1922 | Central China | 6151 | East China | 10,116 |
| Shaanxi | 759 | Henan | 2540 | Jiangsu | 2324 |
| Xinjiang | 598 | Hubei | 2008 | Shandong | 2119 |
| Gansu | 342 | Hunan | 1603 | Zhejiang | 1919 |
| Qinghai | 143 | South China | 2201 | Jiangxi | 1906 |
| Ningxia | 80 | Guangdong | 1489 | Anhui | 831 |
| | | Guangxi | 492 | Shanghai | 637 |
| | | Hainan | 220 | Fujian | 380 |
| | | | | Total | 33,043 |

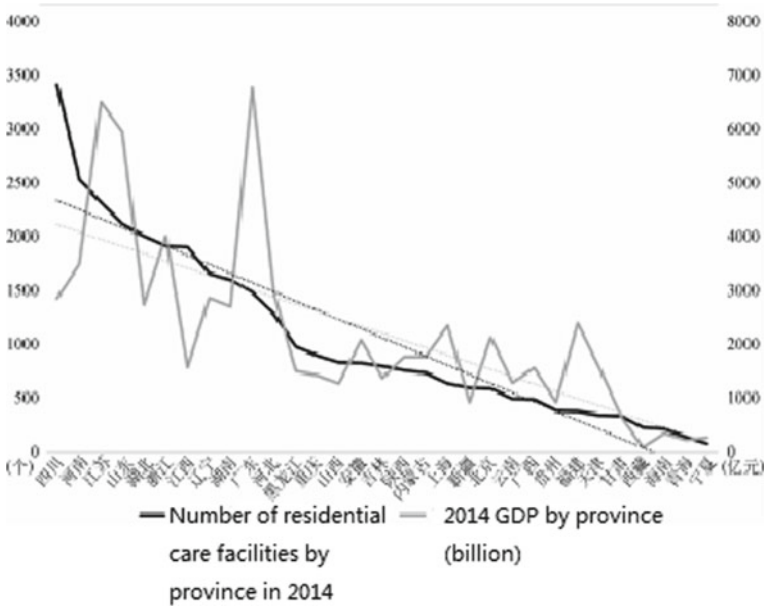


**Fig. 1** Number of elderly care institutions and regional GDP (billion) by province (autonomous region) nationwide in 2014 (excluding Hong Kong, Macao and Taiwan)

of the housing industry, home equipment, professional nursing staff and rehabilitation equipment for the medical and health industries. "Derivative industries" meet the deep-level needs of the elderly, including financial and insurance services, such as investment and financial advice and life cycle planning.;; industries that provide re-education and training, such as senior colleges and re-employment education and training centers, service intermediaries for senior citizens, etc.; cultural entertainment industry and tourism for senior citizens to enjoy life and improve the quality of life. It is worth noting that the bottom-up vertical subdivision has not diffracted to cities in all regions of the country. The pension market in third- and fourth-tier cities is currently focused on the development of core industries. This article will conduct a specific analysis of the development trends of the pension market in third- and fourth-tier cities.

## *1.2 Development and Characteristics of the Current Pension Market in China*

Developing from the national welfare of the planned economy and taking into account national conditions and foreign experience, the current pension system of China is based on family pension, supported by community pension, and supplemented by

**Table 2** Vertical segmentation of the pension market

| | |
|---|---|
| Derivative industry | Investment and Finance, Cultural Entertainment<br>Insurance and trust, education and training<br>Consulting services, senior travels |
| Subsidiary industries | Raw material production, equipment manufacturing<br>Product research and development, human resources education |
| Core industries | Hospice housing, long-term care<br>Health care, senior products |

institution pension. With the process of shifting to the aging industry, the current pension market presents characteristics of a "single pension mode, great regional differentiation, and few professionals".[2]

First, in terms of the pension mode, according to the Notice of the General Office of the State Council on Printing and Distributing the Social Pension Service System Construction Plan (2011–2015) (Guobanfa [2011] No. 60), "the social pension service system is mainly composed of three organic parts: family pension, community pension, and institution pension." It clearly stated that a new system "where the elderly are provided with family pension, taken care of by the community and supported by social services" will be built. However, in reality, the current overall pension mode in China is still dominated by the family pension, with the distribution of three parts accounting for 96, 3 and 1%, respectively. The traditional concepts of "attached to the land and unwilling to move" and "raising children for support" hindered the development of the pension market. The financial burden for children supporting the elderly under the "4-2-1" family mode has increased with the development of the economy and changes in lifestyles; the traditional mode has been severely challenged and therefore urgently needs to be changed. However, on the other hand, the elderly, especially those in first- and second-tier cities, have begun to actively explore new pension modes, which have given birth to ecosystems such as smart pensions.

Second, the overall development of China's pension market is still slow and in need of professional talent. Taking the operation of senior housing and service institutions as an example, the overall humanized design and high-quality operation of residential development and service operation still require long-term market cultivation; an inadequate number and poor quality of nursing staff, scarce mature talent, and frequently flowing personnel all make it difficult to establish a professional team and provide stable and high-quality services. In addition, the investment scales of pension-related communities and service institutions are usually large, the payback periods are long, and cash flow is slow, making it difficult to obtain economies of scale and maintain long-term operations without long-term capital support.

[2] See Yang Lixiong, "Research on the Development of Aging Service Industry", *Journal of Xinjiang Normal University*, 2017(2).

The social pension system in China is still facing the serious problem of uneven regional development in urban and rural areas, reflected on the one hand in the regional echelon from east to the west (Shanghai first entered the aging society in 1979, 33 years earlier than Ningxia), and on the other hand, in the apparently higher number of elderly in third- and fourth-tier towns than in first- and second-tier towns. With the development of urbanization, a large amount of labor has been employed in first- and second-tier cities, which has led to the differentiation of age structure in third- and fourth-tier cities; many young and middle-aged laborers in underdeveloped third- and fourth-tier cities flow to core cities, but because of the household registration system and the high housing prices in cities, they cannot settle down, let alone take their parents with them to live together. Consequently, elderly people have to be left behind in less developed cities. In rural areas, they can still rely on neighbors and relatives in the village to take care of each other, and the village committee can also be of help in some ways; however, in third- and fourth-tier towns, neighbor relations are not as close as the countryside, as most people live in high-rise buildings in the community. Some elderly people with limited self-care ability cannot get care and help from their neighbors and the neighborhood committees. The property management company is not responsible for the care of the elderly, plus the late start of volunteer service. Therefore, family pension is not effective for many elderly living in third- and fourth-tier cities and towns. For institutional pensions, the relatively high cost and the limited number of beds make it not easier to ensure care and support for the elderly. As China's urbanization continues to develop rapidly, a large number of people will still flock to developed and advanced cities, and the problem will become severe.

## *1.3 Development and Evolution of Pension Modes in Foreign Countries*

We can find some future development paths from the development experience of other countries through international comparisons.

(1) The development of Japan's pension mode

China is about to become the first developing country to enter an aging society, and Japan is the first developed country to enter an aging society (more than 20% of the population was over 65 in 1970). As a close neighbor to China, Japan is deeply influenced by Chinese Confucianism. The rich experience it has accumulated in the field of social pension services has obvious reference significance for China. Japan started aging in 1970, and in 1963, it introduced the world's first legislation on the welfare of the elderly, The Elderly Welfare Law. Since 1989, it has begun to implement the Golden Plan to cope with the aging society, with the main purpose of increasing the social supply of pension services. To implement the plan, the local government has built large-scale and high-end pension facilities in the suburbs or on the seasides. However, the elderly are unwilling to leave their home and community,

causing the failure of this plan and new orientation of supporting the elderly at home. The facility construction of pension institutions was characterized by "pocket size and small" and deployed in cities close to the community. This pension mode is worthy of reference.

In addition, the Japanese government has also implemented the Nursing Care Insurance System since 2000, advocating the return of the elderly to their families and communities. With economic growth and the diversification of lifestyles, the function of family support has begun to weaken. The cohabitation rate of the elderly and their children has gradually declined from 70% in the 1980s to less than 40%. Japan began to promote the unification of family pension, medical care, health care and welfare. Japanese law stipulates that as long as there is a middle school, there must be a community-based family pension support center to provide comprehensive and continuous support and services to the elderly. The effect of the insurance system has been remarkable. Taking 2009 as an example, the number of people receiving insurance services in Japan quadrupled from the date of implementation of the system, and the number of new service facilities for the elderly in insurance institutions tripled while effectively controlling the excessive expenditure of medical funds, which opened the door for private enterprises to enter the pension service market. The scale of the pension market is expanding under the opening strategy of government promotion. Its support and supervision policies for pension service enterprises are also worthy of reference.

(B) The development of the United States pension mode

As a highly immigrated and market-oriented country, the shape and service mode of the elderly in the United States are quite different from those in China. The United States entered an elderly society in 1940 (the proportion of elderly people over 65 reached 7%). The marketization of the pension industry has been very mature, which has positive reference significance for the development of private pension institutions in China.

The elderly in the United States are highly independent and generally do not rely on their children after retirement. Most Americans sell their houses and live in elderly apartments after retirement, paying for the apartment with money from the house sale. More elderly people prefer to live in public elderly apartments, the rent of which is flexibly charged as a percentage of household income. Although there is a large gap between the rich and the poor, most of the elderly can find a suitable apartment. The market can be roughly divided into three categories: the first is self-occupied apartments, designed for elderly people who can take care of themselves, developed and invested by real estate companies, and property-owned by elderly residents. The elderly need to buy or rent an apartment first and then pay for nursing expenses on a monthly basis. Since few services are provided, the monthly service fee is quite low. In the first-tier cities of China, such apartments have also sprouted, such as the shared property housing of Gonghejiayuan in Chaoyang District, Beijing. It is expected that this type of elderly community will continue to grow in the future. The second type is assisted apartments, accounting for the highest proportion. It is mainly designed for the elderly who need help in daily life but do not need professional medical care,

with government funding and low cost. The third type is the special care apartment, which provides comprehensive health services.

The "three-pillar" mode in the United States pension system is quite successful throughout the world. "Three-pillar" refers to the social security plan compulsorily promoted by the government, the pension plan with benefits funded by the government or employers, and personal savings and investment insurance (with tax incentives). Relevant data[3] show that only when the total economic income after retirement reaches more than 70% of the total economic income before retirement can the quality of life after retirement be guaranteed, and the government security pension for ordinary citizens after retirement only reaches 40% of the preretirement income. Therefore, the remaining part must rely on private pension plans. Since basic insurance cannot meet general pension needs, the United States government actively guides and encourages enterprises and individuals to participate in employers' pension insurance. The investment is led by enterprises, and the government provides tax reduction and exemption policies to fill the gap in basic pension insurance. Individual pension insurance is entirely privately built and funded for investment, its marketization is very mature, and mainstream pension institutions are private and profitable. The income of nursing homes is 80–90% privately paid, and most pension services are not in the insurable scope.

## 2 Development of the Pension Market in First- and Second-tier Cities of China

### *2.1 Status Quo*

(1) Characteristics of the elderly group in first- and second-tier cities

The first- and second-tier cities represented by Beijing and Shanghai are relatively more developed, with richer social resources in education and culture and residents with higher education levels. The elderly group has the following three characteristics.

First, life is more secure. Currently, most elderly people rely on their children and government pensions to maintain their old age. The social security system in first- and second-tier cities is generally more complete, with a high endowment insurance coverage rate, and the source of income for pension groups is relatively secure. For example, the "Shanghai Elderly Service Development Report (White Paper)" published by the Shanghai Development Research Center shows that the total registered population of Shanghai is 14.3869 million, and the number of registered elderly people over 60 years old is 4,139,800, accounting for 28.8% of the total population.

[3] Zhang Kaiti and Guo Ping, *American Pension*, China Social Sciences Press, 2010.

The number of elderly obtaining socialized pension grants in 2016 reached 4.219 million.[4]

Second, cultural life is more abundant. Benefiting from the abundant social resources of large cities, the entertainment options of the elderly are more diverse. Elderly people can participate not only in chorus, dance and other recreational activities but also in social activities through volunteer work in large-scale events. Elderly universities in large and medium-sized cities covering almost all districts and counties also provide opportunities for the elderly to learn musical instruments, calligraphy, and photography.[5]

Third, the elderly are more open-minded, although most people are still extremely attached to family. First- and second-tier cities have a high level of education. Elderly people are affected by the overall environment, receive more diversified information, are less bound by old concepts and are more willing to try new pension modes. However, the influence of local culture is still far-reaching, and the acceptance of institutional pensions is still very low compared to Europe and America. Take the empty-nest elderly surveyed in the affiliated community of Peking University as an example. Although they have a high level of education, 88.7% have no financial difficulties, and 72.1% feel unhappy due to physical illnesses, 75.4% of the elderly are still unwilling to accept the way of "staying in nursing homes, children visiting regularly, and picking up home on holidays".[6]

(B) Development of the pension market and mode in first- and second-tier cities

As mentioned earlier, the current domestic pension mode is "9631", that is, "96% family pension, 3% community pension, and 1% institutional pension." The family pension for the elderly is the most traditional method. In the "4-2-1" family mode, family pension often requires assistance in socialized services. According to the results of the fourth sample survey on the living conditions of the elderly in urban and rural areas in China, in 2015, the top three items of family pension service demand for the elderly were home-based consultation, home housework and rehabilitation, and their proportions were 38.1, 12.1, 11.3%. The community pension allows the elderly to choose to purchase community services according to their own conditions and provide services such as short-term residential care and day care. This mode overlaps with the family pension in terms of scope and form, and both rely on the "community" platform. In the institutional pension mode, the elderly often have to leave their home and live in a certain area to be cared for by professionals. The main demand comes from disabled and semi-disabled elderly. In first- and second-tier cities, family pension occupy an absolute dominant position, and the acceptance of community and institution pension is higher than that of the whole country. Beijing

[4] See the Trade and Foreign Economic Statistics Department of the National Bureau of Statistics of the People's Republic of China, *China labor Statistics Yearbook*, China Statistics Press, 2018.

[5] See Li Baoyuan, *2015/2016 Human-based Development Report: How to Provide for the Aged*, Economic Science Press, 2016.

[6] See Tian Qinglai, "An Investigation on the Family Pension of the Empty-Nest Elderly at Peking University", *China Journal of Gerontology*, 2014(34).

proposes to realize "9064" by 2020; Shanghai has set the target as "9073", paying more attention to community pension.

After the release of the State Council's Opinions on Accelerating the Development of the Elderly Service Industry in 2013, first- and second-tier cities accelerated the construction of pension institutions. According to the "2018 Social Service Statistics Quarterly Report (First Quarter)" of the Beijing Civil Affairs Bureau, Beijing has established a total of 651 service organizations for the elderly and the disabled, including 224 urban pension organizations and 41,000 beds in urban pension organizations. According to the "2016 Social Service Statistics Monthly Report (December)" issued by the Shanghai Civil Affairs Bureau, Shanghai has established 642 service organizations for the elderly and the disabled, including 428 urban pension organizations and nearly 70,000 beds in urban pension organizations. In the short term, supply exceeds demand. In the second-tier cities, taking Wuhan as an example, according to the statistics for the fourth quarter of 2017 released by the Wuhan Civil Affairs Bureau, as of the end of 2017, there were 188 service agencies for the elderly and the disabled, and the number of beds for the elderly and the disabled was 3.9 ten thousand.

## *2.2 Case Study—The Community-Family Pension Mode of Wuhan Baibuting*

The Baibuting Community is located in Houhu New District, Jiang'an District, Wuhan City, Hubei Province. It won the first Award for Chinese Habitat Environment It in 2001. Within an area of 5 $km^2$ with accommodation of 160,000 people, in a comprehensive community that integrates applicable housing and low-rent housing for the general public, the historical development of Baibuting can be roughly divided into three stages: enterprise-led (1995–2000), government-led (2001–2005), and volunteer-led (2005–present),[7] completing the transformation from an old community with fish ponds and ditches everywhere, with no access to water and electricity circuits and other municipal supporting facilities, to a sustainable and modern community. Now, Baibuting has an owner committee, community organization, property service office, and an innovative series of volunteer systems, with more than 100 characteristic volunteer teams and more than 40,000 volunteers, most of whom are responsible for serving and caring for the elderly; the residents' committees are used as units to conduct service activities in the form of service teams. Meanwhile, the community has also established detailed information files of the elderly over 65 years old to provide a basis for paired services; on the other hand, Baibuting Property Management Co., Ltd. performs comprehensive community service functions, establishing a pension service platform, and equipping each elderly person with

[7] See Wang Wei, Wang Ming, Lan Yuxin, "Leading and Commanding: Community Leadership in Community Cogovernance: A Case Study of Wuhan Baibuting Community", *China Nonprofit Review*, 2017(1).

a push-to-talk mobile phone. When the elderly need help or emergent assistance, they can immediately get in touch with the service platform through the phone. The property management company, the characteristic volunteer team and more than 200 surrounding online businesses provide free or compensated services for the elderly.

Currently, Baibuting has four levels of pension institutions.[8] The first level is the daycare system, which provides places for leisure activities such as TV and movie screening rooms and book reading rooms and helps to improve the establishment of health files and cooperation with community health service centers. The second level is the "mutual assistance and cooperation" and "living together" modes. With the coordination of the community, the elderly living alone separately can live in a certain household together and rent out redundant houses for new rental income. The third level is the full-care "nursing home", which is equipped with a medical office, a library, a laundry room, a kitchen, an emergency call system, etc., to meet the needs of short-term care for the elderly. The fourth level is the elderly apartment, where ten services such as traditional Chinese medicine hospital, canteen, day and night response, senior college, and housekeeping are provided. The elderly can choose different services according to their specific needs.

However, the Baibuting mode still has some problems. First, it is mainly government-funded, which is relatively scarce, considering the increasing demand; the low consumption awareness of the elderly restricts the further development of pension services. Second, the quality of community service personnel needs to be improved. The trained volunteers are not as good as professional social workers, and it is difficult to retain high-quality talent with limited wages and a heavy workload. Third, the types of services are relatively singular and concentrated in day care, and professional medical care and psychological comfort services are few, which makes it difficult to meet the diverse needs of different groups of elderly people. Fourth, the evaluation system is mainly led by government departments or self-evaluated by service agencies so that the evaluation and service quality are not fully accurate.

## 3 Development of the Pension Market in Third- and Fourth-tier Cities

### *3.1 Status Quo*

(1) Characteristics of the elderly group in third- and fourth-tier cities

Economically, basic pension insurance for urban employees is the first and most important pillar of pension security, and its total fund ratio with the two pillars of enterprise supplementary pension insurance and personal savings pension insurance

[8] See Han Weixue, "The Establishment and Development of the Community Elderly Care Service System in Wuhan-Taking Baibuting Community as an Example", *Legal Expo*, 2015(11).

is 87:9:4.[9] The payment of pension insurance in third- and fourth-tier cities is usually related to occupation. The pension insurance participation rate of employees in state-owned enterprises is relatively high, and the basic pension insurance participation rate of employees in urban private enterprises and individual industrial and commercial households is relatively low. Provisions for pension reserves in third- and fourth-tier cities are uneven. In recent years, some resource-based cities have experienced a relatively sluggish economy, and families have limited spending on the elderly. Some elderly people cannot even afford nursing homes at ¥1500–2000.

Conceptually, the tradition of family pension in third- and fourth-tier cities is more ingrained. In some areas, the elderly and children are unwilling to accept new things. They are neither used to going to day care centers nor able they accept care from outsiders such as nurses. The result is often that disabled or semi-disabled elderly cannot receive professional care, and their children have a heavy burden. According to the *China Statistical Yearbook* 2017, the floating population was 245 million in 2016. Although the proportion of middle-aged and elderly people aged 45 and above is increasing year by year among the floating population and their family members, the highest is only 18.1%.[10] This means that in third- and fourth-tier cities, most of the elderly did not migrate with the floating population or became left-behind elderly or empty-nest elderly. Therefore, the third- and fourth-tier elderly population has more urgent needs for services such as life care, spiritual comfort, and emergency medical treatment.

(B) Development of the pension market and modes in third- and fourth-tier cities

There are more than 200 third- and fourth-tier cities in China above prefecture-level cities. The cultural and economic strengths of various regions vary greatly and cannot be generalized. According to the China Statistical Yearbook 2017, Inner Mongolia and Zhejiang have 58.3 and 56.3 beds for the elderly, respectively, which is much higher than the national average of 31.6, while Xizang and Hainan have the lowest, with 14.2 and 18.0 beds, respectively.

Some large state-owned enterprises have a large number of local employees of the same age. The residences of employees and their families are concentrated in entrepreneurial buildings or welfare houses, which are conducive to community construction and work. Residents are familiar with each other, and it is easy to form close neighbor relationships. The enterprise also has the ability to set up professional pension institutions and provide them to employees at a more favorable price, such as the Datong Coal Industry in Shanxi. Public and private nursing homes often have very different situations. Public nursing homes have better facilities and services, and the occupancy rate is higher; the occupancy rate of the public nursing homes of Coal Group can reach more than 70%. Although some private nursing homes are cheaper,

[9] See Wei Hualin and Jin Jianqiang, *General Trends in Elderly Care*, CITIC Publishing House, 2014.

[10] See Lv Lidan, Duan Chengrong, Liu Tao, etc., "Analysis and Discussion of the Changes in the Scale of the Floating Population", *Southern Population*, 2018(1).

they have poor basic conditions, large differences in medical insurance policies, poor management, and remote locations, making it difficult to attract elderly people who can afford. The occupancy rate is below 50%.[11]

## 3.2 *Case Study—The Virtual Nursing Home in Chengguan District, Lanzhou City, Gansu Province*

The "virtual nursing home" is opposite to the physical nursing home, but it does not belong to the category of nursing homes. It is an innovative form of family pension service using modern science and technology, with characteristics of "government-committed, directional-entrusted, contract management, evaluation and fulfillment". The virtual nursing home in Chengguan District was established in December 2009. Based on the virtual nursing home in Gusu District, Suzhou, it has been improved according to local conditions and supported by a network communication platform and service system under government guidance and financial subsidies. It provides rapid response, professional services and process supervision to various needs of the elderly, such as life care, daily escort, medical and health, and legal consultation for the elderly in the region, through service outlets all over the city and the combination of corporate operation, professional services and social volunteer services. In 2012, the number of elderly people who received services reached 27,000, cumulative services amounted to 100,000, absorbed 126 franchised service companies, built 6 neighborhood medical and nursing integration service centers, and 65 virtual pension restaurants. There are more than 150 service items in the four areas: daily care, medical care, spiritual comfort, and emergency assistance.[12]

This new type of pension has three significant advantages: first, small initial investment and easy operations. The "virtual nursing home" in Chengguan District invested only ¥2.571 million during the initial construction period to complete the preliminary work of equipment purchase, software development and information platform construction. It can be put into trial operation within 3 months and will work normally within one year. Second, it can save costs for the government and residents. Chengguan Virtual Nursing Home is a regular-level institution, and its main source of funding is government funding. As of 2012, the government has invested ¥20.62 million in subsidies, with an average annual subsidy of ¥763 per elderly, which is relatively low compared to traditional pension operating costs. If you choose to enter a private nursing home in Lanzhou, the monthly cost is between ¥1200–2000, the disabled and semi-disabled elderly need to charge ¥300–600 more for nursing care. Generally, the cost of enjoying the "virtual nursing home" can be

[11] See Chinese Society of Gerontology and Geriatrics, *Structural Reform of Elderly Care Service Supply Side: Research and Practice*, China Social Publishing House, 2017.

[12] See Li Lijun, "Research on the Local Practice and Path of the Socialization of Elderly Care Services—Based on the Case Comparison of Canglang Virtual Elderly Home and Chengguan Virtual Elderly Home", *Journal of Gansu Administration Institute*, 2016(4).

controlled at approximately ¥200 per month. Third, it is easier to promote. On the one hand, virtual nursing home is not restricted by places and beds, and the number of elderly service personnel increases with the increase in registration; on the other hand, with the government in charge of supervision, promotion and corporate docking, the elderly will be more easily to accept this type of pension service emotionally.

At present, there are three factors restricting the development of this pension mode: first, financial constraints. Since the position of virtual nursing home is not confirmed, it cannot enjoy the preferential policies provided by the government. Second, lack of active participation from all sectors of society. The government can only play the role of a platform for coordinating organizations; it is easily constrained by the overall economic development level of the region, insufficient private capital and high cost pressure Third, shortage of employees. Volunteer organizations are loose and the total number of social work employees is insufficient, and the ratio to service targets is 1:1142, which is far from adequate.

## 4 Reflections on Pension Modes in First- and Second-tier Cities and Third- and Fourth-tier Cities Based on International Experience

### *4.1 Reflections on International Experience*

It should be noted that the aging transition period of Western developed countries is relatively long. From a mild aging population of 7% of the population to a deep aging population of 14%, Sweden took 85 years, the United States took 70 years, and the United Kingdom took 45 years; China is expected to enter a deeply aging society in 26 years (2000–2026), which is more similar to Japan in 1970–1995.[13] However, China's population base is even larger, and it is about to face the explosive growth of the elderly population. The pension industry in the United States is highly commercialized, integrating the needs of real estate developers, REITs, operators, and residents of pension institutions. The first reason is that the well-developed REIT system and tax incentives have reduced the financing costs of pension institutions and attracted a large number of commercial institutions; second, most elderly people choose to enter professional pension institutions, which is easier to manage. In comparison, the Nursing Care Insurance Law System introduced by Japan in 1996 had met the needs of more than 90% of the elderly for family pension, which is more suitable for China's conditions. Nursing care insurance divides nursing care into 7 levels, providing refined services. However, Japan's Nursing Care Insurance Law clarifies that care users only need to pay 10% of the cost, and the government pays the other 90%. China's elderly is about to "blow out", and if the same system is

[13] See Hou Yufeng, Liu Lingzhi, Wang Xin, "The Enlightenment of Japan's Aging Process and Countermeasures to China", *Journal of Architecture*, 2015(12).

adopted, it will pose great challenges to China's finances. We should learn from the structure of the Japanese system to ensure the quality of life of the elderly and, at the same time, the efficient business mode of the United States to reduce the national burden.

Compared with the mature pension modes in the United States and Japan, China lacks detailed laws and regulations and an evaluation system for pension service standards, which makes it impossible to compare the results of implementation. On the other hand, the unbalanced welfare subsidies for public, private and other forms of pension institutions result in low enthusiasm for private capital participation and fewer choices of pension services. Third, it is difficult to guarantee service quality for we are still in need of professional pension teams and related skills training systems. Fourth, the still relatively scarce medical resources in community are, difficult to meet the needs of the elderly. These are the problems facing by all cities of China. The development of the pension mode is a long process, from investigation and research to policy promulgation and implementation, and every city should continue to explore based on their local conditions.

## *4.2 Reflections on Pension Modes in First- and Second-tier Cities*

Achievement cases in first- and second-tier cities have brought three revelations to home-based community pension. First, social forces have shown an important position, for example, in the case of Baibuting in Wuhan, the introduction of the power of property management companies and residents' volunteers, the promotion of mutual connection among neighbors, save manpower and promote cultural construction. It is difficult to maintain long-term stability as community pension centers often lack supervision and management, and the participation of social forces in "community autonomy" can help civil affairs departments carry out long-term and effective supervision. Second, community pension centers and community hospitals cooperate to establish health files for the elderly to track the health status of the elderly, which helps the community respond when the elderly need help and achieve "early detection and early treatment" in the long run, thereby reducing medical costs. Third, a well-established community equipped with diversified facilities can provide diversified services to meet the needs of housekeeping services, day care and short-term care.

It is also worth learning about Beijing's pension mode. Recently, Beijing has continuously increased its efforts to reform the supply side of pension services and introduced a number of policies to encourage pension institutions to organically integrate medical resources, such as nearby community health service centers and temporary hospitals. Beijing Sijiqing Nursing Home is such an example: the nursing home invites doctors from nearby hospitals for round-robin consultations, with a team of general practitioners providing regular consultations; meanwhile, it cooperates

with surrounding hospitals to explore a new integration mode of medical care and nursing care to give full play to the advantages of urban medical resources. During the 13th Five-Year Plan period, Beijing will complete the construction of 1,000 "Elderly Posts", basically realizing the full coverage of family pension. On the other hand, Beijing took the lead in launching teh first "centralized family pension community", which organically integrates family pension and institution pension and specifically provides property-owned care services for the elderly aged 60 and above..

Other new trends have emerged in institution pension in first- and second-tier cities, such as "integration of medical service and elderly care", "integration of medical service and insurance", and "integration of tourism and health preservation". In response to the requirements of the 19th National Congress of the Communist Party of China for "promoting the integration of medical service and elderly care and accelerating the development of aging careers and industries", the Yanda International Health City in Yanjiao has been constructed, aiming at the health needs of the elderly and providing international medical services; "Taikang Home · Yanyuan" in Beijing, which is characterized by the integration of pension and insurance, is also rapidly deploying; "Taishen Xianghe" Villa in Beijing combines health preservation and tourism; and the farmhouse mode "ZheXianju" in Zhejiang is spreading rapidly across the country. However, some problems have also begun to emerge. The current positioning of pension institutions has a typical "two-headed" structure, focusing on high-end commercial services and subsidized low-end services and rending most elderly people with middle-economic status no suitable choices. Another problem is that the overall occupancy rate is relatively low, after the stage of vigorously building pension institutions. As of the end of 2013, the average occupancy rate in Beijing was less than 47%, causing a significant waste of resources. However, with the advancement of information technology and the help of technological development, new changes may also appear in future pension modes, such as wearable devices that are used to track the health of the elderly and connect the elderly at home with communities and institutions through network information platforms, the "Internet + pension" that enable the elderly to receive more timely and considerate offline services. All these will better help and support the continuous evolution and development of the pension mode in first- and second-tier cities in China.

## *4.3 Reflections on Pension Modes in Third- and Fourth-tier Cities*

The ranking of the China urban elderly care index[14] released by the National Research Institute in 2017 reflected the urban elderly care load and security level, covering the demand-side indicators, namely, the total elderly population, the internal structures of the elderly population, the growth rate of the elderly population, and the dependency

[14] China Urban Pension Index Blue Book 2017 research group, *China Urban Pension Index Blue Book 2017*. China Development Press, 2017.

ratio of the elderly population, as well as covering supply-side indicators, namely, government policies, capital investment, service levels, and ecological environment. Among the top 100 cities, East China accounts for 56%, Northwest China accounts for 12%, North China accounts for 11%, South China accounts for 9%, and Southwest, Central China, and Northeast China account for 5, 4, and 3%, respectively. It can be seen that pension security in East China is in an absolute leading position. The top ten are Xiamen in Fujian Province, Yiwu in Zhejiang Province, Karamay in Xinjiang Autonomous Region, Suzhou in Jiangsu Province, Kunshan in Nanjing Province, Shenzhen in Guangdong Province, Jiangyin in Jiangsu Province, Ningbo in Zhejiang Province, and Wenzhou in Zhejiang Province. The first- and second-tier cities account for only six seats. There are many third- and fourth-tier cities that have inherent advantages in the development of pension care.

We have selected three cities with the highest scores in the first- and second-tier and third- and fourth-tier, respectively, and the heat map is based on their pension index rankings, as shown in Fig. 2; among them, the darker the color indicates the higher the score/ranking, and the cities after 100 are uniformly indicated in white. It can be seen from the figures that the overall elderly care development advantages of East China and Northwest China are more obvious than those of other regions; although there are outstanding cities in the third- and fourth-tier cities such as Karamay and Yiwu, the development of pension care in the third- and fourth-tier cities in Northeast China, Central China and South China is obviously lagging behind first- and second-tier cities, and pension security needs to be improved. Due to funding policies, the loss of the labor force, and cultural influences in third- and fourth-tier cities, more people choose traditional home-based care, and the development of pension facilities is relatively slow, with greater development space and broader development space in the future.

Based on this situation, the government should strengthen its leading role and improve the management system. For example, under the "virtual nursing home" mode, the government should attract franchise companies, incorporate scattered elderly people into the platform, improve the quality of professionals and social volunteers, and coordinate various elements. In addition, elderly related departments need unified planning and coordination to maximize limited resources. Second, it is necessary to dig deeper into social resources, learn from the construction experience of first- and second-tier city owner committees and volunteer teams, such as the Baibuting mode in Wuhan, and fully mobilize community residents to participate in the maintenance of community construction and help the elderly. Third, it is necessary to publicize community and institution pension while developing family pension so that the elderly in need can choose the most suitable way of caring for themselves. The fourth is to attract nonprofit organizations and commercial organizations to further diversify, increase competition, and thereby improving the quality of pension services. On the other hand, third- and fourth-tier cities can fully convert their ecological advantages into economic advantages by establishing pension towns comparable to pension cities, building a characteristic pension leisure service industry based on their own characteristics, and relying on urban ecology and characteristic industrial

| | Northwest | Northeast | North China | Central China | East China | South China | South west |
|---|---|---|---|---|---|---|---|
| Tier 1 and Tier 2 cities | Urumqi | Shenyang | Beijing | Changsha | Suzhou | Xiamen | Kunming |
| | Xi'an | Changchun | Shijiazhuang | Wuhan | Nanjing | Shenzhen | Chengdu |
| | Lanzhou | Dalian | Taiyuan | Zhengzhou | Ningbo | Guangzhou | Nanning |
| Tier 3 and 4 cities | Karamay | Xinmin | Tangshan | Ruzhou | Yiwu | Shishi | Shangri-La |
| | Yinchuan | Suifenhe | Ordos | Shishou | Kunshan | Nan'an | Lhasa |
| | Xingping | Wudalianchi | Qian'an | Danjiangkou | Taicang | Quanzhou | Lushui |

**Fig. 2** Pension index in first- and second-tier and third- and fourth-tier cities

zones and support facilities such as health care and medical care and leisure business to meet the needs of the elderly for leisure and pension and at the same time promote employment and the economic growth potential.

## 5 Policy Recommendations

On the whole, China is facing five major problems, namely, a short transition period into an elderly society, a large elderly population, poor infrastructure conditions, large regional economic differences, and a weak social welfare system. Therefore, the upcoming aging society is still quite challenging. We believe that by coordinating upper-level policies and institutional arrangements, cultivating different regional pension market development paths according to local conditions, and actively encouraging market-oriented institutions to establish a large pension service network, we can help China meet the arrival of a "silver society".

First, it is imperative to establish a unified pension security system for China's urban pension, integrate medical, welfare, insurance and other systems involving various departments, clarify the functions of local governments and investigate management methods and the effect of capital investment measurement. Second, we must focus on the development of professional talent planning, not only to cultivate social service talent in colleges and universities but also to standardize the short-term training of volunteer teams to develop and establish a full-coverage, multi-echelon senior care service talent pool. In addition, in terms of talent training, it is necessary

to conduct key training for the actual needs of pension services in different regions. For example, in third- and fourth-tier cities, it is necessary to focus on the training of service personnel for family pension services, while in first- and second-tier cities, more specialized medical staff will increase the service ratio of institutional pensions.

On the other hand, we must also actively encourage social capital to participate in the pension industry, provide preferential taxation, operation, land use, etc., share the financial pressure of local governments, promote the balanced development of the industry, improve service efficiency and services through market-oriented operations, and focus on encouraging the nonpublic economy to develop the elderly consumer product market and derivative markets such as elderly financial management and the elderly education market. By comparing the pension market in first- and second-tier cities and third- and fourth-tier cities, we found that the demand for pensions in third- and fourth-tier cities is significantly differentiated. To be specific the supply of pension products is mainly low- and middle-end institutions that meet basic living care and nursing care. However, pension products with rich spiritual and cultural contents have not yet appeared. Therefore, in third- and fourth-tier cities, high-quality pension projects have great room for development.

The development of differentiated pension service modes according to local conditions is the development trend of urban pensions in China. The first-tier, second-tier, third- and fourth-tier cities should design different development patterns as the proportion of the elderly and family structure of different cities are quite different. Therefore, for cities where the overall age is relatively old and have more elderly living alone, it is necessary to focus on the development of a mode that shifts the elderly from family pension to community pension, using the community as a link, and enabling the elderly through response platforms such as information technology, to fully connect with the community and improve the service network. Third- and fourth-tier cities with tourism resources or natural resources should try to promote the rapid development of institution pension and leisure pension to meet the increasing elderly needs of various groups, while mainstream elderly families in first- and second-tier cities need to strengthen the quality and convenience of medical services and increase family pension services, so that the elderly can enjoy better medical services without leaving homes, and will not be troubled by the difficulties of seeing a doctor in large cities and by expensive medicines. At the same time, the further development of market-oriented institutions should be encouraged to meet the diverse needs of some elderly people.

General Secretary Xi Jinping emphasized that we must actively respond to the aging of the population and build a policy system and social environment for the elderly, pay filial piety, and respect to the elderly. On the one hand, it is necessary to speed up supply-side reforms and provide different pension services to meet the needs of different groups of people. According to the survey, 97% of the elderly want to spend their twilight years in their own homes, and their greatest wish is to be able to enjoy professional services such as life care, rehabilitation and physiotherapy, culture and entertainment at their doorstep. Faced with the huge demand for pension, we must actively leverage market forces to support and encourage social institutions

to fund and provide family pension services or learn from Beijing's mode of "government providing facilities free of charge and operators operating at low cost" to radiate multiple communities to provide appropriate family pension services. To meet the diversified needs of the elderly, a new mode of pension services featuring diversified development, professional operations, and refined services is in urgent need of construction. With the government's addition of nursing homes for the disabled and demented elderly and more support for towns and villages, policies such as the preferential construction of rural service facilities for the elderly have created better conditions.

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# Research on the Innovative Mode of Agricultural Land Finance in Resolving the Dilemma of Rural Elderly Care Under the Background of Rural Population Aging


**Xiaoquan Zhou, Jiangtao Bai, and Guangsheng Ge**

The aging population has attracted the attention of all countries and has had profound impact on economic and social development and the social security system. In China, the aging population is fast, accompanied by rapid urbanization and regional and urban-rural differences. The population in the central and western regions flows to the eastern coastal areas, young people in rural areas flow to cities, and the population transfers between urban and rural areas. To a certain extent, the problem of population aging in urban areas has been alleviated, but in turn, the aging of the rural population has been exacerbated. The transfer of young and middle-aged people has had impact on rural economic development and elderly care. Traditional rural pensions mainly include family pension, community pension, and land pension. Without institutional pension, land pension is an important guarantee for rural pensions. With the popularization and improvement of institutional pensions, rural household income mobility has gradually alleviated, and rural land is also more flexible. With the improvement of the land circulation mechanism and supporting laws and regulations, the transfer of land contractual management rights, and through agricultural land mortgages and other agricultural land financial innovations, the cash flow generated by the land is used to pay for the farmers' endowment insurance and becomes an important source of income for farmers to provide for the elderly.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_16

# 1 Introduction

The population is not only the main body of economic development but also an important basic resource, with the dual attributes of producers and consumers. The change in population structure will affect economic and social development and become an issue of much attention from many countries and regions. According to the Population Aging Report of the United Nations, the proportion of the global population over the age of 60 was 8% in 1950, 10% in 2000, and 21% in 2050. In the late 1970s and early 1980s, China implemented two far-reaching policies for population and economic growth: the family planning policy and the reform and opening up policy, which determined the characteristics of China's population aging.

## *1.1 The Aging of the Rural Population*

Foreign scholars believe that the aging of the population is mainly caused by the increase in life expectancy and the decline in fertility. In the late twentieth century, population aging was a common phenomenon in all developed countries and was expected to continue into the twenty-first century. The current proportion of the elderly in developed countries is at an unprecedented high level and will be higher in the future. From a demographic point of view, population aging is mainly determined by age structure, fertility rate, mortality rate and migration pattern (Uhlenberg, 1992). Domestic scholars mainly focus on China's aging population. After reviewing population aging in major foreign countries, it is evident that population aging is a process experienced by many countries around the world (Liu Qingzhi, 2009; Liang Hongmei & Li Lei, 2014; Zhao Fujun et al., 2017). According to the research conducted by many scholars concerning the causes of population aging. The first reason is the improvement of medical conditions and the continuous increase in life expectancy (Zheng Wei et al., 2014).The second reason is the decline in fertility rates worldwide, which is closely related to economic and social development, leading to an increase in the proportion of elderly in the population structure (Chen Wei & Gao Shuang, 2013; Zhou Changhong, 2015). In China, the decline in the fertility rate is also directly affected by the family planning policy (Tao Tao & Yang Fan, 2011). Finally, the phenomenon of "getting old before getting rich" is inseparable from China's rapid urbanization development (Song Binwen, 2004; Zheng Wei et al., 2014).

There are few studies on the aging of the rural population. Yuan Jun et al. (2007) analyze the characteristics of spatial differences in the aging of the rural population and find that aging has become a relatively common demographic trend in rural areas, progressing from the east coast to the central and western areas. The aging of the rural population has brought about problems with elderly care and rural economic development (Yuan Wei, 2017). The loss of young laborers who play an important

role in family pension and economic production aggravates the situation, the "4-2-1" family structure further worsens it, and the population outflow makes the family shift to a smaller one with simpler internal structure (Zhou Fulin, 2016). Population migration has exacerbated the problem of elderly care. The pension insurance system in cities is more complete than that of rural areas. The demand for mutual assistance for the elderly has increased significantly in rural areas under the influence of empty nesting. However, the advantages of the currently used mutual assistance turn out to be disadvantages. In short, as the process of population reproduction, the aging of the rural population will be included in economic development (Yuan Jun et al., 2007). Scholars have performed much research on the causes and impacts of aging, but research on aging in rural areas and rural reforms is still inadequate, especially in the context of the current vigorous promotion of rural land transfer. The resolution of rural aging problems remains to be discussed, and that is the main content of this article.

## *1.2 The Environment of the Aging Problem in China*

How to properly handle the problem of population aging without affecting the development of the economy, especially the rural economy, is an urgent issue, given that the fully implemented two-child policy will increase the child dependency ratio, as the newborn population will take a long time to enter the job market. Combined with the reform and opening up policy, the population aging of China has the following characteristics compared with foreign countries.

First, the population aged earlier than the improvement of national economic development and ushered in an aging society when China was still a low-income country. The population of 65 years and over accounted for more than 7% of the total population in 2000, with a per capita GDP of only US$1740, whereas in Japan, the population of 65 years and over in 1979 accounted for 8.8%, with a per capita GDP of US$24,299.

Second, the aging rate is very fast. China is currently recognized as one of the countries with the fastest aging speed. According to *The Aging of Populations and its Economic and Social Implications* published by the United Nations in 1956, when the population of elderly aged 65 and above of a country or region accounts for more than 7% of the total population, it means that the country or region enters the aging society. As shown in Fig. 1, the population aged 65 and above accounted for more than 7% of the total population in 2000 and reached 10.91% in 2016, an increase of 3.90% in just 16 years. The aging of the population has increased the social burden. As shown in Fig. 2, the elderly dependency ratio increased from 9.2 to 14.3% from 1995 to 2015, an increase of 55%. The increase in the elderly increases the demand for social resources, and the working population will be burdened with heavier responsibilities. The one-child policy makes it becoming a norm that two one-child children will care for four elderly people, which undoubtedly aggravates the burden on young people.

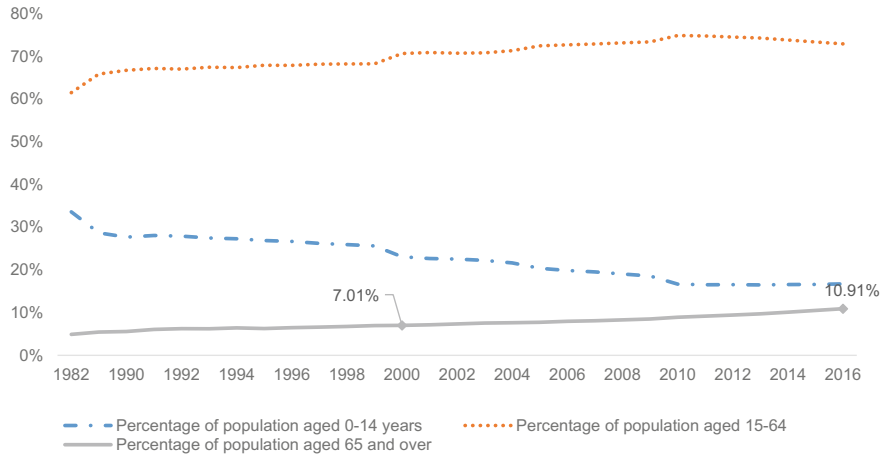


**Fig. 1** The proportion of the population age structure of China. *Data source* National Bureau of Statistics

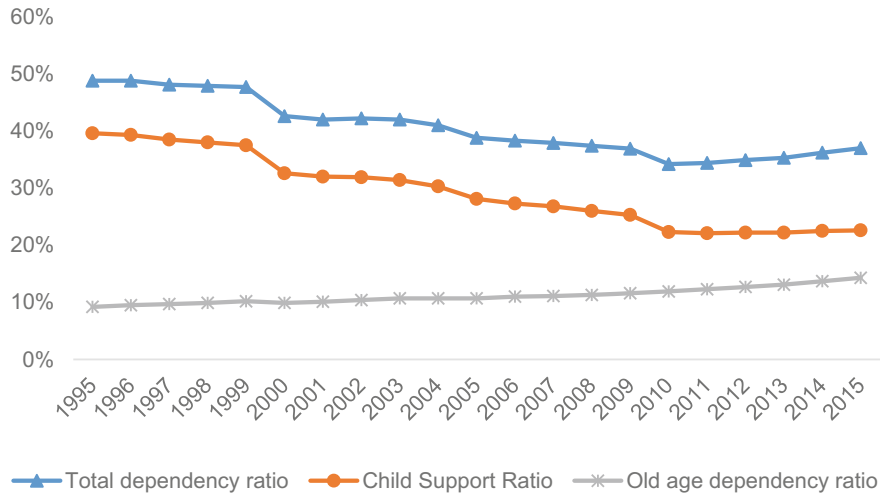


**Fig. 2** The population dependency ratio of China. *Data source* China Population and Employment Statistical Yearbook 2016

Third, the aging of the urban and rural populations is inverted. In recent years, rural aging has exceeded that of urban areas. Since the 1980s, a large number of laborers have migrated to cities, and the transfer of rural labor has increased rural aging (Li Xiaorong, 2016). As shown in Table 1, from 2000 to 2010, the aging of the rural population was more serious than that of urban areas. Taking the proportion of people aged 65 and over as an indicator, the proportion of rural population was 1.08% higher than that of urban areas in 2000, and expanded to 2.26% in 2010.

**Table 1** Comparison of the age structure of the urban and rural populations

| Year | Group | Proportion of population aged 0–14 (%) | Proportion of population aged 15–64 (%) | Proportion of population aged 65 and above (%) |
|---|---|---|---|---|
| 2000 | Urban | 18.42 | 75.16 | 6.42 |
| | Rural | 25.52 | 66.98 | 7.50 |
| 2010 | Urban | 14.08 | 78.13 | 7.80 |
| | Rural | 19.16 | 70.78 | 10.06 |

*Data source* The Fifth Census and the Sixth Census

**Table 2** Comparison of the proportion of the rural population aged 65 and above by region

| | 2000 (%) | 2010 (%) | Changes (%) |
|---|---|---|---|
| East China | 8.7 | 11.4 | 2.8 |
| Central China | 7.6 | 9.9 | 2.3 |
| Southwest China | 7.1 | 10.7 | 3.6 |
| North China | 7.2 | 8.7 | 1.6 |
| Northwest China | 5.5 | 7.9 | 2.5 |
| Northeast | 6.3 | 8.5 | 2.2 |

*Data source* The Fifth Census and the Sixth Census

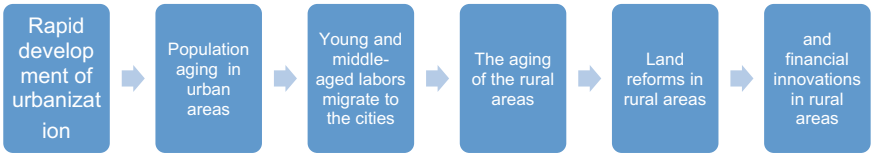


**Fig. 3** Analysis of rural aging

Fourth, there are obvious regional differences. As shown in Table 2, taking rural areas as an example, the aging of the population shows a trend of decreasing from east to west, while the trend of population aging in rural areas is developing rapidly, of which the southwest is the fastest, where the proportion of the population aged 65 years and above increased by 3.6%, compared with 1.6% in north China. China's population aging has a strong correlation with the regional economy (Wang Zhibao et al., 2013)

Fifth, there are significant gender differences, with female older than male. As shown in Table 3, in the population aged 65 years and above, the proportion of female was higher than male from 2000 to 2010 (Fig. 3).

**Table 3** Comparison of population age structure by gender

| Year | Group | Proportion of population aged 0–14 (%) | Proportion of population aged 15–64 (%) | Proportion of population aged 65 and above (%) |
|---|---|---|---|---|
| 2000 | Male | 23.63 | 69.86 | 6.51 |
| | Female | 22.12 | 70.15 | 7.73 |
| 2010 | Male | 17.56 | 74.06 | 8.38 |
| | Female | 15.61 | 74.90 | 9.48 |

*Data source* The Fifth Census and the Sixth Census

# 2 Analysis of Rural Land Reform and the Aging of Rural Population

## *2.1 The Aging Population Forces Rural Land Reform*

(1) Urbanization has exacerbated the aging of the rural population

The urbanization process mainly affects the aging degree of the rural population through two aspects. The first is the transfer of the rural labor population to cities. Rural laborers, especially young rural laborers, go to cities out of the demand for higher wages and benefits. As shown in Fig. 4, the age of rural migrant workers is concentrated between 21–40 years old, and accounted for 59.3% of the total rural migrant workers in 2008. By 2016, it was reduced to 50.6%, and the proportion of people over 41 years old increased from 30% in 2008 to 46.2%. The second is the increase in life expectancy. The process of urbanization has led to improvement in medical standards and lifestyles, thereby reducing population mortality. With the acceleration of the aging process, the rural labor force is mainly composed of the elderly and women, which will have a substantial impact on agricultural production, restricting the development of the rural economy, and exacerbating the problem of rural elderly care. Additionally, due to the low fertility rate and the transfer of young and middle-aged population, the average permanent resident population per household in rural households dropped from 5.54 in 1980 to 3.88 in 2012, and smaller family size has impacted the way of relying on children for the elderly.

(B) Rural pension mode

The current main pension mode in rural China include family pension, community pension, and land pension. Family pension refers to children taking care of the elderly in the family. With the increasingly serious problem of rural aging, the young people must find ways to obtain higher income to support elderly. Therefore, they do not have much time to accompany the elderly. Family pension for the elderly has become increasingly unfeasible as the empty nest phenomenon caused by the migration of young laborers. Community pension refers to the way that society provides care services to the elderly who live at home. It is a mode in which the family and society share responsibility. However, in rural areas, community pension is quite impractical

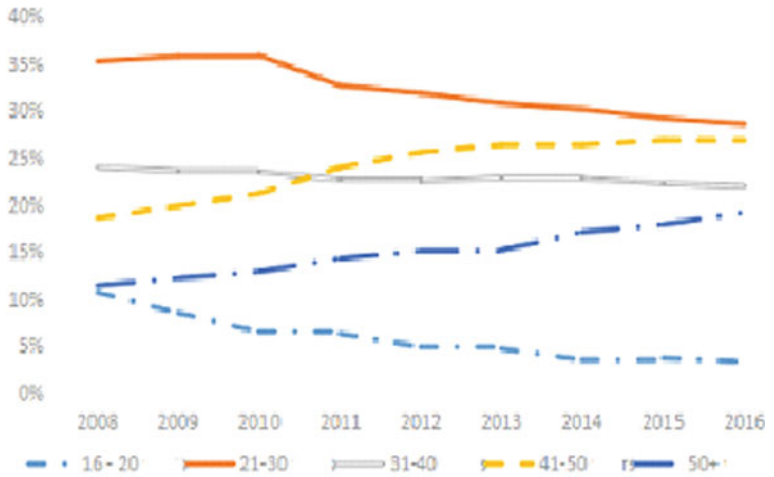


**Fig. 4** Proportion of the age composition of rural migrant workers. *Data source* National Bureau of Statistics

due to the lack of funds and personnel. Land pension refers to land income as an important source for the elderly. When institutional pension security is not in place, land becomes an important guarantee, and the elderly can continue to rely on their land for life necessities. In the past, land security mainly emphasized the production value of land, that is, rural elderly people rely on agricultural production income to maintain their lives. With the advancement of reforms such as land transfer in various parts of the world, the rent of land transfer has become an important source of income for rural elderly care. Table 4 compares these three pension modes.

(C) The necessity of rural land reform

Rural land reform is an inevitable requirement of the marketization process in the context of the current development of the market economy: the advancement of urbanization, the transfer of a large number of rural labor forces, the separation of man and land, and the rapid development of agricultural mechanization and small-scale household production. Agricultural industrialization and intensive production are the trends of agricultural development. Land is an indispensable material carrier for rural economic development and farmers' lives. Therefore, how to carry out rural

**Table 4** Main pension modes in rural areas

| Pension mode | Source of care | Development trend |
|---|---|---|
| Family pension | Family members (spouse, children and other relatives) | Weakening |
| Community pension | Government and community | Strengthening |
| Land pension | Land income | To be developed |

land reform and effectively use land is also an inevitable requirement for solving the problem of rural aging, considering the current "hollowing" and aging of rural areas and the decrease in the working-age labor force. It is difficult for the elderly and women who stay on the land as young people with good education work in the cities to master new agricultural scientific knowledge and agricultural technology, consequently, agricultural productivity and the net income from land are reduced. Therefore, it is necessary to reform and optimize the resource allocation of rural land, apply modern agricultural technology to agricultural production, improve the efficiency of land use, and generate income for farmers.

Rural land reform has further developed with the continuous deepening of the land management system since the reform and opening up. The Decision of the Central Committee of the CPC on Ten Major Issues Concerning the Promotion of Rural Reform and Development reviewed and approved by the Third Plenary Session of the Seventeenth Central Committee of the CPC stated that "in accordance with the principle of voluntary compensation and the law, farmers are allowed to adopt forms such as subcontract, lease, exchange, transfer, and cooperate with shares to circulate land contractual management rights, and develop various forms of moderate-scale management." This has on the one hand improved the efficiency of land use and reduced the problem of land uselessness due to aging, and on the other meets the increasing demand for agricultural products in the process of urbanization development. Land transfer has further promoted large-scale agricultural production. In addition, it also helps disabled elderly people obtain rental income through land transfer. In short, the reform of rural land transfer has provided tremendous help in solving the problem of the aging of the rural population in China.

## *2.2 Advantages of Rural Land Reform*

(1) The pension function of the land

Land is the most basic means of production in rural areas. The implementation of rural land reform system can provide economic foundation for the settlement of rural pension problems. In the well-developed market of rural land transfer, the elderly who have lost labor ability can transfer their own land to obtain income from land transfer rent and provide pension subsidies. As the size of the family shrinks, the economic burden of family pension for young people increases, and the economic income brought by land transfer provides the economic foundation for the elderly.

However, the function of land security has been weakening in recent years, mainly due to the decline in the proportion of income from agricultural production under the rapid development of urbanization and the increase in land-lost farmers, which makes the employment function of land decline. Compared with the secondary and tertiary industries, agriculture's contribution to personal income was indeed limited because land produces direct income. However, with the advancement of land reform, the indirect benefits of agricultural land would be fully utilized. Although the protection

function of land is limited, its full utilization is also an important part of rural pension security.

Of course, there are also problems with land security. After the land is expropriated, farmers who have lost their land undergo a great change in their pension mode. Although they have received a one-off compensation, they lose land security. Farmers have to switch from agriculture to manufacturing and service industries without any occupational skills, which will inevitably cause a decrease in income. Moreover, they receive fewer social security benefits after losing land, which makes the living standards of land-losing farmers unprotected.

(B) The popularization and improvement of institutional pensions have created conditions for rural land reform

As a kind of pension security, land-based pension has a substitute effect for institution pension. Land is the main means of production, which most farmers depend on for survival. The guarantee function of land is closely related to the function of using the means of land production. This guarantee mechanism has solidified small-scale farming operations to a certain extent and hindered the development of large-scale and specialized agriculture. However, when rural institution pension is popularized and improved, adequate pension payments can make farmers feel at ease of transferring their land and allow the value of land security to be realized through transfer, which is also conducive to the large-scale development of agriculture. According to Xu Zhigang and others (2018), for families with elderly people, the new rural insurance will increase the living security and family welfare of the elderly, reduce the agricultural labor supply of the elderly, and promote the transfer of land, especially in the case of strong mobility constraints.

## *2.3 Innovation of Rural Financial Modes*

(1) Farmland mortgage loans based on land transfer

Land transfer is the transfer of land contractual management rights. The farmland management rights under the "three rights separation" have the right to recirculate and mortgage with the consent of the contracting party. With land transfer, large-scale producers and operators obtain the mortgage power of farmland management rights through the land transfer market and then carry out mortgage financing in financial institutions. However, there are many risks to farmland mortgage loans. Pilot projects are currently being carried out. To carry out large-scale promotion, there are still problems such as difficulty in evaluating the value of farmland and in disposal and realization. Farmland management rights mortgage financing has been explored since 2006, and it has been piloted in many provinces and formed a variety of mortgage loans in light of different local conditions.

As shown in Fig. 5, farmland mortgage loans include two basic processes: the first is the process by which financial institutions lend to farmers or agricultural

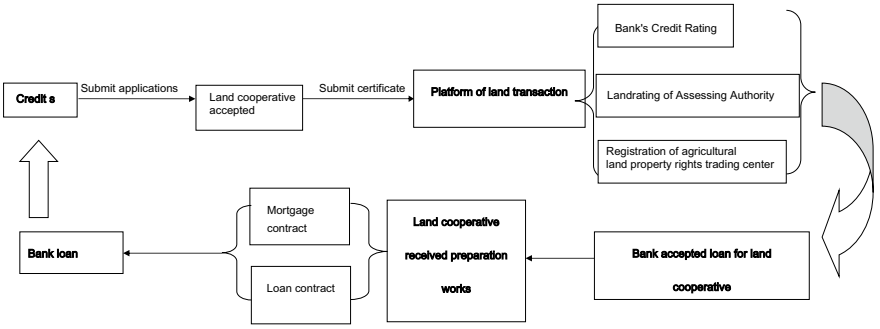


**Fig. 5** Process of mortgage financing of farmland management rights

enterprises that use farmland as collateral; the other is the process by which financial institutions raise funds. In the process of farmland management rights mortgage financing, the main work of financial institutions is to issue loans to farmers. Financial institutions raising funds has become an important way for the innovation of farmland management rights mortgage. On this basis, the mode of farmland mortgage loan has led to more financial innovations, such as farmland trusts and farmland securitization, which have produced positive effects in the United States and Germany.

(B) Innovation of financial mode of rural pension

Based on the mode of farmland mortgage loan, the innovation of the rural pension mode has new directions. If we compare the cash flow generated by land with the wage income of urban residents, we can find their common feature, that is, the sustainability of cash flow. The cash flow generated by land circulation has become one of the payment sources of rural residents' pension insurance. In fact, the government's top-down rural financial reform lacks an effective legal foundation, institutional foundation, and market foundation, and problems such as information asymmetry and lack of collateral still exist. The government actively advocates to support rural economic development and increase financial investment, but rural financial institutions are market entities for profit, which conflict with the government's fiscal functions, making reform unsustainable. Therefore, only by fully respecting the role of the market and gradually introducing the main body and power of the market into rural finance through the guidance of the government can resources be effectively connected with rural economic development.

Based on the mode of farmland mortgage loan, combined with rural elderly care needs, this article initially construct a farmland financial innovation mode that is divided into an initial and a mature period (Table 5).

A. Initial farmland financial mode

**Table 5** Comparison of agricultural land financial mode innovation

| | Early agricultural land financial innovation mode | Mature agricultural land financial innovation mode |
|---|---|---|
| Stage | Early stage | Mature period |
| Insured object | Land transfer farmers | Land transfer farmers |
| Types of Insurance | Commercial Pension Insurance | Commercial Pension Insurance |
| Insurer | Commercial Insurance Company | Commercial Insurance Company |
| Source of payment | Government subsidy + land rent | Land rent |
| Fund pool | Rural pension security fund | Rural pension security fund |
| Fund pool | Purchase insurance | Purchase insurance + investment preservation and appreciation |
| Risk compensation | Government risk compensation fund | Government risk compensation fund + commercial risk compensation fund |

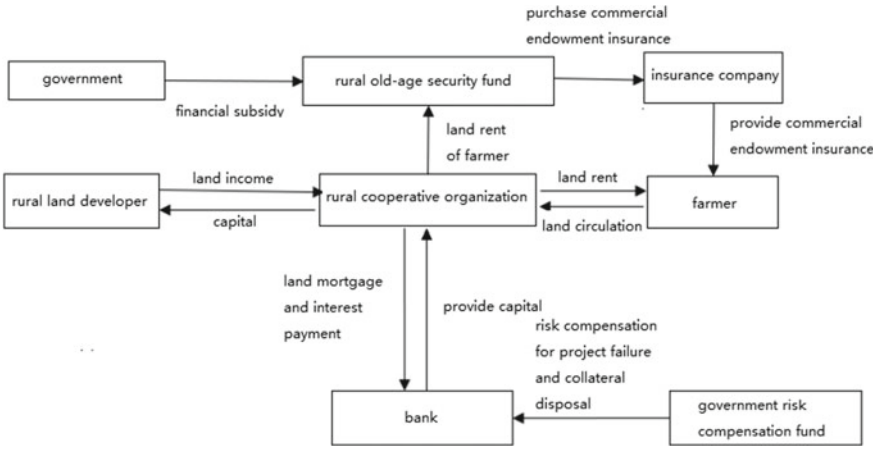


**Fig. 6** Initial innovation of agricultural land financial mode

In the early stage of agricultural land finance, there are problems such as the absence of the deposit and loan insurance system of rural financial institutions and the lagging of the rural financial guarantee system, which make it impossible to develop agricultural land finance solely relying on market mechanisms and requires government intervention. As shown in Fig. 6, in the early stage of financial innovation, on the basis of farmland mortgages, a fixed proportion of government financial subsidies and farmers' land rents constitute the source of the rural pension security fund. The rural pension security fund provide insurance companies for participating farmland mortgages. Farmers purchase commercial pension insurance, and the government needs to set up a risk compensation fund to deal with the risk of failure and compensation for the disposal of collateral.

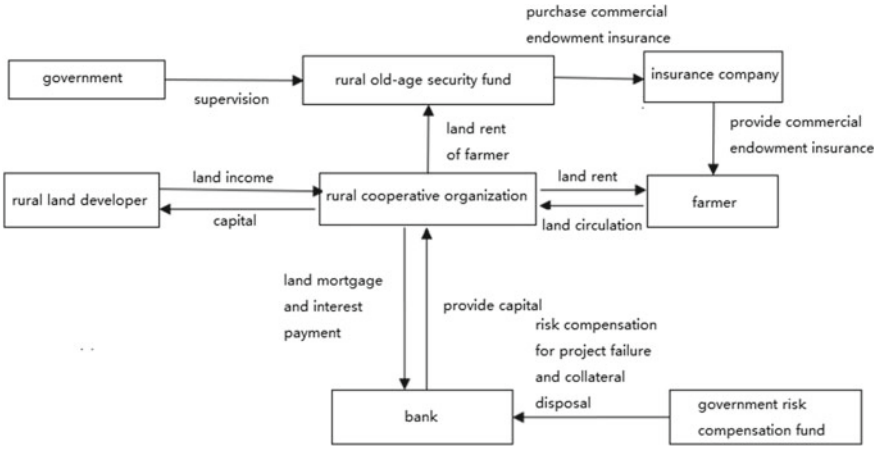


**Fig. 7** Innovation of agricultural land financial mode in the mature period

## 2 Agricultural land financial mode in the mature period

With the improvement of land circulation and farmland mortgage, after the initial financial mode innovation, the market and farmers have a further understanding of the risks and benefits of such farmland financial innovation, and their willingness to participate has gradually increased. With the expansion of the rural pension insurance fund scale, risks have become more dispersed as more farmers participate. At this time, the initial policy guidance was gradually withdrawn, allowing the market mechanism to play a leading role in the operation of the farmland pension insurance fund. As shown in Fig. 7, the government at this time mainly plays the role of supervision and management. With the expansion of the rural pension security fund, the scope of investment has also expanded from commercial pension insurance to other areas of value preservation and appreciation.

Two basic conditions are needed for the innovation of rural financial mode, the first one is the perfection of the transfer market for rural land contracting management rights in China. Only when rural land can be transferred will the credit rights with farmland mortgages be the core development for the improvement of the financial market. As farmland mortgage loan is unique, risk identification and risk hedging mechanisms are needed. At the same time, in the insurance market, the top-level design of endowment insurance for farmers requires not only financial institutions to participate in the construct but also mature market testing. The implementation plan for the specific rural financial mode innovation will be further improved.

# 3 Suggestions for the Innovation of Rural Financial Modes in the Context of Aging

## *3.1 Each Participant Has Its Own Advantages*

The main participants in rural land reform include the government, agri-related enterprises, financial institutions, and farmers. To develop a rural land reform program with "land pension" as the guiding principle, the four participants need to perform their duties and give play to their subjective advantages to jointly promote the implementation of rural land financial innovation.

(1) Government

On the basis of the active and comprehensive implementation of the rural land reform system, the goverment should formulate corresponding policies to benefit farmers and enterprises. While implementing a series of policies, such as tax subsidies and financing incentives, the first is to innovate in rural land finance and establish a sound land transfer mechanism. In addition to supporting regulations and systems, it is necessary to assume the responsibility of managing the rural pension security fund and establish a government risk compensation fund when the specific financial mode is implemented. The goverment should establish special funds to support modern agriculture, focusing on agricultural enterprises that participate in land reform and contract farmers' land for centralized management, especially some large-scale, specialized, and branded agricultural technology enterprises, and promote the development of agricultural economy of medium and large scale, collective management, enterprise-driven, science and technology intensive, to speed up land transfer and contiguous centralized management. The goverment should also establish a special skills training system, focusing on the development and improvement of rural compulsory education, agricultural professional technical education, rural employment education, etc. Comprehensive skills training should be provided to improve the professional and technical level and future development potential of migrant workers, rural labor and rural children to activate the rural labor market and to inspire farmers to learn new skills, increase income, and pursue the vitality and potential of the new dream.

(B) Agribusiness

Agri-related enterprises have essentially assumed two roles in the innovation of agricultural land financial mode, the first is the supplier of rural pension funds, and the other is the developer and user of rural land. Compared with the production and operation mode of farmers' self-production and self-operation, agricultural enterprises have rich business management experience and product marketing channel. They should focus on the sustainability of production and operation to ensure the continuity of land rents. When periodic or seasonal risks occur, risk compensation funds will play its role.

(C) Financial institutions

Financial institutions are the most active force in the innovation of agricultural land financial modes. As a bank, it is necessary to improve the risk review and value evaluation standards of agricultural land mortgage loans and truly grasp risk factors and capital flows. As an insurance company, it is necessary to design endowment insurance with corresponding periods, rates, and payment standards for the endowment of rural residents. With the expansion of rural endowment insurance funds, the payment and maintenance of endowment insurance are also crucial. Management agencies can refer to the current management methods of pension insurance funds and gradually entrust professional institutions such as fund companies to manage them to maintain and increase the value of the funds. At the same time, they should also pay attention to formulating detailed risk systems and rules for the funds.

(D) Farmers

Farmers' own advantage is the ownership of the land, but some farmers have low awareness of land transfer and mistakenly believe that land ownership will be lost after the land is transferred. Therefore, in addition to the government's vigorous promotion of the land pension, farmers should recognize and actively participate in land transfer, revitalize land contractual management rights, and expand their own pension security methods.

## *3.2 Clarify the Profit Distribution Plan to Prevent the Risk of Contract Failure*

In the context of the reform of the three-right separation system, the circulation of rural land across the country has been fully promoted, and various business entities have emerged. The distribution plan of operating profits is as follows: farmers obtain land rents through the circulation of land management rights, sometimes includes the labor income obtained by participating in labor; the enterprise obtains residual profit. However, these investment and operating entities have risks such as defaulting and running away. Therefore, the government should strengthen the supervision of the land transfer market and actively protect the rights and interests of farmers.

(1) Establish farmers' cooperatives and enhance the status of farmers' land transfer entities. Farmers' cooperatives should be established, and the position and functions of the cooperatives should be clarified. When farmers participate in land transfer, allow their opinions have an efficient channel, for farmer cooperatives represent farmers' interests. Therefore, in specific transactions, they will have more powerful pricing ability and rights protection capabilities, which can reverse the disadvantaged position and protect their dominant status. Specifically, the scattered land of the farmer's households should be the priority, followed by the overall centralized transfer.

(2) Introduce market insurance and guarantee mechanisms to ensure the fulfillment of land transfer contracts. Market insurance and guarantee mechanisms are important ways to deal with risks in the introduction of land transfer management projects. On the one hand, through innovative insurance products, the insurance company will pay the compensation and claim the defaulting party in the initial stage of agricultural land financial innovation when one of the farmers and the operator defaults; when the agricultural land financial innovation mode is promoted, the risks involved will be diversified. At this time, a reasonable insurance premium rate and term design can solve the risk event. On the other hand, for farmers and large-scale operators, guarantee measures can be added appropriately when insurance products are not perfect.

## *3.3 Promote the Development of Secondary and Tertiary Industries in Rural Areas*

The development of rural secondary and tertiary industries is an objective requirement for promoting rural urbanization, increasing farmers' income through multiple channels, and alleviating the problem of rural aging. Its development methods and approaches are mainly as follows: speed up the development of rural industrialization; develop small and medium-sized enterprises; introduce leading enterprises in agricultural industrialization; stimulate farmers' entrepreneurial passion; strengthen skills training for land-lost farmers; and encourage migrant workers to return to their hometowns to start businesses with the capital, technology, market information and management experience accumulated in cities.

(1) Increase financing and policy support strategies

Increasing financial support to the agricultural sector and encourage the Postal Savings Bank and Agricultural Bank of China to establish micro-credit mechanisms to invest more funds in rural township enterprises or small- and medium-sized enterprises, developing rural tourism to drive the development of rural commerce and catering. Government at all levels and relevant departments formulate preferential policies, introduce foreign investment, guide the establishment of rural small- and medium-sized enterprises, and promote the development of various rural enterprises to provide an economic foundation and policy guarantee for the development of rural secondary and tertiary industries.

(B) Employment support policies for absorbing farmers

The development of rural secondary and tertiary industries has broadened employment channels for land-losing farmers and further promoted land circulation. The government should carry out comprehensive quality training for rural labor force, and classify management according to the skills mastery after training; provide professional training for farmers, and contact relevant employers to recommend employment. For the employment of most surplus labor in rural areas, large-scale

employment negotiations can be carried out by organizing large, medium and small enterprises in secondary and tertiary industries to promote the employment of surplus rural labor.

### *3.4 Address Both Symptoms and Root Causes and Improve the Rural Social Security System*

Through the rural land reform system, land circulation has improved land security, but improving the rural social security system is the long-term solution, and the improvement of institutional pension security methods can further release the vitality of land circulation and land innovation.

(1) Improve the rural social assistance system

The current poverty alleviation work in rural areas has made positive progress, but it has not yet been completed. We should keep improving the social assistance system in rural areas, increasing the level of protection for left-behind and disabled elderly in rural areas, and ensuring the basic livelihood of rural residents and the rural minimum living security system, social insurance system, and social welfare system. It can help improve the construction of labor resources in rural areas, as well as reduce the cost of care for relatives.

(B) Strengthen the construction of a medical-care integration system in rural areas

In the context of supply-side reforms, facing the diversified elderly needs of rural residents, new requirements have been put forward for the integration of elderly care and medical resources. First, it is necessary to continue to improve the new rural residents' pension insurance system and adjust pension treatment standards in a timely manner according to economic development and regional differences. Second, in terms of medical funding, the coverage and subsidy level of rural medical insurance should be increased. Finally, in the context of the implementation of family pension for the elderly, the supply of medical resources needs to be increased considering the limited rural medical resources and medical personnel.

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# Exploration of the Rural Socialized Pension Mode in Qichun County: Report on Qichun Investigation


**Shaolian Zhao, Guangyi Tong, Junli Wang, and Lu Liu**

## 1 Introduction

There were 130 million people aged 60 and above and 88.21 million people aged 65 and above in China in 2000, accounting for 10.2 and 6.96% of the total population, respectively. As of the end of 2016, the number of elderly people aged 60 and above and aged 65 and above were 230 million and 15.03 million, accounting for 16.7 and 10.9% of the total population, respectively.[1] According to *Population Aging and its Social and Economic Implications* issued by the United Nations in 1956 and the 1982 World Congress on Aging in Vienna, China entered an aging society in 2000. By 2016, the situation had become more serious. It is expected that in 2025 and 2035, China will enter a stage of advanced aging and a hype-raging society. By 2050, there will be close to 500 million people aged 60 and above in China, accounting for more than one-third of the total population of China and a quarter of the world's population. Obviously, China will face huge challenges of population aging in the twenty-first century. The family planning policy has further exacerbated the natural population structure, leading to a unique process of population aging in China, that is, a rapid increase in a relatively short period of time. This will have a far-reaching impact on all areas of economic and social development. If aging cannot be properly handled, it

[1] Data source: http://data.stats.gov.cn/easyquery.htm?cn=C01.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_17

will bring about huge disasters such as extreme labor shortages and extreme scarcity of pension resources.

In the report of the 19th National Congress of the Communist Party of China, it was clearly stated that "the children should be raised, people should be educated, should have income from work, should be treated for illnesses, and the elderly can be provided and be sheltered, the weak should be supported. The requirements of the Internet and the establishment of a mechanism have been comprehensively established to cover the whole people, urban and rural areas, clearly defined powers and responsibilities, adequate protection, and sustainable multilevel social security system." The 19th National Congress gave new inspiration to the pension mode. The government supports society in running medical services and developing the health industry, and society should actively respond to the aging of the population, build a policy system and social environment for the elderly, ensure filial piety and respect for the elderly, promote the integration of medical and elderly care, and accelerate the development of elderly undertakings and the pension industry.

Rural pensions are the top priority among many other problems due to the large rural population in China and the relatively low income of farmers. Therefore, taking Qichun County in Huanggang City of Hubei Province as an example, this article explores the socialized pension-a socialized pension mode supported by the government and industrialized operation-in Qichun rural areas.

## 2 Humanistic Geography and Population Structure of Qichun

### *2.1 Humanistic Geography and Culture*

Qichun is located on the north bank of the middle reaches of the Yangtze River and at the southern foot of Dabie Mountain, with a coverage of 2398 square kilometers. It has jurisdiction over 15 towns, 2 provincial-level development zones, and 1 national wetland park. It has a total population of 1.03 million and belongs to the Wuhan city circle, Dabie Mountain Experimental Area and the central urban agglomeration and is an important part of the Yangtze River Economic Belt. In developing the Chinese medicine and health industry, Qichun has its unique natural resource endowment and historical and cultural advantages: the first advantage is its long history. Qichun has a history of more than 2200 years since it was established as a county in 201 BC. It was called "First-class Qizhou" in ancient times and was the center of medicinal materials in eastern Hubei. The famous poet Lu You in the Southern Song Dynasty once recorded the prosperous scene of Qizhou Pharmaceutical City, "Forty Miles Long Street, with many medicine shops, merchants gathered, and Shu boats on the shore." The second advantage is its deep culture deposit. For thousands of years, Jingchu culture, medical culture and religious culture have been integrated here, and the essence of Chinese medical culture, entirety, dialectics, and "preventive treatment

of disease" has been inherited and carried forward here. With long-term cultural accumulation, Qichun has the famous cultural scene of "passers-by know medicine, and any herb is medicine" and "thousands of families hang wormwood, smell the fragrance of medicine ten miles from the city". The great medical scientist Li Shizhen of the Ming Dynasty was born here. The Compendium of Materia Medica he wrote was known as the "Great Classic of Oriental Medicine" and the "Encyclopedia of Ancient China" and was included in the United Nations Intangible Cultural Heritage Memory of the World. Culture and education are respected here, and Qichun is known as the "Professor County". The third advantage is its abundant resources. Among the 1892 kinds of medicine recorded in the *Compendium of Materia Medica*, more than a thousand kinds were grown in Qichun County, which is a veritable Chinese medicine library. The fourth advantage is its pleasant living environment. Qichun is located on the 30-degree north latitude line, with natural mountains and ridges, rivers and lakes, and the climate is pleasant. As a traditional town of Chinese medicine and culture, Qichun has a self-contained system of health care and health maintenance.

## *2.2 The Status Quo and Development of the Qichun Population Structure*

Qichun had a total population of 1,010,206 million by the end of 2017, including 794,576 county residents, 601,885 rural residents, 215,630 urban residents, 533,529 male residents, and 476,677 female residents. There are 162,000 elderly people over 60 years old, accounting for 15.7% of the county's total population; among them, there are 42,000 empty-nest elderly, 29,000 left-behind elderly in rural areas, 6569 rural "five-guaranteeelderly"s, 31 100-year-olds, and 16,700 80-year-olds. The total number of students attending primary and secondary schools was 107,384, 44,139 in secondary schools and 63,245 in primary schools. More than 10,000 people enter schools every year. Table 1 shows that the population of Qichun before the founding of New China was younger (perhaps due to the premature death caused by the War of Resistance against Japan, the War of Liberation, diseases, food shortages, etc.); since the founding of New China, the number of people has increased sharply. In 1982, the proportion of the population aged 60 and under reached 93.2%. However, from 1990 to 2000, the population aged 65 and above surged from 5.2 to 5.7%; the population aged 60 and above also increased significantly, accounting for more than 10%. Qichun entered an aging society as early as 1998. The population aged 60 and above accounted for 15.7% in 2010 and 16% in 2017. However, the younger population increased from 19% in 2010 to 20% in 2017. However, due to the relatively large base of older people in Qichun, the aging trend will be further intensified in the future.

Many young people have migrated to work (approximately 300,000 people per year) and settled in cities in recent years, and the number of people going to college

**Table 1** Population structure data of Qichun in representative years

| *Year* | *Total population* | *0–15 years old* | *15–60 years old* | *60 years old and over* |
|---|---|---|---|---|
| 1947 | 591,432 | 173,861 (29.5%) | 376,250 (63.6%) | 41,321 (6.9%) |
| 1964 | 530,215 | 207,606 (39.1%) | 298,939 (56.4%) | 23,670 (4.5%) |
| 1982 | 743,948 | 266,539 (35.8%) | 427,306 (57.4%) | 50,103 (6.8%) |
| *Year* | *Total population* | *0–14 years old* | *15–64 years old* | *65 years old and over* |
| 1990 | 858,473 | 262,164 (30.5%) | 552,637 (64.3%) | 43,672 (5.2%) |
| 2000 | 949,478 | 262,969 (27.6%) | 633,350 (66.7%) | 59,160 (5.7%) |
| *Year* | *Total population* | *0–14 years old* | *15–59 years old* | 60 *years old and over* |
| 2010 | 727,805 | 138,589 (19%) | 478,748 (65.7%) | 11,048 (15.7%) |
| 2017 | 1,010,200 | 201,710 (20%) | 64,511,415 (64%) | 163,376 (16%) |

*Note* 1. Qichun County Annals and Qichun County Statistics Report
2. The 2010 data are permanent population data
3. Due to the inconsistency of statistical rules, the selection of statistical years in this table appears to be inconsistent, but it does not affect the evolution of the population structure

**Table 2** The number of school students and students admitted to the University of Qichun County from 2007–2017

| Year | Number of students in school | Number of students admitted to university | Proportion of students (%) | Proportion of university students (%) |
|---|---|---|---|---|
| 2007 | 131,114 | 5043 | 13.37 | 3.84 |
| 2008 | 127,910 | 5949 | 13.02 | 4.65 |
| 2009 | 122,462 | 5899 | 12.35 | 4.81 |
| 2010 | 116,574 | 5934 | 11.42 | 5.10 |
| 2011 | 100,841 | 5788 | 10.05 | 5.74 |
| 2012 | 83,936 | 5283 | 8.30 | 6.29 |
| 2013 | 78,695 | 5204 | 7.73 | 6.61 |
| 2014 | 79,374 | 5308 | 7.77 | 6.68 |
| 2015 | 83,075 | 5540 | 8.08 | 6.67 |
| 2016 | 87,472 | 3702 | 8.59 | 4.23 |
| 2017 | 90,937 | 3011 | 9.00 | 3.31 |

*Note* Data come from the Education Bureau of Qichun County

and working in large cities has increased sharply as the historical tradition of advocating learning and education in Qichun. Leaving of the younger generation makes the aging population of Qichun more prominent, showing a trend of fast speed and large scale (Table 2).

It can be seen from Table 3 that the declining output value year-by-year of the primary industry (from 47.6% in 1990 to 21.3% in 2017) that farmers in Qichun are mainly engaged in and for other reasons has resulted in limited sources of farmers'

**Table 3** The data of economic development and farmers' income level in representative years of Qichun

| Year | Registered population (ten thousand) | GDP (¥100 million) | Primary industry (¥100 million) | Per capita GDP of permanent residents (yuan) | Net income of farmers (yuan) |
|---|---|---|---|---|---|
| 1990 | 86.37 | 8.40 | 4.00 (47.6%) | 972.2 | 529 (54.4%) |
| 1995 | 91.63 | 16.63 | 8.93 (54.7%) | 1815 | 1075 (59.2%) |
| 2000 | 95.40 | 31.9 | 9.97 (31.3%) | 3344.3 | 2196 (65.7%) |
| 2005 | 97.12 | 44.31 | 11.45 (25.8%) | 5687 | 2654 (46.7%) |
| 2010 | 102.04 | 101.35 | 26.42 (26.0%) | 12,031 | 4123 (34.3%) |
| 2015 | 102.82 | 193.50 | 44.54 (23.0%) | 24,916 | 10,341 (41.5%) |
| 2017 | 101.02 | 229.97 | 49.06 (21.3%) | 29,445 | 12,375 (42.0%) |

*Note* 1. Data come from the Bureau of Statistics of Qichun County
2. The income data of farmers in 2015 and 2017 are the disposable incomes of rural residents. The percentages in the fourth and sixth columns indicate the proportion of the primary industry in GDPD and the proportion of farmers' income in per capita GDP

income, and the income gap with urban residents continued to widen. Especially in 2000, the income of farmers accounted for 34.3% of the per capita income of permanent residents, and it was 41.5% in 2015 and 42% in 2017, a minor but non-significant increase. Qichun farmers are actually facing the possibility of "getting old before getting rich".

In short, the population aging in Qichun is worsening, especially the aging of rural residents, and "getting old before getting old" is the most representative characteristic. Solving the aging problem in rural areas is of great importance.

## 3 Explorations of the Qichun Pension Mode

Qichun has solved the problem of providing for the elderly in rural areas as an important subject of targeted poverty alleviation and construction of beautiful villages in recent years. Based on the actual conditions of the county and long-term planning, Qichun has carried out some useful explorations and attempts and has initially formed the characteristic of the Qichun mode, which is sustained by welfare homes, supported by rural happiness homes and day care centers, and supplemented by private elderly care institutions. This pension mode has achieved obvious effect.

### *3.1 Analysis of the Main Body of Population Aging*

The aging group of rural residents can generally be divided into two categories: empty-nest elderly and elderly at home; empty-nest elderly can be subdivided into

the "five-guaranteeelderly" elderly, elderly with children living separately and elderly with children living or working in other places; traditional elderly at home can also be divided into the elderly who have family care, the elderly whose family is unable to take care of them, and the elderly who are able to take care of their families. It is accepted by all that the "five-guaranteeelderly" elderly should be sent to nursing homes, but for the empty-nest elderly with children to nursing homes, the secular notion is an obstacle; The elderly, suffering from the rapid decline in their physiological functions, have also to bear tremendous pressure psychologically and easily feel like "have children or not, it is the same", and "abandoned by children". It is the best choice for the elderly with family care and who are able to take care of their families to enjoy family happiness at home. The elderly whose families are unable to take care of them could hire a professional nanny at home. Because of the high economic requirements of professional family care, social pension institutions are also optional, and it is the direction of future development.

## *3.2 Break of Traditional Concepts and Establishment of New Ideas*

Qichun pension mode also faces some difficult problems. First, there are approximately 3000 disabled and half disabled elderly, a group depending on government support or special care, but the resources for the elderly in the Qichun government are limited. Second, the health status of the elderly is worrisome. The elderly have a high prevalence rate and various types of diseases, and most of them are chronic diseases with many complications, and high difficulty with treatment, which contradict the shortage of existing hospital beds and doctors in Qichun. Third, the functions of family pension are weakening. The parents of middle-aged people who have settled in other places or cities still stay in Qichun for retirement (this group of elderly are getting used to the living habits of Qichun and are unwilling to go out of Qichun for retirement). There are approximately 300,000 young people going out to work in Qichun every year, and the number of family members who take care of the elderly is relatively reduced; young people's care and spiritual comfort for the elderly are becoming less and less. Without care conditions, various forms of elderly universities or activity centers can hardly satisfy the psychological needs of the elderly. Fourth, getting old before getting rich determines the simplification of most people's choice of pension service mode. Ordinary pension institutions cannot meet the medical needs of the elderly, and the disabled and semi-disabled elderly and the elderly with chronic diseases need long-term care and medical treatment. In short, the Qichun pension must be innovative, and the traditional home-based pension mode cannot effectively solve the Qichun problem.

First, the traditional concept of social pension should be broken. Going to a nursing home is not because of unfilial piety, is not "waiting for death", nor is it a "hell" in the world. It is a lifestyle at this stage. The nursing home is a platform for everyone

to enjoy equality. It is "big love" that means getting out of the small family and integrating into the big family of society, and it is "fraternity" that is love without hierarchy, difference and privilege. Children must realize that it is not abandonment, unfilial piety, or social ruthlessness but an effective way for the elderly provided by society.

Second, the new concept of social pension must be established. Social pension is a professional institution that can properly handle the problem of weakened physical function of the elderly, implement reasonable meals and plan appropriate physical exercise programs for the elderly. Pension institutions generally have their own infirmary and professional doctors, and elderly people can enjoy professional diagnosis and medical treatment in time. Pension institutions generally cooperate with nonprofit organizations, which can bring rich and colorful leisure life to the elderly At the same time, pension institutions will also organize various types of activities and implement visitation systems in various ways. They are like happy paradise for the elderly and new starting point for the pursuit of happiness.

It is necessary to eliminate the traditional concept of nursing homes. It is necessary to reconsider that social pension care is an alternative to traditional home-based pension care. It is not the absence of family affection but love.

## *3.3 Build a New Pension System*

Qichun should adhere to the government's leadership and advance at a high level. The Qichun County Party Committee and the government attach great importance to the construction of the pension service system, put the construction of the pension service system on the important agenda, and incorporate it into the economic and social development plan. It has successively issued the Implementation Opinions of Qichun County on Further Strengthening the Work on the Elderly and Qinchun Opinions of the County on Accelerating the Development of Home-based Care Services in Urban and Rural Communities and the 13th Five-Year Plan for the Development of Qichun County Civil Affairs and other policy documents. The county government set up a special work group in charge of the county head as the team leader and the main people in charge of relevant departments as members. The whole county was mobilized, and all people participated, forming a pragmatic working mechanism of government-led, department-coordinated and linked advancement. Qichun should insist on mode innovation and classified construction, combining the reality of Qichun and adapting measures to local conditions. Now four modes have been explored, and a complete pension system has been formed.

First, we implement full care for the elderly based on institutional pensions. Since 2010, Qichun has increased government investment, organizing more than ¥10 million each year to support the construction of county and township welfare homes, which has improved the life standards of the "five-guaranteeelderly" and the level of pension services. Qichun has built 17 township orphanages, supporting 1120 "five-guaranteeelderly" elderly and 110 urban. For example, the Hengche Town

Welfare Institute takes advantage of the advantages of complete equipment, complete functions, and a comfortable environment to address the needs of three urban and rural noes, disabled and semi-disabled elderly, rural orphans, and centralized support for the "five-guaranteeelderly" and orphans have implemented full-care services for food, clothing, housing, transportation, and medical care, giving full play to the role of public pension institutions.

Second, for the implementation of group pensions, we rely on community and rural pensions. Considering the fact that there are many empty-nest elderly and left-behind elderly in rural areas and the scattered support "five-guaranteeelderly" in rural areas who are unwilling to live in welfare homes, community rural elderly day care centers or multi-village joint construction of rural happiness homes are built to implement centralized living for elderly people to the various choices of live independently, help each other, and group together. 120 community rural day care centers and 89 rural happiness homes are built. For example, the Xiacao Day Care Center has an investment of more than ¥3 million, nearly 1000 square meters, and various equipments. It is a multifunctional activity center that gathers leisure, entertainment, health and fitness for the elderly. It plays the role of elderly association and organizes mutual assistance and volunteering among neighbors. The service meets the needs of various pension services for the elderly, such as day care, cultural and sports entertainment, and spiritual comfort. Another example is Dawu Xingfu New Village in Qingshi Town. Taking advantage of the opportunity of the national China Merchants Group to help the poor, Dawu Village Xingfu Home was built to resettle 78 elderly people in 6 villages nearby. This site has become a mode for relocation in the province.

Third, private nursing homes should be supplemented to explore the integration of medical care and nursing. Qichun rationally allocates resources, actively introduces social capital to devote itself to the service of medical care integration, and vigorously develops and supports social forces to establish pension institutions. The Sunset Red Pension Service Center in Fengshulin Community, Caohe Town, covers an area of 50 acres and plans to invest approximately ¥100 million. It can accommodate 1000 elderly people, with a comprehensive pension center integrating elderly care, rehabilitation, health care and entertainment. It is Qichun's largest, highest standard, and fully functional pension institution. At the same time, we should make full use of existing medical and health resources, transform some hospitals into medical-care integration service organizations, and integrate resources. In the Nanzheng Hospital of Guanyao Town, a pilot mode of combining medical care and pension was implemented. The nursing home was "trusted" by the hospital, and the coordinated service of pension institutions and medical institutions was fully implemented to meet the multilevel and diversified services of the elderly.

Fourth, we will build a comprehensive pension system based on the guidance of social elderly care. Qichun effectively coordinated targeted poverty alleviation policies, integrated resources, comprehensively promoted the relocation of poverty alleviation and dilapidated building renovation projects for rural "five-guaranteeelderly", built a social elderly service center, and created high-quality and high-quality social elderly services. The county plans to build 2743 beds for the elderly, including

2 elderly service centers with more than 300 beds and 8 elderly service centers with more than 100–200 beds. For example, the pension service center in Fugang town, Qichun, has designed 412 pension beds equipped with medical rooms, activity rooms, restaurants, service halls and other supporting engineering facilities. It is a comprehensive type with convenient transportation, beautiful environment, complete functions, and liable and suitable for business. The center has greatly improved the Qichun pension service level.

Supported by institutional elderly care and supplemented by private nursing homes, the construction implements full care, relies on community and rural elderly care, promotes group elderly care, explores the integration of medical care and elderly care, and takes social pension as the guidance to create a comprehensive pension service system in which diversified pension care is suitable for the physical and psychological needs of all types of elderly care.

## *3.4 Integrate Social Pension Capital*

There are few sources of continuous funding for the retirement of people. Qichun has a large rural population with serious aging degree and a narrow effective income. Therefore, Qichun social pension financing should be diversified and have multiple channels and strive for policy support and increased investment. First, we are striving upward and actively seeking project funds from the Provincial Department of Civil Affairs, investing more than ¥10 million each year to build, renovate, and upgrade some of the township's pension service organizations in accordance with the requirements of standardization. Second, the government raises funds and focuses on the "three combinations": combined with the targeted poverty alleviation and relocation project, including the "five-guaranteeelderly" dilapidated houses in the unified construction plan and subsidized ¥57,000 per household; combined with the restoration and reconstruction of the collapsed houses, the "five-guaranteeelderly" recovery and reconstruction funds for disasters and the Rural Happiness Home will be constructed in a unified way with a subsidy of ¥40,000 per household; combined with the "five-guaranteeelderly" dilapidated house renovation project, we will strive for policy funds from the housing surplus construction department, and each household will be given 10,000 yuan in support. Third, society should adopt preferential support policies such as government purchases of services, increased funding subsidies, provision of service places to guide and encourage social capital to participate in pension services, and effectively solve the problem of insufficient funds for the construction of pension services in Qichun. Fourth, we create self-creation, support various pension service organizations to develop their own economy, encourage qualified places to provide necessary production land, and improve the blood function of pension service organizations. Finally, the help from the civil affairs supplement. The Welfare Lottery Public Welfare Fund spends ¥3 million each year to give rewards and supplements to the newly built township orphanages and rural happiness homes, and each room is equipped with a bed, a table, and a wardrobe.

## 4 Path Dependence and Strategies for the Future Development of the Qichun Pension Mode

The socialized pension system supported by the government and industrialized operations is one of Qichun's most effective pension modes in the future, and it will contribute to Qichun pension services in conjunction with the implementation of humanistic care through public welfare elderly care. The specific strategy is as follows:

First, social pension institutions or enterprises must adhere to standard management and provide quality pension services. The specific methods are as follows: first, implement the main body, establish a two-level responsibility system for the village, incorporate the construction of the pension service system into the performance evaluation of the township team, make it clear that the township or village committee is the main body of organization and management, and each pension institution selects a manager. Second, the system should be improved, safety, health, and check-in and exit systems should be improved, and a long-term management mechanism should be established. Adhere to the openness of hospital affairs and democratic management and carry out 8 activities, including learning, labor, health, and appraisal of the residents. They combine their respective strengths to establish a mutual assistance group to form a happy small family of self-management, self-service, and mutual help. Third, management should be strengthened, village-level elderly service mutual aid associations should be established, mutual aid activities should be carried out in various ways, and the daily operation and management of elderly service institutions should be guided. The pension service agencies organize and carry out the five grasps and five innovations star awarding activities, conduct inspections and evaluations every quarter, and the results of the evaluations are linked to the annual evaluation and commendations and material rewards. Fourth, humanistic care vigorously calls on organizations such as the Youth Volunteer Association and the Three-Lao Art Troupe to go deep into the pension service organizations to carry out volunteer service activities on special days such as Lei Feng Day and Double Ninth Festival each year. At the same time, it pays attention to the medical care of the elderly, organizes them to go to the hospital for physical examinations, and establishes health records.

Second, we tap the integration mechanism and vigorously develop the mode of combining medical care and elderly care. The 2018 National People's Congress report proposed supporting the inheritance and innovative development of Chinese medicine and encouraging the integration of Chinese and Western medicine. The history of Chinese medicine is very rich. Ancient Chinese medicine sages have long realized the importance of preventing diseases. Suwen·Ancient Innocence Chapter gives the principles of health preservation: Dharma is based on Yin and Yang and based on Shushu, regular diet, daily routine, and no rash work. Suwen·Four Qi Tiao Shen Dalun put forward, "the saint does not cure the disease and cures the disease, and the sage does not cure the disease before the disease." In other words, treatment before the disease includes prevention without disease and prevention

of disease. The multiple meanings of the prevention of chaos and the prevention of chaos and change reflect the simple health consciousness of ancient people and have an enlightening effect on the development of the big health industry. Traditional Chinese medicine pays attention to the same source of medicine and food, focusing on treatment and prevention and the combination of treatment and treatment. In addition, many traditional Chinese medicine products have been passed down from generation to generation and are deeply rooted in the hearts of the people. As long as the systems for planting, research and development, quality control, and management of Chinese medicine continue to be improved, Chinese medicine companies can achieve cross-industry development and gradually become related to daily chemicals, health care, and health assessment. The industry is extended to form a new composite industry and then serves the modern pension in combined medical care.

Taking the Hubei Provincial Department of Civil Affairs as an opportunity to list Qichun as a pilot county for the construction of rural happiness hospitals, Qichun should make full use of existing medical resources, transform some hospitals into medical and elderly service institutions, integrate resources, and actively develop medical services. The pilot of the combined care mode is to build a combined medical care and pension service organization, with the hospital "custodial" the nursing home, and comprehensively promote the coordinated services of pension institutions and medical institutions to meet the multilevel and diversified services of the elderly.

In the end, provide services to meet the needs of the elderly with multilevel and diversified services.

Finally, build the "Qi Ai" (wormwood, a plant that has medical function) industrial chain operation and cultivate leading institutions or enterprises for health and elderly care. Based on the fact that Qichun is the hometown of the medical sage, the sacred place of the palace, the famous county of professors, and "the city of Ai" of China, successive county party committees and county governments have devoted themselves to the development of Li Shizhen's humanistic brand. They have actively explored medicine, medical care, and medical treatment, forming a one-two-three overall layout of the industry and the development pattern of "six in one" for the health industry. "Starting from Ai", the rural elderly transfer land and other resources to grow Ai plant, and then the leading health and pension institutions or enterprises process and produce Ai products, then the enterprise builds an e-commerce platform, and then the qualified elderly or family members participate in e-commerce to realize the industrialized operation of the pension chain. Although the pension industry is still in the early stages of development, the industry concentration is low, there are many companies but a lack of leading companies, the business mode is not mature, and there are many problems. At the same time, Qichun is also building a group of companies in Qichun County, Huanggang City and Hubei Province. This is even the best time for leading health and pension enterprises nationwide. Realize the sustainable development of the pension industry with the "Qi Ai" industry.

In short, the Qi Ai industry will serve as the pillar industry for the development of the Qichun pension industry. Social pension and medical care integration should be established as a guide, and a diversified pension service system should be created to provide services for the elderly's welfare services, life care, medical care, physical

fitness, cultural education, and legal services for hardware and software construction. We should promote the transformation of elderly care, attract social forces into the pension industry, and implement the strategy of combining medical care and elderly care. The “Qi Ai” industrial pension can not only effectively solve Qichun pension problems but also contribute to China’s pension industry.

# Lifelong Education Under the Background of Population Aging: Taking Hubei Qianjiang as an Example


**Cheng Jiang and Yujie Zheng**

## 1 Research Background

### *1.1 Status Quo and Trends of Population Aging in China*

In recent years, the aging of the population structure has attracted widespread attention from governments worldwide. Population aging refers to the trend that the proportion of the elderly in the total population continues to rise. According to the definition of the World Health Organization, when the proportion of people over 60 years old in the total population reaches 10%, or the proportion of people over 65 years old reaches 7%, that indicates the threshold of an aging society; when the proportion of people over 65 years old reaches 14%, this means the official entry of an aging society; if the proportion reaches 21%, that means the entry of a super-aging society. The number of elderly people aged 65 and above in China was 88 million in 2000, accounting for 6.96% of the total population, which has reached the threshold of an aging society. Affected by the two baby booms in 1953–1957 and 1962–1973, a large number of people will reach 60 years old in 2013–2017 and 2022–2033. By the end of 2014, the number of people aged 65 and above reached 138 million, and the proportion rose to 10.06%. People born in the third baby boom in 1985–1991 caused by the inertial effect of the second baby boom will enter old age approximately in 2045–2050. By 2040, the proportion of people over 65 will exceed 20%, and will continue to increase by 2050, reaching 20–24%, the peak of the aging level. With the reduction of the total population, the proportion of the elderly will continue to be at a high level, and it will exceed 30% by 2100. Scholars agreed on the predictions on the number and structure of the population of China, with only little difference

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_18

in the specific aging degrees. Needless to say, population aging will accompany the twenty-first century. To date, population aging in China is already severe. China is the country with the largest elderly population and is also one of the countries with the fastest population aging.

## *1.2 Proposal for the Construction of a Lifelong Learning Society*

The continuous increase in the number of elderly people has led to a more severe situation. This has led to the imbalance of the social demographic structure and will have a greater impact on the social economy, culture and modernization. The fact of population aging requires the government to plan and vigorously promote the development of education for the elderly in accordance with the strategy and the construction of a lifelong learning society. On the big stage of an aging society, lifelong education has greater potential. The Decision of the Central Committee of the Communist Party of China and the State Council on Strengthening Work on Aging issued at the beginning of this century point out that the issue of aging involves many fields, such as politics, economy, culture, and social life. It is a major social issue related to the national economy and the people and long-term stability. In the Notice of the General Office of the State Council on Printing and Distributing the Education Development Plan for the Elderly (2016–2020), it clearly stated: "The elderly are precious wealth of the country and society. Their education is an important part of China's education and aging services. The development of education for the elderly is an important measure to actively respond to the aging of the population, modernize education, and build a learning society. It is an inevitable requirement to meet the diverse learning needs of the elderly, improve their quality of life, and promote social harmony." It reiterates the strategic decision to "speed up the construction of a learning society and develop education for the elderly". General Secretary Xi Jinping makes important instructions to strengthen the work on aging and emphasizes that an effective response to the aging population has a bearing on the overall development and the well-being of hundreds of millions of people. It is necessary to strengthen top-level design, improve major policies and systems such as childbirth, employment, and pensions, and achieve timely, scientific and comprehensive responses based on current and long-term perspectives. Premier Li Keqiang also issues instructions and points out that it is necessary to focus on scientifically responding to the problem of population aging, combined with the formulation and implementation of the 13th Five-Year Plan, promptly research and put forward relevant policy recommendations, and pay attention to feasibility. The above discussions clarify the direction for the top-level design to deal with population aging. How to actively respond to the challenge of population aging and to reasonably and effectively classify and develop current and future potential elderly labor resources is an urgent issue in the education field.

## 2 Opportunities and Challenges Brought by Aging to Lifelong Education

### *2.1 Concept of Lifelong Education*

The concept of lifelong education is based on the traditional education system. In the traditional system, institutions such as elementary school, middle school, and university undertake the responsibility for education and talent training. However, for various reasons, there are still some people who cannot receive institutional education. Therefore, lifelong education is proposed for the purpose of allowing people who are free from traditional school education to have the opportunity to learn again. As a part of lifelong education, senior education is extremely important in the context of aging. The implementation of senior education will help improve the overall quality of the elderly and play an important role in creating a harmonious society, realizing healthy aging, and developing the human resources of the elderly to build a lifelong education system.

### *2.2 Lifelong Education and the Development of Talent Resources for the Elderly*

Human resources is a general term referring to people in a country or region with strong management, research, creative and specialized technical capabilities, with emphasis on quality. Elderly labor resource refers to the sum of talents who have reached or exceeded the legal working age or the retired high-quality elderly. Talent resources are included in human resources, referring to the part of human resources with a higher level of knowledge and ability. Therefore, there are distinctions between the two in terms of development. Human resource development refers to a series of policies, methods and procedures for the continuous development of employees to ensure that employees have knowledge and skills that match their jobs and, on this basis, to further improve work performance. The development of talent resources is mainly the development of human knowledge and intelligence resources, the cultivation of ability and the improvement of quality. The development of elderly talent resources in this article mainly involves two elements: the first is the number, a large number of idle senior citizens can be systematically discovered and participate in social development through lifelong education; the second is the improvement of quality. Targeted training plans for the elderly should be formulated according to their personal characteristics and the specific needs of the positions they are engaged in to help them better engage in current or future work.

Compared with many countries in the world, the retirement age of China is relatively young. With the continuous increase in average life expectancy, the average life expectancy of retirees is approximately 15–20 years or even longer. They have

accumulated rich experience in technology and management after decades of work and are still in a very healthy state with the improvement of living standards and the advancement of medical technology. They are capable of continuing to engage in corresponding studies and work. Keep working can, on the one hand, accumulate more wealth for the future and relieve loneliness and boredom caused by premature retirement, thereby helping them maintain a good mentality; on the other hand, the development of human resources for the elderly through lifelong education can not only provide experienced labor resources and improve labor productivity but also effectively alleviate the decline of labor supply, form a secondary demographic dividend, and promote economic development.

Therefore, the importance and necessity of elderly education for an aging society must be recognized. Efforts must be put into vigorously developing elderly education to promote the development of a lifelong education system, to improve the quality of the elderly through elderly education and achieve a healthy aging society, as well as ease the pressure brought by the aging population on the social economy and modernization. At the same time, it must be realized that there is an inherent connection between an aging society and lifelong education. Lifelong education plays an important role in improving the overall quality of the aging population, promoting the coordinated development of society, and building a lifelong education system. The aging society brings development opportunities and challenges to the development of senior education and lifelong education. How to meet the rapidly increasing demand for education and learning services of the elderly has become a huge challenge and a new task for the current education system. This article will take Qianjiang City of Hubei Province, the central region of China, as an example to gain a thorough understanding of the current situation of the learning needs of the middle-aged and elderly, and propose policy recommendations for reference for China to be able to fully release the new potential of the development of aging talent through lifelong education in the future.

## 3 Survey of Lifelong Education in Hubei Qianjiang

### *3.1 Research Methods*

The purpose of this survey is to understand the current situation and needs of senior education in Qianjiang, to identify the problems facing the development of senior education based on the survey, to learn from successful experiences at home and abroad and to make policy recommendations as to how to deal with population aging and promote education for the elderly. Meanwhile, this survey is also intended to fully understand and grasp the real learning needs and learning preferences of the middle-aged and elderly and to help relevant educational institutions or curriculum planners provide more appropriate learning environments and resources to the target population to meet their lifelong learning needs.

The content of the questionnaire include basic information of the subject population (such as residence, education status, age, gender, etc.), a five-point scale on learning needs, and a five-point scale on learning methods, channels, and institutional preferences. The items of the learning demand scale mainly refer to the active aging theory of the World Health Organization and the active aging index established by the Economic Commission for Europe (UNECE, 2015), supplemented by regular observation and informal interviews from the Veteran Cadre Activity Center of Qianjiang and the staff at senior universities.

Regarding the research methods, this article adopts demographics, literature, questionnaires, interviews, cases, comparative analyses, etc. The questionnaire was distributed to students from senior university or community senior schools in Qianjiang in the sample area, volunteers from high schools, and employees over 45 years old from state-owned enterprises or private enterprises. With the support and cooperation of relevant institutions, the investigator explained the requirements for filling out the electronic questionnaire to the managers of the surveyed enterprises on the spot, and they were organized to complete the filling in the staff meeting. In high school, the investigator explained the questionnaire survey requirements to the student volunteers on the spot and asked them to return home on the weekend to conduct a questionnaire survey with relatives. According to the specific situation of senior students in senior universities, the main method of investigation was to visit the senior university to interview the students, filled in the questionnaire first, and then collected information through telephone communication.

### *3.2 The Status Quo and Development Trends of the Elderly in Qianjiang*

As shown in Fig. 1, as of the end of 2017, there were a total of 200,000 senior citizens aged 60 and above in Qianjiang, accounting for 19.8%, much higher than the internationally accepted population aging standard of 10%. The total population of Qianjiang has been declining year by year since 2014 (Fig. 2). In the same period, the national elderly population accounted for 17.3% of the total population. The degree of population aging in Qianjiang has been much higher than the national average (Data source: the Public Security Bureau of Qianjiang City).

From 2011 to 2017, the growth speed of the number and proportion of the elderly in Qianjiang was very significant. The rapid development has brought huge demand for education for the elderly and forebodes the huge demand for a larger group of elderly education in the future. As shown in Fig. 3, from 2011 to 2017, the proportion of the registered elderly population increased year by year; the increase in the proportion of the population aged 70 years and above was the most significant.

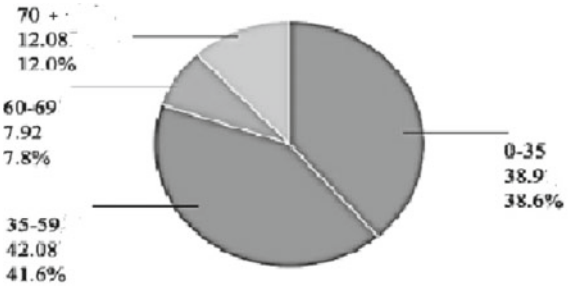


**Fig. 1** The age structure of the registered elderly population of Qianjiang

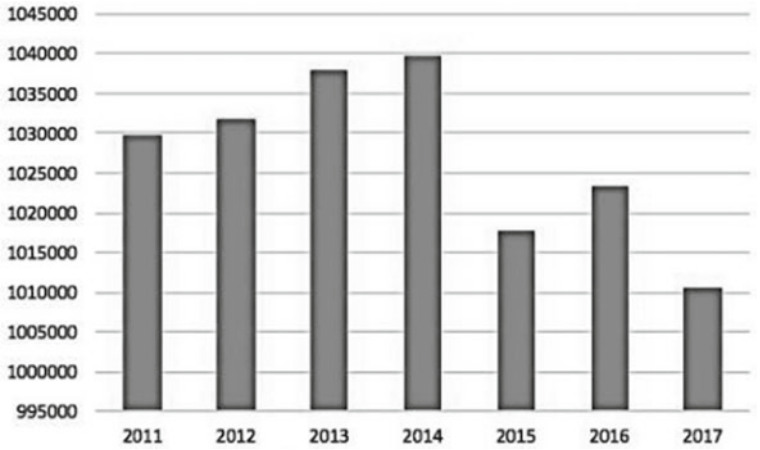


**Fig. 2** The distribution of the registered population of Qianjiang

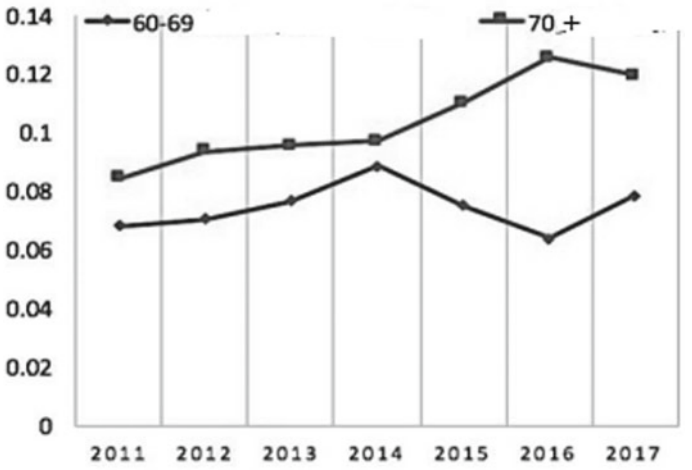


**Fig. 3** Distribution of the proportion of the elderly in the total population

# 4 Survey Results of the Needs and Status Quo of Senior Education in Qianjiang

## *4.1 The Status Quo of the Senior University in Qianjiang*

Qianjiang Senior University is an educational school for the elderly, approved by the Qianjiang Municipal Organization Committee. Sponsored by the Municipal Party Committee Veterans Bureau, it is a fully funded institution and is in charge of the Organization Department of the Municipal Party Committee. In accordance with the requirements of the municipal party committee and the municipal government for the overall transformation of urban planning, Qianjiang has built a new senior university with an area of 19.5 acres and a building area of 8466.34 square meters. As the school scale continues to expand, financial allocations are also increasing. Independent legal person registration was carried out, and the organization was further improved. The school has established various regulations and management systems according to actual conditions, and various tasks operate normally. School teaching management is conducted according to the academic year. In terms of staff organization, the school currently has 5 staff members, 2 are incumbents, 2 are retirees, and 1 is hired. Among the staff, 2 had a bachelor's degree, and 3 had a junior college degree. The school has 15 teachers, all of whom are external staff; among them, 5 are professional teachers in urban primary and secondary schools, 10 are members of various associations or freelancers, 3 have intermediate titles, 2 have junior titles, and 10 have no professional titles. In terms of students, the school has 514 students, including 402 female students and 112 male students. The number of students attending classes is 860. According to the survey, the students live mainly in urban areas, some from nearby urban areas and remote towns. Among the students, female students mostly concentrated on paper-cutting classes, music classes, dance classes, electronic organ classes, and cucurbit flute classes, while male students concentrated on poetry classes, calligraphy classes, photography classes, and painting classes. The age of the students is mainly around 50–70 years old, and there are few 80 years old. Most of them are retirees from agencies, enterprises and institutions, with a fixed source of income; there are also freelancers, and the number is increasing, but at present, the growth rate is limited.

## *4.2 Educational Needs for the Elderly in Qianjiang and the Characteristic Contents*

(1) Basic situation of the survey objects

To understand the characteristics of the education needs of the elderly, we targeted the headquarters of Qianjiang Senior University and those engaged in senior education, as well as the staff of state-owned or private enterprises over 45 years old (mostly

occupations are retired cadres, teachers, doctors, engineers, etc.) Through interviews and questionnaire surveys, a total of 187 valid data points were obtained. The majority of the survey subjects were women (approximately 67%), with 45–69 years old as the main body. Among them, the ratio of 55–59 years old was the highest (26.83%) and the 75 years old the less (5.37%). Retirees accounted for 78%, and non-retirees accounted for 17%. Less than 5% of the survey subjects had an education level of elementary school and below, and most of them had an education level of high school (28.89%) and above. In terms of learning investment, more people are willing to invest ¥100–200 per year (36%), 30% are willing to invest less than ¥100, less than 10% are willing to invest more than ¥400, and the rest are noncommittal about the investment in learning expenses. After interviews, the vast majority of interviewees indicated that this expenditure should belong to pension benefits and should be borne by the government or the employers they worked for. In terms of health status, the vast majority of survey respondents (75%) thought their health was fair or acceptable, 18% thought it was good, and less than 6% thought it was not good (Figs. 4 and 5).

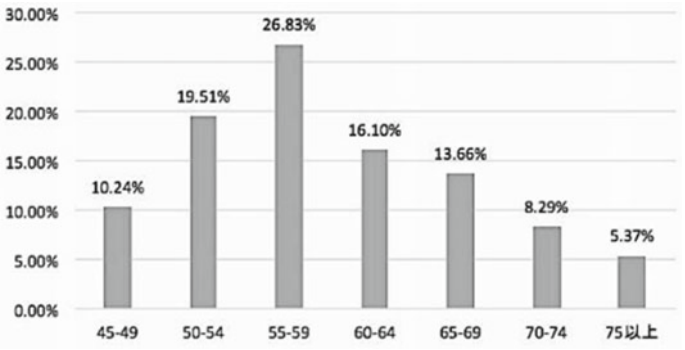


**Fig. 4** Age distribution of the survey subjects

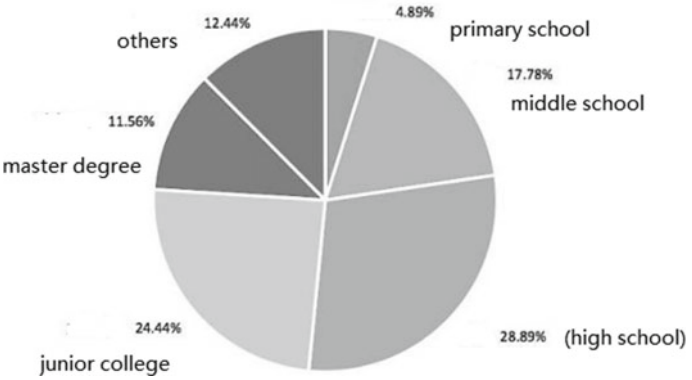


**Fig. 5** Education level of the survey subjects

(B) Overall learning needs

First, most elderly people do not have much academic education. When asked about the importance of obtaining a certificate of completion from a senior university, 82% of the interviewees said that the final certificate was not important and was not the main reason for their participation in the school. In addition, in the process of in-depth exchanges and interviews, the trainees said that they paid more attention to the learning content to be closer to their daily life and hobbies, and it can be seen that this group emphasized the practical value of learning. In general, the survey respondents have different levels of needs for safety, health, and participation in learning. The average learning needs for safety are the highest (4.6), followed by learning needs related to participation (4.3) and health (4.1). The highest score for each item is "Identify and prevent various frauds" (average value 4.7), followed by "Methods of preventing fire and theft at home" (average value 4.6). The average values of these two items are both higher than 4.5, which are safety requirements. It can be seen that the survey respondents pay more attention to safety than to health. According to the information obtained from interviews, in recent years, telecommunication fraud cases have caused much damage to the elderly, and there is a high demand for fraud prevention knowledge among the elderly. Their participation included relatively high-demand content, such as learning knowledge and methods of caring for other elderly (mean value 4.3), learning knowledge and methods of raising grandchildren and infants (mean value 4.6), use of computers and smartphones, and individual counseling (4.2). This is related to the demographic imbalance caused by the one-child policy in China. The subject of the survey was the retired population, who are generally in the stage of taking care of their elderly parents and children. With the acceleration of the information age, how to use smartphones using online chat tools such as WeChat and keep in touch with children or relatives and friends by sending and receiving emails have also become common learning aspirations. As far as the current situation is concerned, the satisfaction in recreational teaching activities is relatively high, but there are vacancies in skill-based courses and electronic product use counseling services for their participation in social and family affairs.

(C) Overall learning preferences

Participants expressed that face-to-face teaching activities are the best, emphasizing that learning resources are easy to obtain and teaching content easy to learn. Specifically, the survey respondents preferred learning based on entertainment and sports (such as physical exercises, dancing, etc.), the average value of both is higher than 3.7, and the learning method of visual (such as watching TV, movies, pictures, etc.) has the lowest score (mean value 3.4). During the interviews, the respondents expressed a strong sense of discomfort with electronic screens. Judging from the popularity of various institutional types, survey respondents generally prefer local senior colleges and other specialized institutions for the same age group (mean 4.1), and the lowest scores are ordinary colleges, vocational colleges, and ordinary primary and secondary schools, and other formal education institutions (average 3.4). In summary, providing services to continue their studies will become the main task of developing education

for the elderly, the vast majority of which hope to participate in related learning that is beneficial to improving the quality of life, enhancing life skills, and enriching the quality of social life. The learning activities should be public, nonacademic, educational and with significant diversification and practical features enjoying four characteristics: convenience, low fees, easy to learn and easy to accomplish.

## 5 Problem Analysis and Policy Recommendations Under the Mode of Education for the Elderly in Qianjiang City

In general, there are three forms of education for the elderly in China. The first is the public welfare senior colleges at all levels under the bureau of old officials, mainly for the majority of retired cadres but also for all elderly living in the region, now have gradually extended to the level of the community with conditions, covering a wide range and involving a large number of people. The second is the elderly colleges run by the factories, mainly for retirees, and its functions are the same like the public elderly universities at all levels. The third is the newly emerged private colleges for the alleviation of the difficulty of enrolling in public colleges. However, in the actual operation process, they have encountered various obstacles. Qianjiang adopted the first mode, and the senior universities gradually extend from the level of retired cadres to the community level. Effective attempts have been made in both the construction of new school sites and the structural rectification of faculty and staff, and gained recognition and support from the local people. However, the increase of the limited publich resources are bound to fail to meet people's demand for a better life. In general, there is a huge gap between the huge demand for education of a large number of the elderly with the aging of the population and the very limited actual educational resources and services. This is reflected in many aspects, such as financial funds, which are mainly used for the salary of the staff, employed teachers, office expenses, purchase and update of teaching equipment, and school activities. In 2015, the financial appropriation was ¥140,000, and the budget was ¥200,000 in 2016. Although the annual financial appropriation for senior colleges has increased, it is far less than the increase in expenditure caused by the expansion of the scale of running schools. At the approach of the end of the semester, the funding is still very tight and teaching resources are still scarce, despite the fact that the expenses have exceeded ¥200,000 and the school has cut expenses and activities in various ways. Among the teachers, there are 5 with the degree of undergraduate, 1 with the degree of junior college, and 9 with the degree of high school or below. Many teachers have engaged in senior education for a short time, and 13 out of 15 have less than 5 years of teaching experience, only 1 has 10 years of teaching experience. To make the national policy of providing education and learning services for the elderly a reality and to truly promote the effective development of resources, great efforts are required from the whole society, and multiple parties need to participate in the construction

and improvement. Based on practical experience at home and abroad, improvements can be made from the following aspects:

(1) Timely adjustment and transformation of the development of concepts and functions

Under the situation that the aging trend is becoming increasingly obvious, in addition to further expansion in scale, education institutions for the elderly in various regions should also be adjusted and transformed in time in terms of development concepts and functions. Attention should be given to the existing social education institutions, such as museums, cultural centers and art galleries and other institutions or places, to transform or reform their functions and to enhance the function of education on safety, health and participation for the majority of middle-aged and senior citizens, helping these target groups obtain effective learning support and services in these institutions or places, which is conducive to the formation of a positive social public opinion atmosphere of positive aging in society.

(B) Exploit the potential of formal education and social organizations in improving the supply of local senior education

Our investigation show that respondents tend to choose formal education institutions. Although senior universities and other institutions are relatively specialized, there are still limitations and deficiencies in the breadth and depth of the overall education supply. The teaching team still depends on part-time teachers or temporary retirees. In view of the fact that such senior colleges are still unable to meet the actual needs of some middle-aged and elderly people with higher learning needs, and that local higher education institutions have sufficient teaching resources, especially human resources, they are expected to be available in the future to provide relevant education supplies for the elderly. For middle-aged people who have retired or are about to retire, it is necessary to provide them with compensatory continuing education to improve their education level. The interview reveals that the survey respondents had taken this kind of study at senior universities as a way of life, which also reflects that such institutions had undertaken a larger part of the social function by strengthening the organization, for example, to develop the autonomous and self-help learning ability of the elderly and to enhance the ability of the same age group in the organization. In practice, some students have the ability to learn independently or to lead and organize other people of the same age around them to carry out self-help group learning, after several years of study. By helping some people to achieve ability improvement, it can not only free up opportunities for more elderly people, which will make the resources more efficient and cultivate more private learning groups with self-help ability so that the benefits of learning can be extended to a wider population. Furthermore, the curriculum setting should keep up with the changes of the time, and take into consideration of the life needs of the students, such as supplementing the courses of operating basic electrical appliances and electronic communication equipment, increasing the knowledge and methods of caring for the elderly and raising grandchildren, in order to improve the ability of participation in family affairs or social activities.

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# Exploring the Feasibility of Allocating REITs to Chinese Pension Funds


**Bin Wang, Chunzhao Wang, and Haomin Li**

## 1 Current Situation and Problems of China's Pension System

At present, China has become the country with the largest elderly population in the world. According to statistics, by the end of 2017, the population of people over 60 years old in China reached 241 million, accounting for 17.3% of the total population of China, and the population over 65 years old reached 158 million, accounting for 11.4% of the total population of China. The degree of aging in China is not optimistic, and as aging continues to accelerate, the burden of pension security is becoming increasingly heavier. Therefore, it is particularly important to improve the pension security system in China. Constantly deepening the reform of the pension insurance system is of great significance to alleviate the problems brought about by aging. At present, many developed countries have already established a relatively sound first-, second- and third-pillar pension insurance system. A pension insurance system jointly undertaken by the government, enterprises and individuals, which was called the "three-pillar" pension insurance system by the World Bank in 1994, and the establishment of a "three-pillar" pension insurance system has become an inevitable trend.

China's pension insurance system began in the early 1950s, and the Decision on Several Issues Concerning the Establishment of a Socialist Market Economy System adopted at the Third Plenary Session of the 14th Central Committee in 1993 called for the "establishment of a multilevel social security system", while the report of the 19th

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_19

National Congress pointed out that "a multilevel social security system covering the entire population, integrated between urban and rural areas, with clear powers and responsibilities, moderate protection and sustainability, will be fully established". The report of the 19th National Congress points out that "a multilevel social security system that covers all people, is integrated between urban and rural areas, has clear powers and responsibilities, provides moderate protection and is sustainable", and the pension insurance system is an important part of the social security system.

At present, in the process of building China's "three pillars" pension insurance system, the first pillar, i.e., basic pension insurance, has been developed for a relatively long time and the system is relatively sound; the second pillar, i.e., corporate annuities and professional annuities, has been developed for more than ten years and is relatively lagging behind; the third pillar, i.e., personal savings pension insurance, was led by the Ministry of Human Resources and Social Security in February 2018. A working group was set up to initiate the establishment of the third pillar, which is currently in a gap. Therefore, the development of multilevel pension insurance in China is seriously imbalanced, and there is still a large gap from the completion of a perfect multilevel pension insurance system. In contrast, the first, second and third pillars of developed countries are relatively balanced and have gradually established a sound "three-pillar" pension insurance system. Approximately by 2050, China's aging will reach its peak, and during this time, it is vital to develop and establish a sound "three-pillar" pension insurance system; otherwise, it will be easy to have a serious situation where pensions will not be able to cover their expenses.

To ease the pressure on pension payments, many developed countries are actively promoting the market operation of pensions and increasing the rate of return on pension investments, while the trend is to diversify the allocation of pensions. Therefore, considering further optimizing the investment mode and scope of pensions, expanding investment channels and promoting their value preservation and appreciation will play an important role in promoting the development of the "three-pillar" pension insurance system.

Finance plays an important role in the allocation of social resources, and financial support helps to better solve the pension problem. Although many financial institutions in China are gradually taking pension finance as an important strategic business, the current development of the pension finance business in China is immature, and the service mode is relatively simple. The investment targets of China's pension funds are mainly stocks and bonds in the secondary market, and the products are relatively singular. In contrast, public funds and insurance funds have more investment targets to choose from compared to pensions. Therefore, it has gradually become a trend to strengthen the innovation of pension insurance products, enhance the market-oriented operation of pensions, broaden the asset allocation of pensions and meet the investment preferences and diversified needs of different groups, which is also of great significance to promote the development of multi-pillar pension insurance in China.

## 2 International Experience in the Market Operation of Pension Funds and Its Implications for China

### *2.1 Analysis of the Current Status of International Pension Operations*

Population aging started in the developed countries in the West. In the early 1980s, to cope with the challenges brought by aging, the developed countries in the West carried out pension insurance reforms, and after decades of development, certain results have been achieved. At the same time, the pension market in the developed countries in the West has a much longer history and a larger scale, which has certain significance for the development of the pension market in China (Table 1).

According to statistics, by the end of 2017, the size of the pension market in the world's main 22 countries had reached US$41.36 trillion, compared to US$36.44 trillion in pension assets in 2016, an increase of 13.50% year-on-year. The largest of these was the United States with US$25.41 trillion, followed by the UK with US$3.11 trillion and third, Japan with US$3.05 trillion in pension assets. Australia, Canada and the Netherlands also have pension assets of over US$1 trillion, and Switzerland has US$0.91 trillion in pension assets. In these seven countries, the size of pension assets reached US$37.77 trillion, accounting for 91.34% of the total size. At the same time, the asset size of pensions in these developed countries is also very high as a proportion of GDP, so it can be seen that developed countries are very focused on increasing the size of their pensions.

According to Wills Towers Watson's Global Pension Assets Study 2018, the asset allocation of pensions in the seven countries mentioned above gradually diversified over the period 1997–2017.

As shown in Fig. 1, at the end of 2017, 2% of the pension allocations of the seven major countries mentioned above were invested in cash, 21% in alternative assets (e.g., real estate, securitised assets, hedge funds, commodities, etc.), 27% in bonds and 46% in equities. The largest change over the 20 years from 1997–2017 was in alternative asset investments, which increased by 21% from the initial 4%, followed by equity investments, which decreased by 11% from the initial 57%. It can be seen that the proportion of alternative asset investments has gradually increased, and with the development of the pension market, pension asset allocation is not limited to equities, bonds and cash but shows a trend of diversified asset allocation.

As the United States pensions have the largest asset size, much higher than other developed countries, with its asset size reaching 131.2% of GDP in 2017, the market-oriented operation of US pensions is also successful, which has certain implications for China's pension operation and asset allocation.

According to a study provided by CEM Benchmarking, which analyzes the asset allocation and investment returns of US pensions and analyzes the returns of the 12 main asset classes allocated to US pensions, equity-listed REITs have the highest investment returns.

**Table 1** Size of pension assets in selected countries

| Country | Total assets at the end of 2007 (US$bn) | Total assets at the end of 2017 (US$bn) | 10-year compound annual growth rate (US$) (%) | Share of GDP (2017) (%) |
|---|---|---|---|---|
| The United States | 15,330 | 25,411 | 5.2 | 131.2 |
| The United Kingdom | 2686 | 3111 | 1.5 | 121.3 |
| Japan | 3002 | 3054 | 0.2 | 62.5 |
| Australia | 1086 | 1924 | 5.9 | 138.4 |
| Canada | 1209 | 1769 | 3.9 | 107.8 |
| Netherlands | 1058 | 1598 | 4.2 | 193.8 |
| Switzerland | 539 | 906 | 5.3 | 133.1 |
| Korea | – | 725 | – | 47.4 |
| Germany | 391 | 472 | 1.9 | 12.9 |
| Brazil | 259 | 269 | 0.4 | 12.9 |
| South Africa | 195 | 258 | 2.8 | 75.1 |
| Finland | 183 | 233 | 2.4 | 92.8 |
| Malaysia | – | 227 | – | 73.4 |
| Chile | 111 | 205 | 6.3 | 77.8 |
| Italy | – | 184 | – | 9.6 |
| Mexico | 108 | 177 | 5.1 | 15.5 |
| China[1] | – | 177 | – | 1.5 |
| France | 170 | 167 | −0.2 | 6.5 |
| Hong Kong | 75 | 164 | 8.1 | 49.1 |
| Ireland | 128 | 157 | 2.1 | 48.2 |
| India | – | 120 | – | 4.9 |
| Spain | 46 | 44 | −0.5 | 3.3 |
| Total | 26,577 | 41,355 | 4.2 | 67.0 |

*Data source* Willis Towers Watson and secondary sources

As shown in Fig. 2, equity-listed REITs achieved an average annual investment return of 11.4%, the highest average investment return among the 12 asset classes counted, followed by private equity investments, while the investment cost of equity-listed REITs was also lower.

As shown in Fig. 3, equity-listed REITs also have higher Sharpe ratios, and their returns are higher per unit of risk. The underlying assets invested in by REITs typically generate stable cash flows and are safer and have been favored by investors in the United States pension market in recent years.

[1] Only data for corporate pensions in China are calculated.

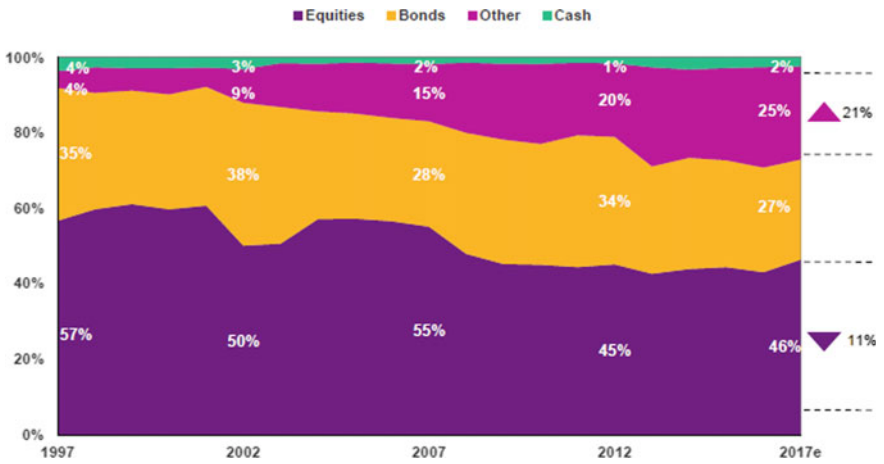


**Fig. 1** Pension asset allocation in the United States, UK, Japan, Australia, Canada, Netherlands and Switzerland (1997–2017). *Data Source* Willis Towers Watson and other secondary sources

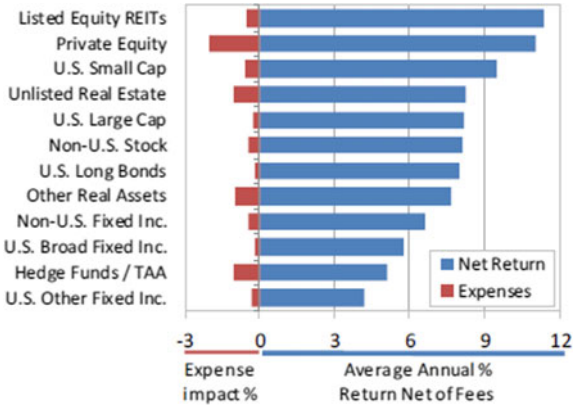


**Fig. 2** Average annual rates of return on various types of assets and their investment costs (1998–2015). *Data Source* CEM Benchmarking 2017

## *2.2 Implications of International Pension Operations for China's Pension Development*

Developed countries such as the United States have a high scale of pension assets and are experienced in the market operation of pensions. Pensions in developed countries prefer to invest in equity and alternative assets, with a more diversified investment direction, more diversified investment products and higher investment returns. At present, the scale of China's pension funds is relatively low, and there is still a large gap in building a perfect "three-pillar" pension insurance system,

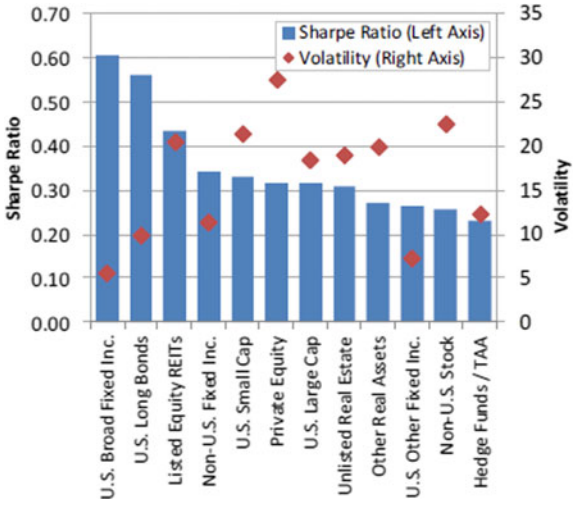


**Fig. 3** Volatility and Sharpe ratios across asset classes (1998–2015). *Data Source* CEM Benchmarking 2017

while the investment restrictions and investment ratios of China's pension funds are strictly limited, and market operation experience is lacking. From the experience of foreign pensions, we can see that strengthening the market operation of pensions and expanding the scope of their investment is conducive to the growth of pensions and the development of pension insurance systems. To promote the development of China's pension insurance system and the growth of pensions, we can learn from the experience of developed Western countries, focus on the asset allocation of pensions, strengthen the market-oriented operation of pensions, consider appropriately relaxing the investment restrictions on pensions in the future, take active measures on the asset allocation of pensions, and take a more active approach to the underlying objects in which pensions can be invested. In the future, consideration could be given to appropriately relaxing the restrictions on pension investments, taking active measures on pension asset allocation, and conducting more active research and exploration on the underlying investments that pensions can make.

## 3 Feasibility Analysis of China's Pension Investment in REITs

### *3.1 Current Status of China's Pension Investment Mode*

In August 2015, the State Council issued the Measures for the Investment Management of Basic Pension Insurance Funds, which clearly stipulates that basic pension insurance funds can invest in deposit-type, treasury bond-type and equity fund-type products with strict restrictions on their investment ratios, and substantial progress

has been made in the market-oriented operation of the first pillar of pension funds. In December 2016, the National Council of Social Security Funds selected a group covering fund companies, insurance institutions and securities companies, 21 basic pension fund securities investment management institutions, and market-oriented investment in the first pillar of pensions. Although the second pillar of pensions in China currently operates in a market-oriented manner, there are still certain restrictions, while the scale of the second pillar of pensions is relatively small compared to the scale of the first pillar, while the third pillar of pensions is just in its initial stage and the second and third pillars are relatively weak. At present, China still has insufficient experience in the market-based operation of pensions, and there are still some problems.

The scope of investment of basic pension insurance funds is more restricted. In the first pillar of China, the basic pension insurance fund has the largest scale, but for a long time, it can only be deposited in banks or buy treasury bonds, making its return rate very low, which mainly considers the safety of the pension insurance fund, but the investment is too conservative, resulting in less room for pension appreciation. With the development of the capital market, as well as the release of the Measures for the Investment Management of Basic Pension Insurance Funds and the selection of the management agency for the securities investment of basic pension insurance funds, the integration of basic pension insurance funds with the capital market will gradually increase, and the level of market-oriented operation will be further enhanced.

The rate of return on investment in enterprise annuities is low. Although corporate annuities, as the second pillar, have achieved some development through market-based operations, the current rate of return thrown up has yet to be improved. According to the 2017 Summary of National Enterprise Annuity Fund Business Data published by the Ministry of Human Resources and Social Security, the cumulative scale of the fund reached RMB1.29 trillion, an increase of 16.3% year-on-year, with a weighted average yield of 5.0%. enterprise annuities are more often invested in equity portfolios in a single scheme, and although enterprise annuity fund managers cover insurance institutions, fund companies, trust companies and banks, etc., the current In February 2018, the Corporate Pension Scheme was formally implemented, and at the same time, with the development of the market and the reform of the pension insurance system, the scale and investment yield of the second pillar of pensions will be increased.

In conclusion, the current investment mode of China's pensions lacks market-oriented operation, and the development of the "three pillars" of pensions is extremely unbalanced. Whether in terms of scale or investment returns, China's pension system and investment operation mode need further reform and innovation.

## *3.2 Advantages and Significance of Pension Investment in REIT*

(1) China's REIT market is developing rapidly, providing a broad space and channel for pension investment

With the aging of China's population, the need for pension services has increased significantly, the pension system has gradually improved, and the size of China's pensions is growing at a relatively fast pace. According to the average annual growth rate of 20% in the last five years, it will be approximately 2 trillion after five years; the third occupational pension is approximately 200 billion per year and will be approximately 1 trillion after five years; the fourth social security fund is currently 2 trillion and will have a scale of 3 trillion after five years according to the 10% growth rate; the fifth individual tax-deferred pension is approximately 200 billion per year and will reach 3 trillion after five years. Therefore, China's pension fund may exceed 10 trillion in the next five years. The huge scale of capital has raised higher requirements for investment level and investment targets. In addition to investing in the secondary market, China's emerging REITs also provide a wide space and channel for huge pension investments. According to Wind and CNABS data, 2017 was a year of explosive growth for REITs, with a total of 37,976 billion products issued, an increase of 23,142 billion or 156.1% over the 14,825 billion in 2016. In the future, under the macro situation of the state promoting rental housing policy and securitisation of infrastructure assets, the future market size of REITs will reach $4 trillion to $12 trillion, predicted with reference to Peking University Guanghua School of Management's "China Real Estate Investment Trust Market Size Study" from the following indicators for reference: the first is based on the 2006–2016 global market value of REITs in major countries to GDP, and the first is based on the ratio of market capitalization of REITs to GDP and market capitalization of listed companies in major countries around the world from 2006–2016. The global average is between 5.4 and 16%, with the highest being 16% in Singapore and the lowest being 5.42% in the United States. Therefore, according to China's GDP volume, the mature market size of China's REITs is approximately between $4 trillion and $12 trillion. The vast market outlook and potential for REITs in China therefore provide a huge driving force for pension investment and value preservation.

(B) REITs can provide continuous and stable asset cash flow with high yield and low volatility

REITs have lower volatility and higher yields than secondary market investments, according to Wilshire Consulting data, which show that over a total of 40 years from 1975 to 2015, 44% of the returns from listed equity REITs came from rising share prices and 56% from high annual dividend payments. Over the 40-year period from 1975 to 2015, just from listed equity REITs, 44% of returns came from share price appreciation and 56% from high annual dividend income, compared to less than 8% from equities. Therefore, the stable cash flow and high dividend yield of REITs is

one of the best underlying assets for pension investment, and pension investment in REITs is conducive to achieving stable value preservation and appreciation.

(C) REITs as high-quality underlying matches the investment maturity structures of long-term capital such as pension funds

REITs are long-term assets due to their organizational structures and underlying assets of high-quality real estate such as real estate and infrastructures; therefore, REIT products are long-term assets. From the perspective of the supply side of funds, pension funds are long-term capital pursuing long-term stable returns, and pension funds have realized long-term capital holding long-term high-quality assets by investing in REIT products and by improving the level of operation and risk management. This is conducive to the stable appreciation of pension funds and the reduction of investment volatility, which improves the efficiency of the financial market in serving the real economy and avoids the phenomenon of mismatch in term structures.

(1) REITs have better liquidity and information transparency

REITs can be traded in the secondary market and have good liquidity. This provides a high degree of safety and liquidity for pension investments.

(B) REITs can convert physical assets into share-based traded assets

REITs are a form of asset securitisation that transforms real assets such as real estate and infrastructures into tradable assets, and through the securitisation of REIT assets, China's huge fixed assets can be revitalized, and more efficient financing can be achieved. The securitisation of assets through REITs can revitalize China's huge fixed assets and achieve a more efficient way of financing. At the same time, pension fund investment is conducive to driving social capital into the REIT sector, accelerating the level of asset securitisation of real estate, providing a strong financing channel for local construction, facilitating local governments to establish more public service facilities, resolving the risk of excessive local government debt, revitalizing public assets and improving the efficiency of local investment and financing.

## *3.3 Exploring the Mode of Investment in REITs by Pension Funds in China*

(1) The current operating mode of REITs

Understanding how REITs operate is important for exploring the mode of pension investment in REITs in China. There are many criteria for classifying the types of REITs. Taking the United States as a reference standard, they can be classified into contractual and corporate based on the mode of operation and organizational structures.

Corporate REITs are companies set up with the primary objective of investing in real estate-related properties, raising funds through a public offering of shares in the capital market, and investing the funds raised in high-quality real estate assets. Investors become shareholders of the company by subscribing for shares, thus indirectly owning interests in the underlying assets, and the company obtains the proceeds from the underlying assets by entrusting them to a third party for operation and returns most of the proceeds (not less than 90%) to the shareholder-investors in the form of stock dividends; contractual REITs refer to trust plans, capital management plans and other contractual funds set up by investors and trusts for the purpose of investing in real estate-related assets funds, with the sponsoring trust or fund company as the asset manager, while a custodian is introduced to supervise the investors in order to safeguard their rights and interests, and investors receive regular income and information disclosure. Globally, the United States market is dominated by corporate REITs, while Asia is dominated by contractual REITs. The mature markets for REITs in Asia are represented by Singapore and Hong Kong. Singapore is predominantly a contractual REIT, with a small number of corporate REITs allowed to operate, while Hong Kong only allows contractual REITs, which are simpler and clearer in structure and less difficult to legislate, and where the trust or fund company has the advantage of greater expertise in operating the assets and investors receive the associated returns through contracts and regulations with lower risk.

(B) Pension fund investment in public funds + ABS mode

The development of REITs has become very mature overseas, but as the corresponding legal system in China is not yet perfect, most of the products available in the market are REIT-like products issued according to the mode of foreign REIT products, which are quite different from real REIT products in terms of transaction structures, tax liability, fund raising methods and liquidity. At present, there are typical REIT-like products, such as the private REIT CITIC Qixiang Special Asset Management Plan issued by CITIC Securities as the scheme manager and CITIC Jinshiji Management Co Ltd. as the fund manager and the public REIT issued by Penghua Fund Management Co Ltd. In the CITIC Sailing Special Asset Management Plan, the SPV company's equity held by the nonpublic fund is used to indirectly hold the CITIC Securities Building in Beijing and Shenzhen, and investors subscribe to the nonpublic fund through the special plan. At the same time, the underlying assets are only two buildings, and the underlying property assets cannot be dynamically adjusted. As the first public REIT-like product, the "Penghua Qianhai Vanke REIT" is a qualitative development in terms of liquidity and has lowered the investment threshold, but the public fund cannot invest more than 50% of the equity in the project company and has a closed period, so it is not a REIT in the true sense. From 2005, when the Ministry of Commerce first mentioned the development of REITs, to the recent introduction of a series of policies and the issuance of REIT-like products, the Chinese version of REITs is evolving (Fig. 4).

The market environment is maturing with the introduction of policies to promote the development of REITs and the increasing innovation of REIT-like products. The development of this mode takes advantage of the feasibility of the existing system and

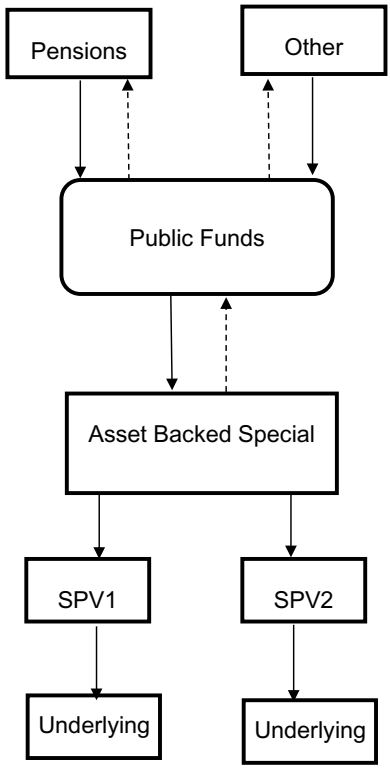


**Fig. 4** Public REITs in the public fund + ABS mode

has fewer legal barriers. The public fund broadens the scope of investors, while the public fund's subscription to a special asset management plan solves the limitation of the public fund's investment scope, allowing investors to own the underlying real estate.

The pension fund investment public fund + ABS mode offers a number of benefits, specifically.

The public fund + ABS mode offers a balance of stability and liquidity, providing a margin of safety for pension fund investments to achieve value-added and active management. Considering the supply side of the fund, pension funds seek long-term stable returns, investing in secondary market equities has low dividends and high volatility, while investing in bonds is more stable and has lower yields. Stability. At the same time, from the fund management side of the analysis, the public fund has mature investment and research capabilities and plays a professional advantage in the process of selecting high-quality underlying real estate assets, while the ABS asset securitisation provides liquidity for REITs' product transactions, thus allowing pension funds to actively manage and enter and exit the relevant products according to their strategies and needs, enhancing investment flexibility.

The public fund + ABS raises the pricing level of the real estate market and has a transparent information disclosure system under the public fund framework, creating regulated market conditions for pension investments. Under the mature

mechanism and trading mode of ABS asset securitisation, the participation of many institutional investors has raised the market pricing level of REITs, providing a reference for specific planning of pension investments, while public funds will strictly and regularly disclose information on REIT project returns and dividends, providing decision-making information for pension investments to transfer positions and exits. With the gradual development and maturity of the public fund + ABS market, the risk of pension investments will be gradually reduced, and the level of investment and returns will gradually increase, adding to the diversity of asset portfolios.

Public funds + ABS are long-term asset investments based on real estate, which will provide pension fund investments with the flexibility of concentrated and diversified investments once the regulator relaxes the shareholding and investment ratios. According to the relevant provisions of the Administrative Measures for the Operation of Publicly Raised Securities Investment Funds, the proportion of the same securities held by the same fund shall not exceed 10% of the fund's net assets. However, REIT products are real estate in nature, and the scale and investment volume of high-quality real estate assets are large. Therefore, the relaxation of the proportion of ABS assets held by the fund by the regulator will help the fund to achieve centralized investment and ABS control, in which case the pension fund can also achieve centralized and diversified investment in public REITs based on the investment plan.

Pension fund investment in the public fund + ABS mode will hopefully enjoy tax incentives. From international experience, the development of REITs enjoys relevant tax incentives, and with the implementation of tax incentives in the future, the public fund + ABS investment is very attractive, and pension investment will gain more income.

### *3.4 Analysis of Problems and Obstacles*

However, China is still facing many problems and challenges in the development of REITs, and these unfavorable factors have become obstacles and uncertainties for pension investment. The main problems include the following points.

(1) REITs in foreign countries have tax exemptions, while tax incentives in China have yet to be implemented. In foreign countries, as REITs are tax-exempt products, companies are exempt from corporate income tax, and individuals are exempt from capital gains tax. As a result, asset owners who make their assets into REITs will receive tax benefits from government concessions. In China, the tax exemption policy is still imperfect, and REITs are subject to business taxes, value added taxes, property taxes and personal income taxes, all of which reduce the investment attractiveness of REITs to a certain extent.
(2) There is a shortage of talent and professional teams for REITs in China; the operational structures of REITs are complex, and there are many market uncertainties in their operations, while the relevant laws and regulations have not yet been perfected. A highly professional team is conducive to the smooth operation and rapid development of REITs, making them a professional platform for

real estate asset management and capital operation and creating more value for investors.

(3) The level of professional institutions such as rating agencies and commercial property management companies regarding REITs needs to be improved; the development and operation of REITs requires impartial real estate rating agencies, while the domestic market lacks experience in real estate rating agencies, and professional commercial property management and operation companies are not mature enough. Accelerating the cultivation of relevant professional institutions is conducive to the rapid and healthy development of REITs.

# 4 Policy Recommendations

## *4.1 Formulate Rules for Pension Investment Management Guidelines to Promote Market-Based Pension Operations*

At present, the scale of China's pension funds is small, investment returns are low, and the market-oriented operation of pension funds is the future trend. In general, the market-oriented operation of pension funds in China is in its initial stage. In August 2015, the State Council promulgated the Measures for the Investment Management of Basic Pension Insurance Funds, approving the entry of pension funds into the market, and China is promoting the market-oriented operation of pension funds. It is recommended that relevant rules on the investment management of pension funds be actively introduced to strengthen the investment management of pension funds and promote their market-oriented operation so that the value of pension funds can be preserved and increased. Against the background of China's accelerating aging process, the formulation of corresponding rules is of great significance in promoting the market-oriented operation of pension funds, which is conducive to improving the investment returns of pension funds and promoting the growth of the pension fund scale and can greatly alleviate the problems brought about by aging.

## *4.2 Improve REIT-Related Management Methods and Laws and Regulations to Facilitate the Implementation of REITs*

In developed Western countries, REITs have already generated high investment returns for pensions. At present, there are no REITs in the strict sense in China. Promoting the landing of REITs in China and at the same time making them a high-quality investment target for pension funds is of great significance to the development of pension fund investment. However, the establishment and regulation of REITs need to be clarified by relevant laws and regulations, which need to be regulated in terms of property rights definition, operation mode and information disclosure. A

sound legal and regulatory system is conducive to protecting the rights and interests of investors and provides a basis for investors to defend their rights.

### *4.3 Establish More Professional Pension Investment Management Institutions*

At present, China has already selected 21 basic pension fund securities investment management institutions, but with the development of China's capital market, the landing of REITs in China has slowly matured, and the investment scope of pensions will gradually expand, which will put forward higher requirements for the investment management institutions of pensions. It is recommended to establish more professional management institutions, adopt a market-oriented mechanism, and adopt a more stringent selection and management of pensions' operation management institutions It is recommended that a more professional management body be established, that a market-based mechanism be adopted, that stricter selection and management be adopted for the operating management bodies of pension funds and the issuing management bodies of REITs, that the degree of information disclosure of pension fund investments be improved, that its transparent management be enhanced, and that public supervision of pension fund management bodies be strengthened.

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# Analysis and Theoretical Reflection on Pension Cases in Fujian and Taiwan


**Gaowen Zheng, Simin Ye, and Wenchuan Huang**

General Secretary Xi Jinping emphasizes that the population aging of China is increasing rapidly, and the development of the pension industry is still relatively lagging. It is necessary to improve the system and promote the diversified development of the pension industry so that all elderly people can have a sense of security, support, happiness, and peace of mind. The pension industry, also known as the "elderly service industry", refers to a collection of industrial departments that provide corresponding products and services to meet the special life needs and spiritual needs of the elderly, including life care, medical care, sports and fitness, culture and entertainment, finance, tourism and other industries (Hu Zuquan 2016). The China Aging Industry Development Report released in 2014 claim that China will become the largest country in the global aging industry. According to the forecast of the Gerontology Research Center, the population over 60 years old in Fujian Province will reach 6,157,300 in 2020, accounting for 15.02% of the total population. In the context of population aging, the aging industry in Fujian Province presents a huge potential and broad market. The potential market demand for the service industry will reach ¥50 billion to ¥64.5 billion by 2020 (Xie xi 2016). On July 25, 2017, the People's Government of Fujian Province issued The 13th Five-Year Plan for the Development of the Elderly Career in Fujian Province and the Planning of the Elderly Care System, emphasizing the need to actively cultivate the pension industry chain and improve the supply capacity of elderly care products. In response to the new needs and new situation of the new era, this article focuses on exploration and reflection on the development path of the pension industry in Fujian and Taiwan from both practical and theoretical aspects.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_20

# 1 Case Analysis of Pension Modes in Fujian and Taiwan

## *1.1 Typical Cases in Fujian*

(1) Three-level pension service mode in Gulou District, Fuzhou City

There are 108,000 elderly people aged 60 and above in Gulou District, accounting for approximately 18% of the registered population. The district is building a three-level pension service network of "community service sites—street and town care centers—professional institutions", optimizing community facilities for the elderly and creating a "15-min circle of home and community elderly care".

Gulou is committed to improving the quality of elderly care services.

In terms of safety protection, it is the first in the province to equip positioning bracelets for the lonely and demented elderly; an annual investment of ¥ 2.16 million has been invested to purchase accident insurance for 108,000 elderly people aged 60 and above in the district since June 2017.

In terms of "smart elderly care", an elderly care service network platform was built, and an elderly care hotline 12,349 was connected to create an "Internet + medical care" mode at the end of 2018; one or two smart health elderly care demonstration enterprises will be cultivated, and a smart health elderly care mode community will be built by the end of 2020.

In terms of the expansion of inclusive elderly care, a monthly payment of ¥200 to ¥400 family pension service vouchers for elderly people who are over 80 years old, destitute, subsistence allowances, and severely disabled in the jurisdiction was provided, serving a total of 128,000 people; the establishment of a long-term care service system for the elderly was explored, and the connection of the pension subsidy system with other social security systems for the elderly, such as social assistance, was linked.

Regarding the promotion of cultural and sports services, the elderly education and learning network (including distance education) will cover 30% of the community by the end of 2018; the coverage rate of the elderly sports activity center in streets and towns and the coverage rate of agencies, enterprises and institutions will reach 100% by 2019; the per capita sports area for the elderly will reach 2.5 square meters or more, and community pension centers and elderly care institutions will offer fitness training courses by 2020.

In terms of the construction of the elderly care team, the certified employment rate of elderly nursing staff in the district will exceed 80% by 2020; the salary and reward system is improving, an entry subsidy system for college students is establishing, and an encouragement system for enterprises to hire elderly professionals with a college degree or above.

At the end of 2018, the health management rate of the elderly over 65 in Gulou will reach 50%. All elderly care institutions have infirmary offices to establish two-way referrals and green channels for the elderly to seek medical treatment.

By 2020, all elderly care institutions will realize medical insurance integration, and the signing rate of family doctors will be 100%.

(B) Zehui Pension Center in Datian County, Sanming City, "110" pension mode in mountainous areas

Datian County is located in the mountainous area of central Fujian. There are more than 50,000 elderly people over 60 years old, and most of them live in rural areas. To allow this group to enjoy better elderly care services, Datian County makes full use of digital technology to establish a "mountainous elderly care" service mode of "anytime, anywhere, one-key call, nearby dispatching, and precise service". When the elderly need help, they press the SOS button, and the center will dispatch the nearest contracted service agency to provide on-site service within 15 min. In addition, the video conversation mode can also be used to enjoy more convenient intelligent services. This mode has the following advantages:

Full coverage of multiple services. Datian County Zehui Cension Center has established a complete set of digital systems, which is composed of GPS positioning, elderly health file management, work order dispatch, O2O mall, government management, volunteer management, mobile app and other modules, and has contracts with primary care institutions, supermarkets, grocery stores, snacks, fast food restaurants, barber shops and other service organizations. They produced "QR code" billing cards and filial piety apps, gifted smartphones with SOS keys to the elderly, made full use of the Internet, artificial intelligence and other technologies, established an intelligent integrated service platform, and provided it to the elderly in 274 villages (residents) throughout the county 24-h hotline service.

Combine online and offline. When the elderly ask for help, they can dial the center phone to accurately locate them, contact the nearby contracting agency, and provide on-site service in the shortest time. Datians integrate resources such as county pension centers, township (town) pension stations, and village (residential) pension centers, with paid and low-paid services as the mainstay, supplemented by unpaid volunteer services, and three levels of county, township and village have been established. The volunteer service team implements the "time savings bank" system for the elderly to provide diversified and humanized door-to-door services for the elderly at home, empty-nest elderly, and disabled and semi-disabled people to meet their growing safety surveillance, medical care, and rehabilitation nursing, material purchasing, housekeeping services, spiritual comfort, entertainment and learning.

(C) The "Elderly Paradise": mutual assistance mode in Yong'an City.

Yong'an City in Fujian Province implements a mutual assistance pension mode; that is, all the elderly who participate in the "group life" and "hug group pension" are volunteers. Their common identity is the "empty-nest elderly" in the countryside, and their service mode is "completely voluntarily" "younger volunteers serving senior volunteers", that is, young people taking care of the elderly, coupled with the support of governments at all levels, they take turns being "on duty" to provide volunteer services such as cooking.

Its operational characteristics are summarized as “assistance”, “willingness” and “multiple choices”.

Mutual assistance for the elderly is provided through family members’ self-help, neighbors’ mutual assistance, and voluntary social assistance. Family members fulfill their duty of support, and the empty-nest elderly will do their best to solve their own daily life problems or live together in a group, and each do their best to help each other.

The elderly and their children apply together to village committees or the elderly association to live together in a joint life. The elderly who live in a group pay for their own living expenses, and the village finances only pay for public facilities and water and electricity; the elderly who live in a group sign an agreement out of their own willingness.

The elderly have multiple choices regarding ways of living together. There are “full care” style that provide three meals a day and accommodation, such as Xinchong Village in Dahu Town, Shangjishan Village in Yanxi Street, Meiban Village in Xiaotao Town, etc., empty-nest elderly can choose this form; elderly people with children working outside can choose the form of “day care” that provide only lunch and lunch breaks, such as Yanshuang Village of Gongchuan Town, Bengkou Village of Xiyang Town, Gaoping Village of Huainan Town, etc.; there is also paired assistance on-site services “neighborhood mutual assistance” form. The three forms have their own merits and complement each other. The service content covers board and lodging care, day care, culture and entertainment, safety inspections, medical care, purchasing maintenance, laundry cleaning, spiritual comfort, etc. Mutual aid canteens for the elderly have various forms of operation, some provide unified meals and separate accounts to open small stoves, some pay meals on a monthly basis, and some pay meals on a daily basis. The elderly can choose according to their own preferences.

(D) Xiamen Zhiyu Xiaolao Group—Internet + pension

Xiamen Zhiyu Xiaolao Group is the first brand of elderly care information platform in Fujian Province. The group promotes the transformation and upgrading of elderly care services in Fujian Province through the Internet + mode and the supply-side reform of the elderly care industry in Fujian Province through platform big data analysis. The cross-border and efficient integration of social elderly care services will strive to solve the problems of misalignment of supply and demand in the elderly care industry and asymmetry of supply and demand information to facilitate the supply of products and services that meet market needs.

At present, the Xiamen Zhiyu Filial Piety Group includes several units, including the Xiamen Citizen Elderly Service Center, Zhangzhou Filial Piety Elderly Service Center, Pingtan Filial Piety Elderly Service Center, Nanping Filial Piety Elderly Service Center, etc. The group mainly helped various elderly care service centers complete the elderly care electronic care network, make full use of community public service information, social public service information, social service network information and third-party enterprise service information, and realize the standardization of the family pension service system and elderly care service management information to optimize the allocation of resources for socialization and pensions.

The group also launched the remote filial piety app Huanxiao, which enables children who cannot accompany their parents in person to check their parents' health status in real time from a remote place. With the measurement of the smart blood pressure instrument, the app will provide the health status based on big data analysis performed by professional doctors based on professional reports. You can also book housekeeping services on the app to help the elderly living alone complete difficult housework.

## *1.2 Typical Cases in Taiwan*

(1) Case 1: Chang Gung Hospital

Regarding the integration of medical care and elderly care in Taiwan, we have to mention the Taiwan Chang Gung mode, which covers care and health preservation.

To meet the needs of medical care, the Chang Gung Medical System continues to expand its service scale, setting up a "Children's Medical Center" to protect children's health, a "Chinese Medicine Hospital" that promotes traditional Chinese medicine, and a "Nursing Home" that specializes in chronic patients and peaceful care, and provide a series of vertically and horizontally integrated complete medical care systems such as the "Health Culture Village" where the elderly can enjoy their lives and provide Taiwanese people with "holistic care", "full care" and "holistic health" from early childhood to old age.

In addition, the Chang Gung Medical System also attaches great importance to the details of medical services, truly focusing on patients and creating the best medical service experience:

a. Each hospital bed is equipped with a chair, which is convenient for family members to accompany. The most important thing is that this chair can be turned into a bed at night, and family members can lie down and sleep;
b. Lubricants are applied for B-ultrasound. After finishing the procedure, the nurse helps the patient wipe off the sticky things;
c. A emergency rope in the bathroom of the ward for critical moments. When a real crisis occurs, the patient can pull the rope and fall down. The pull will pass the emergency message. Such meticulous and thoughtful service reflects the hospital's patient-centered mission.

(B) Case 2: Chang Gung Health Cultural Village

The Chang Gung Health Cultural Village was completed in 2005 and covers an area of 17 hectares. The village has houses, canteens, green spaces, post offices, supermarkets, cultural and entertainment centers, sports centers, churches, Buddhist halls and other facilities. There are choirs, drama clubs, and calligraphy and painting clubs. There are also voluntary service teams organized by the elderly themselves.

"Never too old to learn, and never too old to do." The old people sing, play the piano, practice calligraphy and painting, arrange flowers, and learn computers, etc. Currently, 607 households in Block A are open, with an occupancy rate of 80% and an average age of 81 years old. Two types of apartments, 73 square meters and 46 square meters, are provided.

What can be learned from the case of Chang Gung Health Cultural Village?

The first is the complete information facilities. Here one card deals with everything. You can swipe the card to open the door and measure blood pressure. The second is the humanized architectural design. The health care village provides a wealth of daily entertainment and leisure activities for the elderly, including karaoke, library, piano classroom (wear headphones to prevent mutual interference), religious worship room, financial and security room, mahjong room, etc. There are regular concerts, movies, and lectures. There are various courses in music, art, and health preservation. Free house cleaning service is provided every month, and daily cleaning is performed by the elderly themselves. Regular disinfection of public areas is provided. The restaurant offers various types of means, such as buffets, vegetarian food, and set meals.

The philosophy of Wang Yongqing, the founder of the Chang Gung Health Cultural Village, is that with proper planning and facilities, the elderly living in the village can not only receive good care but also contribute their precious wisdom to each other to construct a rich and diverse spiritual life. This concept goes beyond general elderly care, which is why the village is called a health-care cultural village rather than a nursing home or apartment for the elderly.

The management idea of the health-care cultural village is to assist the elderly to lead an independent and dignified life. Medical center-level health monitoring, health education guidance, and preventive health care for the elderly are provided, and a continuous care system are established.

(C) Case 3: Fengrong Nursing Home

Feng Rong Nursing Home opened in 2010, with a total of 267 beds, with mostly are 6-person rooms, which are all occupied now. The annual rate of return of the institution is approximately 15%.

Feng Rong Nursing Home is especially built for elderly people who lack self-care ability (long-term bedridden chronic diseases), who need professional rehabilitation during the golden period of stroke, people with various nursing service needs (including those with tracheostomy tube, nasogastric tube, urinary tube, gastrostomy, etc.), the elderly or demented elderly patients with dialysis, stroke, cerebral edema, spinal injury, the elderly after artificial joint replacement surgery, the elderly who need rehabilitation after fracture and amputation, the patients with major injuries (terminal cancer), the elderly who need temporary care, breathing services, or the terminal cancer patients.

As to the architectural design features, it is divided into three areas according to the severity of the elderly. And the needs of the elderly are considered in architectural design: dignity, privacy, and comfort, as well as the color differences caused by dementia..

What can be learned from the case of Fengrong Nursing Home?

Safety should be emphasized. Fire prevention (the alarm will be activated, and the air-conditioning system of the entire building will be automatically turned off to prevent smoke from spreading), emergency treatment procedures and emergency response procedures for safety incidents are the priorities. The environment is very clean, and door management is very good. The design of the inner single room can save costs while paying attention to the feelings and privacy of the elderly.

Pay attention to humanized details. There is a protective fence placed at the stairs of each floor to prevent the wheelchair from falling, and it can be removed immediately in case of an emergency. Separation screens are set up in the rehabilitation area to avoid mutual interference between the semi-self-care elderly and the elderly who cannot take care of themselves at all. Isolation rooms are specially set up, for the newly occupied elderly people generally need to live in the isolation room first and will be transferred to the corresponding room after 7 days.

## 2 Theoretical Reflections on Pension Services

The elderly care service industry has become an important aspect of the development of the modern service industry and is of great concern to all sectors of society. Its development should be based on the actual conditions of each region and on the basis of its existing advantages. Efforts can be made in these aspects:

(1) Strengthen the publicity of elderly care services

First, we should strengthen society's strategic awareness of responding to the aging of the population and the consciousness of elderly care services and create a good social environment for its development through various forms of public opinion propaganda. Second, we should change the concept of providing for the elderly through propaganda. Due to the influence of traditional concepts, family pension is deeply ingrained in the mind of the elderly. With the development of urbanization and modernization, and the smaller trend in family structure brought about by the one-child policy, the concept of family pension has become increasingly functional and the community pension and institution pension will become the trends of future care development. The elderly should adapt to the new development, comprehend the connotations and advantages of community and institutional pensions, and promote the development of the pension service industry.

(B) Increase policy support for the elderly

The development of the elderly care service industry is inseparable from the government's policy support, but judging from the various preferential policies that have been issued thus far, the incentives are far from sufficient. It is recommended that the national civil affairs, industry and commerce departments adjust the existing access system for elderly care institutions, study the implementation of financial support

for the pension industry, and encourage local governments to actively explore and break the bottleneck in the development of elderly care institutions. According to the principle that substance is more important than form, those who meet the conditions of pension institutions can enjoy fiscal and taxation policies such as private nonprofit organizations. Assets can be mortgaged, and profits can be distributed to accelerate the marketization of pension institutions.

(C) Continuously promote the integration of medical care and health service

If medical institutions and elderly care institutions are independent and self-contained, nursing homes are inconvenient for medical treatment, and hospitals cannot provide for the elderly. Once sick, elderly people must travel between homes, hospitals and elderly care institutions frequently, which will delay treatment and burden family members. To solve this problem, we must actively explore and practice a medical-care integration mode. In public hospitals, we should actively explore the expansion of rehabilitation and nursing functions as the main way to expand the pension market and upgrade the quality of old services; in private hospitals, we should give full play to the brand advantages and integrate beds and facility resources to explore elderly services; in private elderly care institutions and medical institutions, service agreements should be signed. The contracted medical and health institutions provide medical support services and open up green channels for private elderly care institutions to facilitate medical treatment and hospitalization for the elderly. The new integration mode not only provides routine medical care services for elderly patients, but also 24-h full-course meticulous life care and emotional care.

(D) Strengthen the construction of the elderly care service personnel

On the basis of formulating the implementation rules for talent training, we will proceed from three aspects: first, we must increase the salary and treatment of employees in the pension industry, raise the minimum wage standard through the payment of nursing staff post allowances and social insurance subsidies for employees, year-end bonuses and other methods to mobilize the enthusiasm and initiative of employees. Second, it is necessary to establish a vocational education system for employees in the aging service industry, carry out vocational and technical education, vocational skills training and vocational qualification certification in the aging service industry, and integrate the traditional virtues of respecting and caring for the elderly. In addition, it is necessary to expand the scale of pension volunteers, encourage, mobilize and guide enterprises, public institutions, social groups, college students and young people who have free time to provide public welfare services to the elderly, actively carry out a series activities, and realize the normalization of voluntary services through labor savings and the assistance mechanism of the "Volunteer Bank" (Xu Lianfeng and Chen Pinghua 2018).

(E) Build a multilevel elderly care service system

With the intensified population aging and the increase in the elderly population, the requirements for the functions of social elderly care services are becoming increasingly diverse, forming a multilevel demand group of public welfare, professional and

consumer types. We can provide different elderly care services for different objects, further promoting the development of the elderly care service industry, and forming more elderly care service projects and products. Combining the actual consumption level and consumption capacity of the local elderly market to formulate a special plan for the development of the pension industry and actively develop cultural education, leisure and entertainment, hospice care and other services on the basis of meeting the basic physiological needs of elderly health care and life care.

(F) Improve the technological level of elderly care services

In the era of advanced information technology, we should encourage the development of a new form of smart elderly care with "Internet + elderly care" and construct a service information system, such as the elderly medical service system, family monitoring system, and e-commerce system, to realize timely, efficient, and low-cost intelligent elderly care services. At the same time, attach importance to brand management and improve the market competitiveness of the elderly care service industry. At present, most companies are in the initial stage, and their brands have insufficient market influence. With the development of the aging service industry, corporate brand value has become increasingly prominent, and some well-known brand companies are gradually expanding market value, which is very common in Beijing, Shanghai, Taiwan and other regions. Therefore, it is recommended to vigorously develop several exemplary elderly care institutions and build a group of branded enterprises to play their exemplary and leading roles.

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# National Pension System of China and Development of the Capital Market


**Xianfeng Ma and Wei Qiu**

## 1 The Reform Goal of China's Pension System: The Three-Pillar System

### *1.1 Mode of the Theoretical Analysis of Pension System*

As the two most commonly used typical pension systems, the pay-as-you-go system and the fund accumulation system have been adopted by various countries or regions in the world, usually in the form of a combination or the fund accumulation system based on the combination of the two. The basic goal of the pension system is to achieve a balance between pension income and expenditure, that is, total contributions equal to total payments. In terms of their institutional functions, the two systems are equivalent, but they differ in applicable social environmental conditions, especially the conditions of the population structure. Generally, the pay-as-you-go system is easier to adapt to a society with a younger population, and the fund accumulation system is easier to adapt to an aging society. However, this is not always the case. A healthy development of the capital market and the pension's long-term investment rate of return being higher than the inflation rate are the premises for a successful operation of the fund accumulation system.

(1) Pay-as-you-go pension system

The pay-as-you-go pension system uses the contributions of the current working population to support the retired population and achieve the inter-generational balance of the whole society. This system can withstand the effects of inflation and rapid wage increases, but financial income and expenditure are easily affected by changes in the age structure of the population. When the population born during the

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_21

baby boom period starts to work, the proportion of the contributors is high, the proportion of the retired population is low, and the financial balance of income and expenditure holds good. However, as the aging population increases, when the proportion of contributors is low and the proportion of retirees is high, the pay-as-you-go pension plan will face the challenge of an imbalance in income and expenditure.

For the pay-as-you-go pension system to achieve sustainable development, the following conditions should be met: current payment per capita × current payment population ≥ current pension per capita × current retirement population.

(B) Fund accumulation pension system

The full fund accumulation pension system pays contributions to individual accounts during the working period of the employed population and uses the accumulated contributions to invest, and the pensions at retirement are derived from the accumulated contributions and investment income, realizing the inter-temporal balance of personal pension savings and pension expenditures. Whether the accumulation pension system can achieve better implementation results depends on actual investment income, and actual investment income will be affected by economic growth and inflation. If the actual investment income is low or even deficient, the individual will bear the risk of an insufficient pension. For the individual, the fully accumulated pension system satisfies the following equation: total pension assets accumulated during work = the sum of pensions received after retirement.

which is

$$\sum_{i=1}^{n} A_{i-1}(1+r_i) + \lambda_i w_{i-1}(1+g_i) = \sum_{t=n+1}^{N} P_t$$

Explanation: $A_{i-1}$ represents the pension assets accumulated in period *i-1*, $r_i$ represents the actual rate of return in period i, $\lambda i$ represents the payment rate in period i, $w_{i-1}$ represents the salary level in period *i-1*, $g_i$ represents the wage growth rate in period i, $P_t$ represents the pension received in period $t$ after retirement, and $n$ represents $n$ years of work, from $n + 1$ years to retirement until N years.

(C) Multi-pillar pension system

On the whole, the choice of pension system depends on the actual conditions of a country. If the age structure of the population is stable or the proportion of the employed population is large, the inflation level is high, and the pay-as-you-go pension system is more suitable; if the population age structure is seriously aging and the actual investment returns are high, the fund accumulation pension system is more suitable. The problem is that reality is much more complicated. It is more likely that the population is seriously aging, the inflation rate is also high, and the rate of return on real investment is not high. Therefore, most countries have chosen a multi-pillar pension system to make comprehensive use of the advantages of these two pension systems.

## *1.2 The Goals of Pension System Reform in China*

Establishing a multi-pillar pension system and reasonably distinguishing the responsibilities of the elderly care of the government, employers and employees are the urgent need to actively respond to the aging population and promote the sustainable development of the pension system, the important task and goal of China's social security system reform, and the universal choice of most countries in the world that have established a social security system.

Since the 18th National Congress of the Communist Party of China, the Party Central Committee, with Comrade Xi Jinping as the core, has adhered to the people-centered development philosophy, attached great importance to safeguarding and improving people's livelihood, and taken the strengthening of the construction of the social security system as a means of promoting fairness and justice and achieving common prosperity. The policy of full coverage, basic guarantee, multilevel and sustainable development must be adhered to, and the reforms are continuously deepened. The social security system has become more mature and finalized, and fairness and sustainability have been further enhanced.

In the report of the 19th National Congress of the Communist Party of China, Comrade Xi Jinping clearly stated that, in accordance with the requirements of the bottom line, weaving dense networks, and building mechanisms, our strategic goal is to establish a comprehensive multilevel social security system that covers all people in urban and rural areas with clear rights and responsibilities, appropriate security, and sustainability.

## *1.3 The Three-Pillar Pension System of China*

China adopts a "three-pillar" system. The first pillar is basic pension insurance, the second pillar is enterprise annuities and occupational annuities, and the third pillar is personal savings pension insurance and commercial pension insurance.

(I) The first pillar: basic pension insurance

Through continuous reform and improvement, the basic pension system has formed two major platforms: basic pension insurance for urban employees and basic pension insurance for urban and rural residents. At the end of 2017, more than 900 million people participated in basic pension insurance, "webbed the world's largest social security network", and accumulated more than 4.6 trillion yuan.

The basic pension insurance for urban employees is for urban employees, and it implements a partial accumulation system combining pooling and accounting. Participation is mandatory, and employers and employees pay jointly. At the end of 2017, 401.99 million people participated in basic pension insurance, and the accumulated fund scale was over 4.3 trillion yuan.

The basic pension insurance for urban and rural residents is mainly for low-income groups, implementing a basic pension plus individual account mode. The basic pension is included in the fiscal budget and paid by the government; individual accounts are made up of individual contributions, government subsidies, and collective organization subsidies, which are accumulated in real accounts. In 2014, the State Council issued Opinions on Establishing a Unified Basic Pension Insurance System for Urban and Rural Residents, deciding to merge the new rural social pension insurance system with the urban residents' social pension insurance system and establish a unified national basic pension insurance system for urban and rural residents. By the end of 2015, all county-level administrative regions completed the integration of the two systems. At the end of 2017, 512.55 million people participated in basic pension insurance, and the accumulated fund size was ¥627.4 billion.

(B) The second pillar: enterprise annuity and occupational annuity

The second pillar includes two parts: enterprise annuity and occupational annuity. Among them, the enterprise annuity refers to the supplementary endowment insurance system established independently by the enterprise and its employees on the basis of participating in basic endowment insurance. Occupational annuity refers to the compulsory supplementary pension insurance system established by government agencies and institutions and their staff on the basis of participating in the basic pension insurance of government agencies and institutions.

After more than ten years of development, the number of people covered and the size of the fund have developed to a certain extent. To promote the development of enterprise annuities, in 2004, the former Ministry of Labor and Social Security issued the Trial Measures for Enterprise Annuities (hereinafter referred to as the Trial Measures) and successively introduced a series of supporting regulations and policies. With the popularization of enterprise annuity policies, especially the increasing awareness of the majority of enterprises of the enterprise annuity system, some qualified enterprises, including state-owned enterprises, private enterprises, and foreign-funded enterprises, have gradually established an enterprise annuity system. In February 2018, the Ministry of Human Resources and Social Security and the Ministry of Finance issued Enterprise Annuity Measures, which were further improved on the basis of the 2004 trial measures. At the end of 2017, more than 80,000 enterprises had established enterprise annuities, with more than 23 million participating employees, and the accumulation of enterprise annuity funds was nearly 1.3 trillion yuan. Compared with 32,000 enterprises, 9.29 million employees and 151.9 billion yuan in 2007, the positive effect of the supplementary pension was initially shown.

Occupational annuities have been gradually established with the reform of the pension insurance system of government institutions. At the beginning of 2015, the State Council issued the Decision on the Reform of the Pension Insurance System for Staff of Government Institutions, requiring institutions to establish occupational annuities for their staff on the basis of basic pension insurance. In 2016, the Ministry of Human Resources and Social Security and the Ministry of Finance issued the Interim Measures for the Management of Occupational Annuity Funds (Renshebufa

[2016] No. 92), which became the main policy basis for the investment and operation of occupational annuity funds.

(C) The third pillar: personal savings pension insurance and commercial pension insurance

At present, the third pillar of personal savings pension insurance and commercial pension insurance has officially entered the start-up stage of system construction. According to the deployment of the State Council, the Ministry of Human Resources and Social Security and the Ministry of Finance coordinate relevant departments to jointly promote the construction of the third pillar of pension insurance. Since May 1, 2018, personal tax-deferred commercial pension insurance has been piloted in some regions, marking the start of the third pillar.

The establishment of the third pillar is of great significance for actively responding to the aging population, improving the multilevel pension insurance system, meeting the needs for a better life, and promoting economic and social development.

## 2 Pension Investment in the Capital Market

With its large scale and long investment periods, putting pension funds into the capital market can, to a certain extent, expand the market scale and improve the structures of market investors and promote the development and improvement of the capital market. A healthy and mature capital market can also provide basic conditions for pension funds to make market-oriented investments. In particular, equity investments can better match the long-term funds of pension funds.

### *2.1 The Basic Pension Insurance Fund Has Begun Market-Oriented Investment Operations*

To improve the efficiency of fund operation, achieve value preservation and appreciation, better respond to the financial pressure brought by the aging population, and promote the sustainable development of the basic pension insurance system, the State Council issued the Basic Pension Insurance Fund Investment Management Measures in August 2015 (hereinafter referred to as Investment Measures), the implementation of centralized investment and operation of the basic pension insurance fund, which is uniformly entrusted by the provincial government to the operation of the pension insurance fund management agency authorized by the State Council and is currently managed by the National Council of Social Security Funds as the trustee.

Pension funds are limited to domestic investment. The investment scope mainly includes the following: the first choice is the major national projects and major project construction, equity investments in the restructuring and listing of key state-owned

enterprises, with an investment scale of less than 20% of the pension fund's net asset value; the second choice is to invest in government bonds, policy or development bank bonds, financial bonds with credit ratings above investment grade, corporate bonds, local government bonds, convertible bonds (including convertible bonds for separate transactions), short-term financing bonds, medium-term notes, asset-backed securities and other fixed-income investment products, with the upper limit of the investment ratio reach 95% of the accumulated pension fund balance; the third choice is to invest in stocks, stock funds, hybrid funds, stock-based pension products, with the upper limit of the proportion of such investment funds up to 30% of the fund's net asset value.

The fund will gradually arrive in the account and enter the financial investment market. In the fourth quarter of 2017, 9 provinces (autonomous regions and municipalities), including Beijing and Anhui, signed ¥430 billion of entrusted investment contracts, and ¥273.15 billion of funds were received. The governments of four provinces (regions) in Jiangsu, Zhejiang, Gansu and Xizang have reviewed and approved entrusted investment plans.

The basic pension insurance fund is a staged balance with high liquidity requirements and low risk tolerance. All entrusted provinces require a guaranteed return rate, and are more cautious in investment operations. Therefore, the basic pension insurance fund is likely to focus on the allocation of fixed-income products and cannot invest in overseas assets and private equity funds, with low proportion of investment in stocks and other assets.

## *2.2 The Relative Maturity of the Market-Oriented Investment Operation of the Enterprise Annuity*

The Administrative Measures on Enterprise Annuity Funds are the main basis for formulating enterprise annuity investment policies. The measures specify the investment ceilings of enterprise annuities and major types of assets.

Enterprise annuity assets are limited to domestic investment, and there are more investment varieties. Financial products that can be invested in include bank deposits, treasury bonds, central bank bills, bond repurchases, universal insurance products, investment-linked insurance products, securities investment funds, stocks, financial bonds and corporate bonds with credit ratings above investment grade, financial products such as convertible bonds (including convertible bonds for separate transactions), short-term financing bills and medium-term notes.

The enterprise annuity plan is very active in the capital market. At the end of the third quarter of 2017, the amount of assets of the enterprise annuity period was ¥1,149.288 billion, of which fixed income assets were ¥203.550 billion, accounting for 17.7%, and the weighted average yield for the first three quarters was 3.26%; the scale of assets including equity was ¥945.738 billion, accounting for 82.3%, and the weighted average rate of return in the first three quarters was 3.90%.

## 2.3 Occupational Annuity Market-Oriented Investment Operation Has Just Started

In terms of occupational annuity investment and operation, the Notice on Printing and Distributing Occupational Annuity Measures for Government Institutions (Guobanfa [2015] No. 18) and the General Office of the Ministry of Human Resources and Social Security on Printing and Distributing the Notice of the Interim Measures of Occupational Annuity Fund Documents (Renshe Department Fa [2016] No. 92) have been issued successively in recent years, clarifying that occupational annuities adopt personal account management methods, entrust qualified financial institutions to manage them, and achieve value preservation and appreciation through market-based investment operations.

The Occupational Annuity Fund is managed by centralized, entrusted investment and operation. Among them, the Occupational Annuity Funds of the central state agencies in Beijing and their affiliated institutions are centrally exercised by the Central State Agencies Pension Insurance Management Center, and the Occupational Annuity Funds of various agencies and institutions are covered by provincial social insurance. The handling agencies centrally perform entrusted duties.

Occupational annuity fund assets are limited to domestic investment, and the investment scope is similar to but not identical to enterprise annuities. These include bank deposits, central bank bills; treasury bonds, bond repurchases, financial bonds with credit ratings above investment grade, corporate bonds, convertible bonds (including convertible bonds for separate transactions), short-term financing bonds and medium-term notes; commercial bank wealth management products, trust products, infrastructure debt investment plans, specific asset management plans; securities investment funds, stocks, stock index futures, pension products and other financial products.

The occupational annuity currently has no funds to carry out market-oriented investment operations. The occupational annuity fund is still in the collection stage. A few provinces and cities have successively issued implementation rules in accordance with the national interim measures for the management of occupational annuity funds. This is the first local occupational annuity fund management method promulgated, and funds will be gradually put in place for investment in the future.

## 2.4 The Third Pillar of the Personal Pension Has Just Started to Pilot

On April 12, 2018, the Ministry of Finance, the State Administration of Taxation, the Ministry of Human Resources and Social Security, the China Banking and Insurance Regulatory Commission, and the China Securities Regulatory Commission jointly issued a document, deciding that starting from May 1, 2018, individual development activities in Shanghai, Fujian Province and Suzhou Industrial Park Tax-deferred

commercial endowment insurance are piloted for one year. This marks the official launch of the third pillar of personal pensions, which has been brewing for many years.

The investment scope of individual commercial pension accounts is expected to be further expanded. The five departments also made it clear that after the pilot, in accordance with the pilot situation and the relevant conditions of the third pillar of the pension insurance system, the scope of participating financial institutions and products will be expanded in an orderly manner, and public funds and other products will be included in the investment scope of individual commercial pension accounts.

## 3 The Strategic Reserve of National Pension Fund: National Social Security Fund

### *3.1 Establishment and Scale of the National Social Security Fund*

In August 2000, to raise and accumulate social security funds and further improve the social security system, the State Council decided to establish the National Social Security Fund (referred to as the Social Security Fund) and established the National Council of Social Security Fund (referred to as the Social Security Fund) to be responsible for the management and operation of the Social Security Fund. The social security fund is a national social security reserve fund concentrated by the central government through fiscal budget allocation, state-owned assets allocation, and especially state-owned equity allocation of listed companies and is specifically used to supplement and adjust social security expenditures such as pension insurance during the peak period of population aging. It is an important part of China's social security system.

Since its establishment, the social security fund has expanded rapidly. At the end of 2016, the equity of the National Social Security Fund was 1,604.258 billion yuan, of which the cumulative fiscal net allocation was 795.961 billion yuan, the cumulative investment value was 808.297 billion yuan, and the average annual investment yield was 8.37%.

### *3.2 The Positive Interaction Between Social Security Funds and the Capital Market*

The National Social Security Council has continuously accumulated experience in the management and operation of social security funds and has embarked on a professional, market-oriented and standardized investment operation road. The social security fund adheres to the prudent investment policy and the concepts of

long-term investment, value investment, and responsible investment. It has obtained good investment returns through financial market investment, especially equity and stock investments.

The National Social Security Council focuses on long-term investment. The social security fund plays the role of the national pension reserve fund. There is no pressure on fund expenditures, and the investment period is very long. It pays more attention to the level of long-term investment income and objectively plays a role in stabilizing the capital market. For example, the National Social Security Council has formulated a five-year strategic asset allocation based on the analysis of the long-term returns and risk characteristics of the Chinese capital market to obtain higher long-term investment returns.

The National Social Security Council implements a specialized investment method that combines direct investment and entrusted investment. Direct investment methods are adopted for bank deposits, bond investments with buy-and-hold strategies, stock indexed investments, and unlisted equity investments. Active investment strategies for bonds and stocks in the secondary market, equity investment funds, etc., are mainly entrusted to market professional institutions to implement them. As of the end of 2016, direct investment assets accounted for 45.99%, and entrusted investment accounted for 54.41%.

The National Social Security Council adopts a diversified investment strategy. Since its establishment, the investment field of the National Social Security Fund has expanded from initial bank deposits and treasury bonds to stocks, equity, and industrial investment, realizing portfolio investment of various assets. The social security fund has a wide range of investments. It can invest in fixed income, stocks and unlisted equity assets approved by the State Council and can invest and operate in the Chinese domestic market and overseas markets. As of the end of 2016, domestic investment assets of social security funds accounted for 93.34%, and overseas investment assets accounted for 6.66%.

## 4 The Prospects of the Pension System and Capital Market

### *4.1 Prospects of Pension System Construction*

The long-term goal of pension system development is to comprehensively build a multilevel social security system. The construction of a multilevel social pension security system means that the three pillars of pension insurance are rationally distributed, and the second and third pillars play an increasingly prominent role in personal pensions. With the continuous improvement of the pension system, the coverage of the population will continue to expand, and the size of the fund will continue to increase.

### 4.2 Prospects of the Capital Market

The legal system and supervision system of the capital market will be more complete, a market system with sound mechanisms, transparency, efficiency, and safe operation will be established, and the capital market will become a more open, fair and just market.

The depth and breadth of the capital market will be greatly expanded to become an efficient, multilayered and open market. The markets for stocks, bonds, commodity futures and financial derivatives have developed in an all-round way, and the market has become more diversified. The capital market will include a wealth of investment products and diversified trading platforms.

### 4.3 Vision of an Interactive Development of the Pension System and Capital Market

In the future, the pension system will become increasingly perfect, and the scale of security funds will grow day by day. More professional management institutions are needed to manage operations and investment, and diversified and long-term financial investment products are needed to match funds. The capital market will become increasingly mature, market stability will be enhanced, financial products will be richer, and trading platforms will be more diversified, which can meet the diverse investment needs of pension funds. In this process, pension funds and capital markets will be in a process of mutual promotion: without the standardized development and healthy growth of the capital market, the goal of maintaining and increasing the value of pension funds will not be achieved; without the support of long-term funds such as pensions, the capital market will lack professional and large-scale long-term institutional investors, which is not conducive to the long-term healthy development of the capital market.

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# Analysis of the Option Factors of the Residents' Pension Mode Taking Beijing as an Example


**Zhongsheng Liu and Huanxing Liu**

It is an indisputable fact that China has entered an aging society. Data show that from 2015 to 2035, China will enter a rapid aging stage, and the population aged 60 and above will increase from the current 222 million to 418 million, accounting for 29% of the total population. By 2045, the elderly will account for 30% of the total population, ranking first in the world. The stern situation of "silver-haired society" and "getting old before getting rich" has attracted great attention from all walks of life, and some innovative pension modes that borrow from foreign countries have quietly emerged in China and have attracted great attention. However, since the pension industry is still in its infancy, there are various concerns about these new pension modes. To provide references for the elderly and the government in choosing pension modes, taking Beijing as an example, this article studies the factors of Beijing residents' option on pension modes through the methods of sampling survey and data analysis.

## 1 Related Concepts and Origin of the Question

Through the field research, literature review and questionnaires, this article attempts to analyze the current situation and development of the pension modes in China and explore the new changes and new directions against the background of population aging. Unlike other research on specific pension modes, this article focuses on the diversified analysis of pension modes, that is, what and why people choose different pension modes, and then proposes some constructive measures.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_22

Affected by traditional Confucianism, the concept of "more children, more blessings" was once widely accepted by the general public. The family pension mode, in which children are raised by their parents first and then, in turn, support their parents, came into being and has continued for more than two thousand years. This mode forms a natural pension fund payment, accumulation, value-added and payment process within the family. The risks are all borne by the family, and all expenses incurred are also shared between family members.

An important feature of the traditional family pension mode is "the multiple number of descendants", meaning the previous generation will usually have many offsprings to ensure the normal operation of the mode. The economy has developed vigorously since the founding of the People's Republic of China, people's life quality has gradually improved, and the average life expectancy has also been extended, which have led to a blowout growth in China's population. Despite the vast land and abundant resources, it is still difficult for China to support such rapid population growth with limited resources; also, population boom is not conducive to the improvement in quality of life. Therefore, the family planning policy was implemented in the late 1970s for the sake of the national economy and people's livelihood; since then, the rate of growth has slowed down, but it has also indirectly induced the issue of an aging society in the future.

In the late 1990s, China officially entered an aging society. The implementation of the family planning policy has resulted in increasingly "4-2-1" family structure, that is, four elderly people, two adults and one minor, which means that in this family structure, two adults have to support four elderly people and one child, and the unprecedented pressures burden on them are imaginable. This not only affects the improvement of the quality of life of the younger generation but also adversely affects the quality of life of the elderly in retirement. In addition, people's expectations of a better life are increasing with the development of the economy; the increasingly severe aging situation has seriously hindered the improvement of the quality of life. The key to solving the problem lies in the reform of the pension mode.

At present, in addition to family pension, there are also three more pension modes, as listed in the following:

1. Institution pension mode

Institution pension refers to the pension mode in which social institutions are used as the base, funded by the nation, relatives or the elderly themselves, and the pension institutions provide elderly care functions. This is the result of the gradual increase in the professionalization of social elderly care. The current institution pension mainly includes nursing homes and gerocomiums, which have characteristics of specialization, socialization and marketization. Although the caregivers in institutions are outsiders, the nursing staff are professionally trained so that the elderly can enjoy good services. Meanwhile, the relationship between the elderly in institutions is closer, which is helpful for alleviating loneliness and good for health. Some people, clasping the traditional concepts tightly, find it difficult to accept the institution pension. However, with the development of the economy and society,

people's concepts are gradually changing, and the institution pension has gradually been recognized by more people.

2. Community pension mode

The Community pension is based on the family pension and supplemented by community institution pension; it provides door-to-door services, with services from nursing homes as supplements. Through government support and social participation, with the family pension as the core and community services as the support, community pension provides services such as life care and medical care for the elderly at home. The mode absorbs the advantages of the home pension and the institution pension and combines the two within the community so that the elderly can achieve "family pension in the community". It is a "win–win" strategy for the elderly to enjoy the warmth of the family and the recognition of their peers through community pension. In addition, institutions such as community colleges also provide opportunities for the elderly to "accomplish something in old age".

3. House-for-pension mode

House-for-pension is a new type of pension mode where the elderly mortgage their own property rights to insurance companies or lease them out through certain financial or non-financial mechanisms to cash out in advance and use the difference between the housing life cycle and the survival of elderly residents to provide in their remaining life with a long-term, continuous, stable cash inflow. Because this pension mode has emerged in recent years, relevant laws and regulations are still lagging behind; at the same time, affected by the traditional pension concept and concerns of financial institutions about the decline in housing prices, the house-for-pension mode is difficult to implement in the short term. However, as a supplement to the social pension system, it still has very broad prospects.

By investigating people's satisfaction with these four pension modes, this paper will analyze the factors that affect residents' choice of pension modes from the perspectives of psychology, behavioristics, economics, etc., determine their respective advantages and disadvantages, and further improve their development. There are relatively few comparative studies on pension modes in China, and research projects using econometric modes are even rarer. On the basis of digging out various factors that affect mode options and analyzing their proportions, this paper abstracts, theorizes and digitizes these problems, which will help to fill gaps in related fields and deepen research, enabling the Chinese government to better clarify the needs of the elderly.

## 2 The Process and Methods of the Questionnaire Survey

### *2.1 Investigation Process*

To have a more in-depth understanding of the current situation of the selection of the current pension mode and to provide data support for the measurement regression to be carried out at the end of the project, a questionnaire was formulated with a rigorous attitude.

(1) Construct the framework of the questionnaire. Focusing on the theme factors that affect residents' choice of pension mode, data on areas such as income, consumption and ideas are collected, and the overall framework of the questionnaire was outlined.
(2) The sample characteristics of different groups of different ages were analyzed. Through on-site interviews and online surveys, we can learn about the differences in the social environment, concepts, customs, and behavioral characteristics of people of all ages and use them to formulate questions to understand their potential needs. At the same time, better aspects, such as income, consumption and ideas of the residents of different communities of all ages, can be learned through interviews in different communities.
(3) Design questions. When formulating the questionnaire, we took into account of the large age span of the people involved and the differences in comprehensive ability, therefore, different questionnaires were designed for different age groups, and more approachable language and sentences were adopted. After the preliminary question outline was finalized, the questions were strictly screened.
(4) Trial ask. After designing the questions, the process of trial asking was carried out from the perspective of the respondent to have a preliminary understanding of whether the questions in the questionnaire were clear and whether the logic was smooth.
(5) Trial delivery. We made small batch copies of the revised questionnaire. Considering the geographical factors, we adhered to the principle of proximity. Field trials were conducted on the campus of the University of International Business and Economics and the surrounding communities of Jiajia Garden, and the survey respondents were asked to make up for the lack of questionnaire surveys.

### *2.2 Problems Encountered in the Questionnaire Survey*

(1) Limitations of the scope: among the questionnaires sent out, the returned questionnaires were mainly concentrated on people under 60 years old, while the number of questionnaires completed by people over 60 years old was relatively small. In addition, the people who completed the questionnaire were mainly from Chaoyang District and Fengtai District of Beijing, covering a relatively small geographic area.

(2) Limitations of research methods: the cross-analysis of the received questionnaires may have omissions in the data analysis. Without accurate data support of quantitative regression analysis, the main research methods are cross-analysis data provided by the questionnaire star, single-question analysis, proportional analysis, etc., failing to perform more refined data processing through more advanced data processing software.

## 3 Status Quo and Characteristics of Residents' Options for Pension Modes

At present, the development of the socialized pension industry presents multiple contradictions. On the one hand, there are not enough beds for the elderly, and on the other hand, the occupancy rate in nursing homes is low; on the one hand, family pension is facing huge pressure; on the other hand, most elderly people are unwilling to leave home; on the one hand, the public generally believes that the pension service is a sunrise industry with great potential; on the other hand, this industry lacks full support from large institutions and large financial groups; on the one hand, hospital medical resources are rather constrained; on the other hand, elderly people occupy hospital beds for a long time, and some elderly patients who are reimbursed at public expense even occupy hospital beds for several years. In light of these contradictions, this article attempts to fully present the situation and characteristics of elderly care in Beijing through data analysis (Table 1).

### *3.1 Basic Situation and Analysis of Survey Samples*

(1) Gender: gender has a significant impact on residents' option of pension mode.

Among the 315 valid questionnaires, 149 were male, accounting for 47.3%; 166 were female, accounting for 52.7%; 109 were male under the age of 45, accounting for 73.15% of the total number of males; 40 were over the age of 45, accounting for 26.84%; 123 were under the age of 45, accounting for 74.1% of the total number of females; and 43 were over the age of 45, accounting for 25.9%.

It can be seen from the sample that most of the data collected are young people under the age of 45 and fewer middle-aged and elderly people over the age of 45. After cross-analyzing the option of gender and the four types of pensions, 71.14% of male and 58.44% of female choose the family pension, which shows that more females are willing to try new modes

(2) Education level: certain differences exist in the option of pension modes among survey subjects with different educational backgrounds.

In terms of the estimated retirement age, most of those with high school education and below want to retire before the age of 55, accounting for

**Table 1** Basic situation of survey samples

| Variable name | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 149 | 47.3% |
| | Female | 166 | 52.7% |
| Age | Under 30 years old | 104 | 33.02% |
| | 30–45 years old | 128 | 40.63% |
| | 45–60 years old | 78 | 24.76% |
| | 60 years old and over | 5 | 1.59% |
| Estimated retirement age | Under 55 years old | 81 | 25.71% |
| | 55–60 years old | 156 | 49.52% |
| | 60–65 years old | 61 | 19.37% |
| | 65 years old and over | 17 | 5.4% |
| Education level | High School and below | 36 | 11.43% |
| | Undergraduate | 181 | 57.46% |
| | Postgraduate and over | 98 | 31.11% |
| Per capita monthly household income | Less than ¥3500 | 76 | 24.13% |
| | ¥3500–8000 | 113 | 35.87% |
| | ¥8000–20,000 | 88 | 27.94% |
| | More than 20,000 | 38 | 12.06% |
| House | 0 set | 65 | 20.63% |
| | 1 set | 165 | 52.38% |
| | 2 sets | 69 | 21.9% |
| | More than 3 sets | 16 | 5.08% |

55.56%; those with bachelor's degree expect to retire between the age of 55 and 60, accounting for 58.56%; for those with a master's degree and above, the distribution is even.

Regarding the option of pension mode, 64% of people with high school education and below choose family pension, 16% choose institution pension, 13% choose community pension, and only 5% choose house-for-pension; 65% of people with bachelor's degree choose home pension, 7% choose institution pension, 20% choose community pension, 8% choose house-for-pension; and in those with master's degree and above, 65% choose home pension, 10% choose institution pension, 22% choose community pension, only 4% of the people choose house-for-pension.

From the above data, it can be seen that people with different educational backgrounds have different options. Most people have chosen home pension, and people with bachelor's, master's degree and above are prone to accept the institution and community pension, which means that with the continuous improvement of education, institution and community pension will be increasingly recognized.

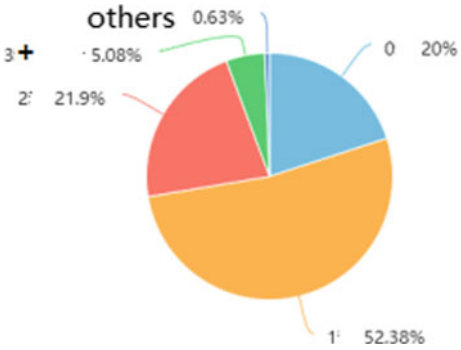


**Fig. 1** Number of houses owned by the respondents

(3) Household monthly income per capita: people with higher income have a clearer understanding of the new modes.

In this sample, 76 people have an income of less than ¥3,500, accounting for 24.13%; 113 people have an income of ¥3,500 to ¥8,000, accounting for 35.87%; 88 people have an income of ¥8,000 to ¥20,000, accounting for 27.94%; and the number of people with an income above is relatively small, only 38 people, accounting for 12.06%.

Regarding the option of the pension modes, most people still choose family mode; however, the proportion of respondents with an income of more than ¥3,500 choosing community pension mode is much higher than those with an income of less than ¥3,500. This may be because of the low income making it difficult to afford the cost of community pension in Beijing.

(4) House: people with different house numbers have different options for pension modes among the 315 interviewees. The data show that family pension is the first option for most families, but with the increase in the number of houses, people are willing to accept the other three pension modes (Fig. 1).

(5) Number of siblings or children: it can be seen from the figure that with the implementation of the family planning policy, most people have only one or fewer siblings or children, and only a few people have two or more siblings and children. This shows that as time passes, an increasing number of families will enter the "4-2-1" structure, the traditional family pension mode will become increasingly less suitable, and the reform of the social pension system is imminent (Figs. 2 and 3).

(6) The retirement income of parents: most children believe that the main source of income of their parents is their pension and child support payments; however, from the perspective of parents, they believe that their income is mainly from pension and does not include child support payments.

We speculate that the reason for this difference is that most parents feel that they can live on their own pensions and do not need to rely on their children. However, out of filial piety, children still give their parents some funds to improve their retirement lives. This shows different characteristics of thinking of different generations (Figs. 4 and 5).

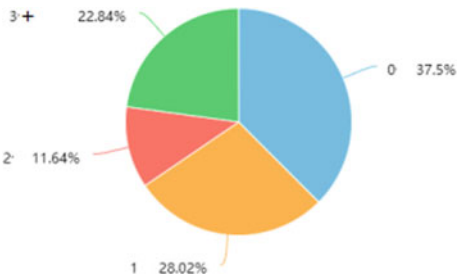


**Fig. 2** Number of siblings of the respondents

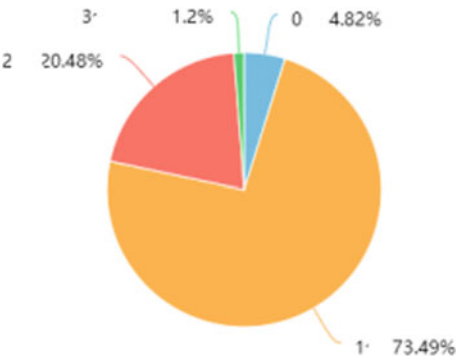


**Fig. 3** Number of children of respondents

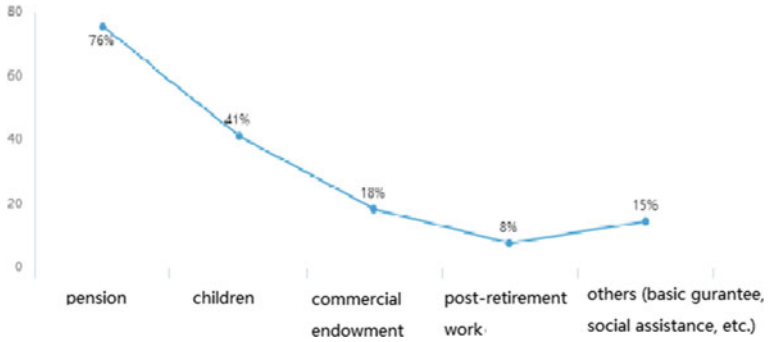


**Fig. 4** Children's expectations of parents' main source of income

(7) Parental relationship and health status: more than 90% of people feel that they have a very good relationship with their parents (children), so both parties are not willing to leave each other psychologically or do not want to live too far away.

In the cross-analysis of parental relationships and the option of pension mode, 66.67% of people chose family pension, and relatively few people chose other pension modes. In terms of parental health, the vast majority of children believe that their parents are in good physical condition and can take care of themselves. At the same time, most parents also believe that their bodies are relatively healthy and do not need their children's care (Figs. 6, 7, 8, and 9).

## 3.2 *The Final Option of the Pension Mode*

Regarding the first option, this research has two directions, namely, the expectations of children and the expectations of the elderly themselves (Fig. 10).

There are 230 valid answers to this question. First, the proportion of family pension mode is 65.65%, institution pension mode is 6.09%, community pension mode is 20%, and house-for-pension mode is 8.26%. It can be seen that more than half of the

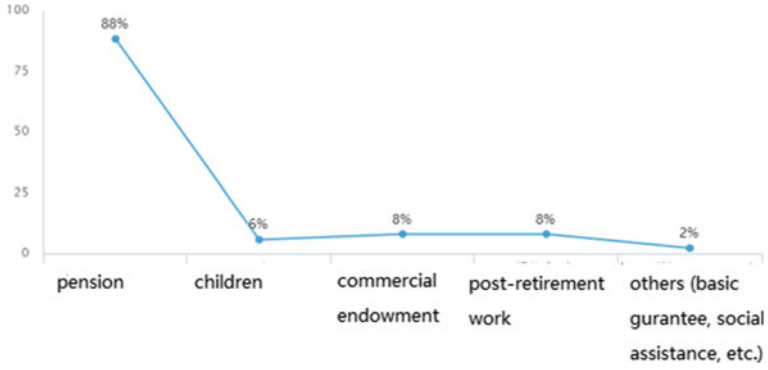


**Fig. 5** Parents consider their main source of income

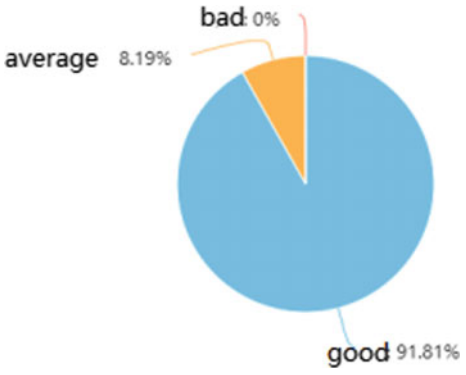


**Fig. 6** The relationship that children think of themselves with their parents

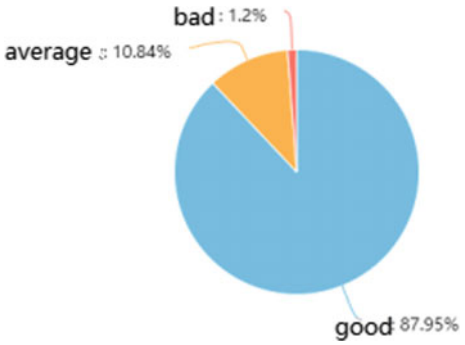


**Fig. 7** The relationship that parents think of themselves with their children

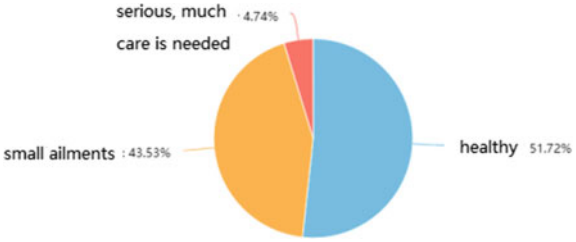


**Fig. 8** Parents' health status (from the perspective of children)

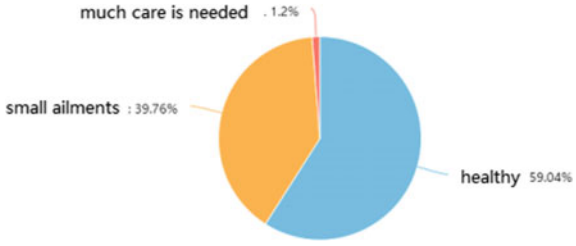


**Fig. 9** Your own health status (from the perspective of parents)

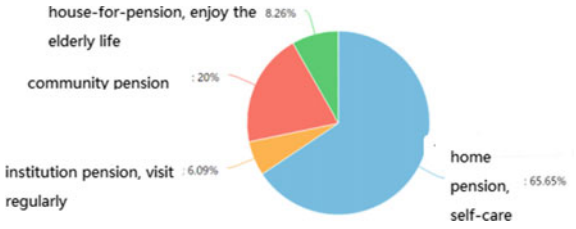


**Fig. 10** Children support the elderly (from the perspective of children)

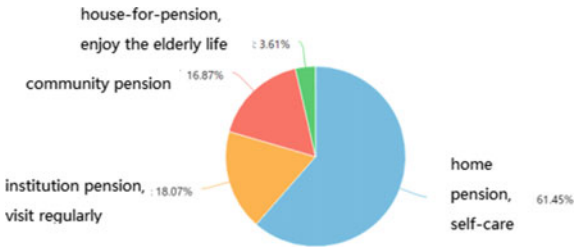


**Fig. 11** The expectations of the elderly themselves (from the perspective of the elderly)

children tend to the traditional family pension mode, and institution pension is the most repellent mode (Fig. 11).

There are 83 valid answers to this question. First, the proportion of family pension mode is 61.45%, institution pension mode is 18.07%, community pension mode is 16.87%, and house-for-pension mode is 3.61%. Among them, family pension mode is still the majority, but the minimum option has been changed to house-for-pension.

If we compare the similarities and differences between the younger generation and the older generation in the above questions, following conclusions can be drawn:

(1) Most families and family members recognize the traditional family pension mode, which exceeds 60% in both cases, and the difference in the expectation percentage between children and the elderly for the family pension mode is only 4% (61.45% of the elderly, 65.65% of children), which is in line with research expectations.
(2) Relatively more people choose community pension mode (16.87% elderly, 20% children), which is basically in line with the research expectations. We believe that community pension is similar to family pension and can be regarded as a higher development of family pension. Therefore, its percentage is relatively high.
(3) Institution pension deviates from research expectations (before the survey, our expectations for the option of the four modes were: more than half selected family pension; the percentages subsequently followed were institution pension, community pension and house-for-pension; the younger generation shares similar expectations with the elderly). The data show that the percentage of institution pensions is only 9.17%, which is significantly lower than the research expected. This may be because the setting of our questionnaire preferred institution pension. Most people will not prefer an institution pension, but they do not reject it. This issue will be studied in detail later.
(4) The proportion of house-for-pension is the lowest, which is in line with our expectations. As a new mode, it takes time for people to accept it, especially in China, where family culture is prosperous. Many interviewees said that if the house is mortgaged, then their life's work will be meaningless. There is a long way to go with the development of the house-for-pension.

### 3.3 Family Pension

Family pension mode is still the first option for most people. This phenomenon can be explained from three aspects.

(1) Traditional culture. The concept of family is more important than that in Western countries. People influenced by Western culture still believe that "family" is the only option for the elderly.
(2) Social opinion. Family pension is taken for granted, and other options will incur negative social opinion to some extent. Especially for the elderly, being sent to nursing homes in many people's mind is a manifestation of children's unfilial piety. This further increases the proportion of family pension.
(3) Information understanding. Elderly care repels risks, and the loss caused by information asymmetry is far greater than that caused by other social behaviors. Among the four modes, family pension are the most well known.

We speculate that the selection probability (Y) of family pension mode will be negatively correlated with economic independent variables, positively correlated with the number of children, negatively correlated with health and the educational level, and has no obvious relationship with the number of siblings and the source of income.

### 3.4 Institution Pension

The overall selection ratio of institution pension (9.17%) seriously deviated from research expectations. We have added some questions to the questionnaire, which will help to further answer the reasons for the low selection (Figs. 12 and 13).

The two questions were aimed at the children and the elderly. The results were as follows: 66 (28.57%) of the children agreed, 165 (71.43%) disagreed; 50 (60.24%) of the elderly agreed, 33 (39.76%) disagreed, and the acceptance ratio was much higher than the previous 9.17%. This shows that although institution pension mode is not the first option for many people, it has a high degree of acceptance.

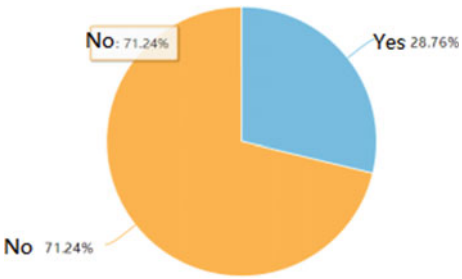


**Fig. 12** Acceptance of sending the elderly to nursing homes (from the perspective of children)

For respondents who do not accept institution pension mode, we have added the question: reasons for not choosing institution pension, and obtained the following data (Figs. 14 and 15).

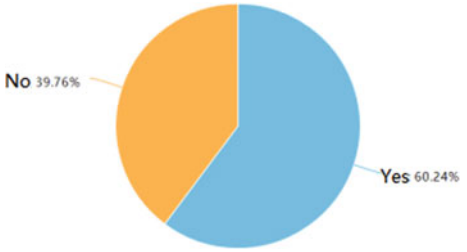


**Fig. 13** Acceptance of sending the elderly to nursing homes (from the perspective of the elderly)

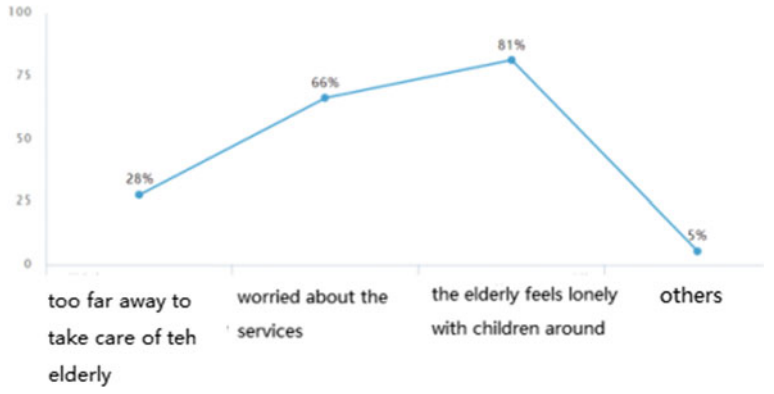


**Fig. 14** Reasons for not accepting nursing homes (from the perspective of children)

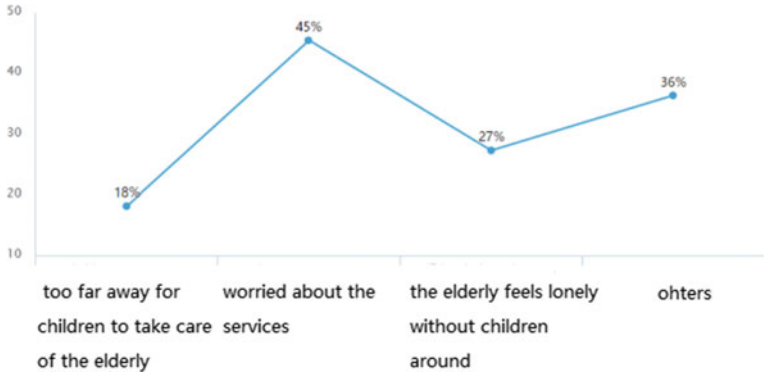


**Fig. 15** Reasons for not accepting nursing homes (from the perspective of the elderly)

It can be seen that there are three main reasons why children do not want the elderly to live in nursing homes: first, the traditional family concept. Most children believe that the elderly need companionship, which nursing homes cannot provide. Second, they distrust institutions, believing that the institutions cannot provide adequate services. Third, the institution pension market is imbalanced where prices are generally high and the supply is insufficient. The main reason for the elderly' unwillingness to the institutions is their distrust of the service.

At the same time, comparing the differences between the two generations, it can be seen that the elderly have higher degree of recognition for the institutions. As for the reasons, we infer the following:

(1) Two generations have different concerns: elderly people pay more attention to service satisfaction, and their children pay more attention to information transparency. This alerts us to pay more attention to the education of the independent variables during mode building and data analysis.
(2) Insufficient communication between two generations: the implicit way of social expression in China causes problems in the communication between the elderly and their children, which makes it impossible to understand and meet the real needs of the elderly. In the subsequent model establishment, the independent variables "relationship between children and the elderly", "number of family members of the same generation" and other factors related to the communication between children and the elderly will be set.
(3) Economic status. Economic status is divided into two categories: the general economic status of the family and the source of the elderly. The explanation for this classification is that the general economic situation inevitably affects the option, and the economic source of the elderly reflects the influence of family members on the elderly when they make options. Therefore, we increase the independent variables "source of income", "income", "number of houses" and so on.

It is inferred from the above information that the selection probability (Y) of institution pension mode will be positively correlated with economic independent variables, negatively correlated with the number of children, negatively correlated with health, and has no obvious relationship with the number of elder brothers and sisters, positively correlated with educational level and source of income.

## *3.5 Community Pension*

Characteristics of community pension allow the elderly to live in their own homes while continuing to be cared for by family members, the relevant service agencies and people in the community providing on-site services or care services. Regarding the community pension mode, we asked the same question for the elderly and children: do you understand the community pension?

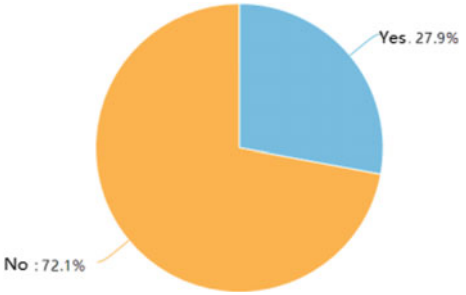


**Fig. 16** Do you understand the community pension (from the perspective of children)

The two valid answers were 231 and 83, of which the people who knew were 64 and 23, both accounted for 27.71%, and the people who did not know accounted for the majority. When we introduced the specific information about the community pension, approximately 90% of respondents who did not understand said they would choose this pension mode.

This result is in line with research expectations. It is believed that most people will choose community pension as an alternative to family pension. Community pension is similar to family pension, but it extends the scope of elderly care services to the community, which reduces the non-economic cost of children. Therefore, it is expected that the family's economic situation and the children's living situation will become the main influencing factors.

At the same time, the above questionnaire also reflects that most people have an insufficient understanding of the existing pension modes in China (the older generation has not been exposed to the emerging modes, and the younger generation has not given more consideration to pensions). Therefore, we have added data collection for the two age groups of 30–60. In the process of data analysis, this age group is the main body. The main reason is that this age group has started to consider supporting the elderly and has begun to consider their own pension mode options, and compared with people over 60 years old, they have more opportunities and capabilities to understand emerging pension modes.

It is speculated here that the option probability (Y) of community pension mode will be positively correlated with economic independent variables, negatively correlated with the number of children, positively correlated with the health level, positively correlated with the number of elder brothers and sisters, and not related to education level (Figs. 16 and 17).

## *3.6 House-For-Pension*

House-for-pension is an emerging elderly care mode based on the difference between the housing life cycle and the survival of elderly residents, the huge real estate resources owned by the elderly, especially the value of the remaining house after

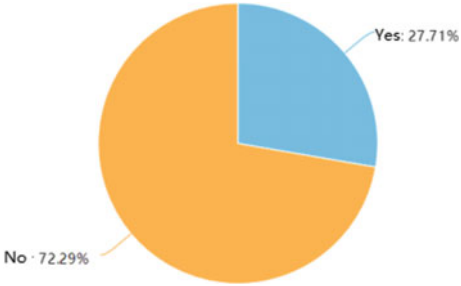


**Fig. 17** Do you understand the community pension (from the perspective of the elderly)

death, through a certain financial or non-financial mechanism to cash in advance. As a pension mode that is always accompanied by controversy, we must first explore whether people truly understand it (Fig. 18).

Only 18 people chose the "well-understood" option, accounting for approximately 4.7%, which reflects a similar problem with community pension—a low level of understanding. To further determine what kind of housing pension is acceptable to people and to explain to the interviewees who do not understand the house-for-pension mode, we selected the four most representative housing pension modes: renting out houses to obtain rent fees, the elderly living with their children and not changing the ownership of the property; renting out the big houses and then renting in a small one to obtain the rent fee difference without changing the ownership of the property; granting the right of house inheritance to the relatives of the main support for the elderly, and changing the ownership of the property; using the house as a mortgage to obtain loans, and changing property ownership to financial institutions to explore the acceptance of the house-for-pension mode (Figs. 19 and 20):

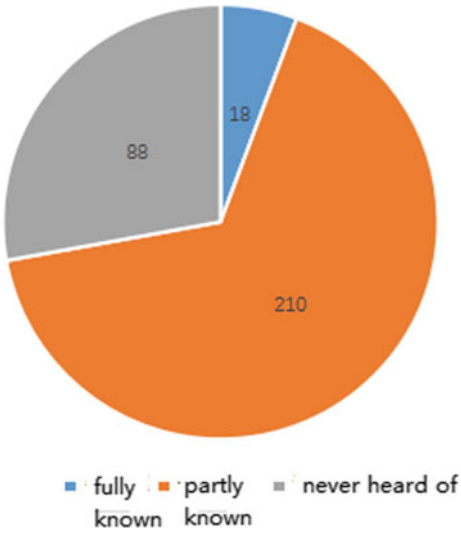


**Fig. 18** The knowledge of the house-for-pension mode

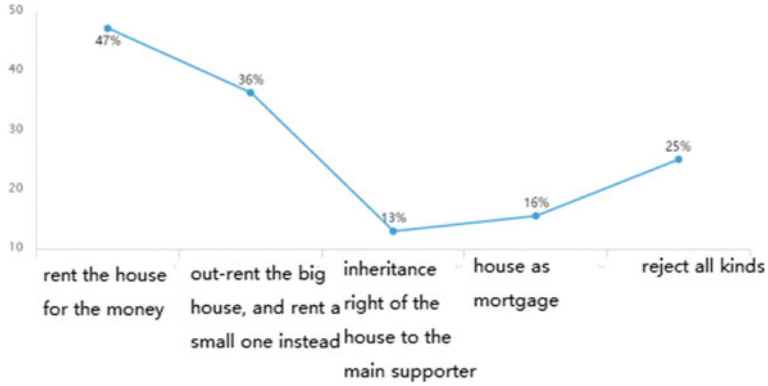


**Fig. 19** Which form of the house-for-pension do you accept (from the perspective of children)

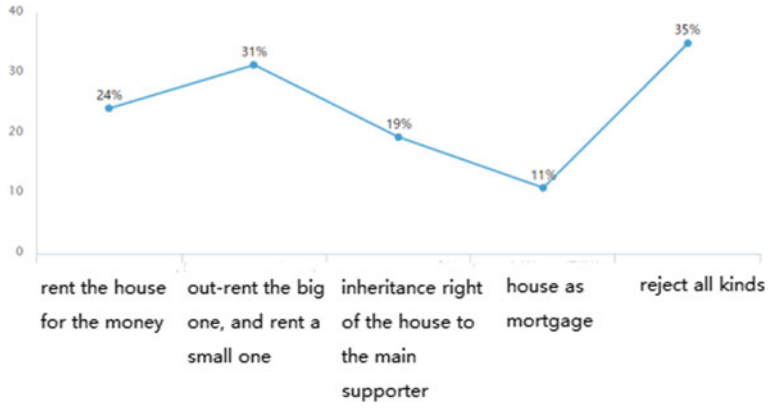


**Fig. 20** Which form of the house-for-pension do you accept (the perspective of the elderly)

The number of elderly people who cannot accept any form has increased by approximately 10% compared with younger people. At the same time, the proportion that chooses to "rent out the big house and rent a small one" has the highest proportion. We tried to explain the difference:

(1) Cultural influence. As the age of the sample increases, the influence of traditional culture is more eminent, so the older people emphasize the traditional concept of real estate passing to the next generation.
(2) Communication problems. Children think that the elderly are happier when living with them, and the elderly think that children are happier if they do not disturb their lives. The implicit Chinese culture and the lack of communication between children and their parents create different options.
(3) Different lifestyles. The younger generation's cognition of financial tools and money is different from that of the older generation.

Based on the above data, it is not difficult to see that the acceptance of house-for-pension is very low. The disapproval mostly came from lack of understanding. We asked about the main reasons and obtained the following data (Figs. 21 and 22):

It can be seen that the main reasons for not accepting house-for-pension are "leave the house to children" and "house evaluation is not standardized." Emotional and economic factors are the main reasons that affect people's rejection of house-for-pension.

It is speculated here that the selection probability (Y) of the house-for-pension mode will be negatively correlated with economic independent variables, positively correlated with the number of children, negatively correlated with the health level, and has no obvious relationship with the number of elder brothers and sisters, positively correlated with educational level and has nothing to do with the source of income.

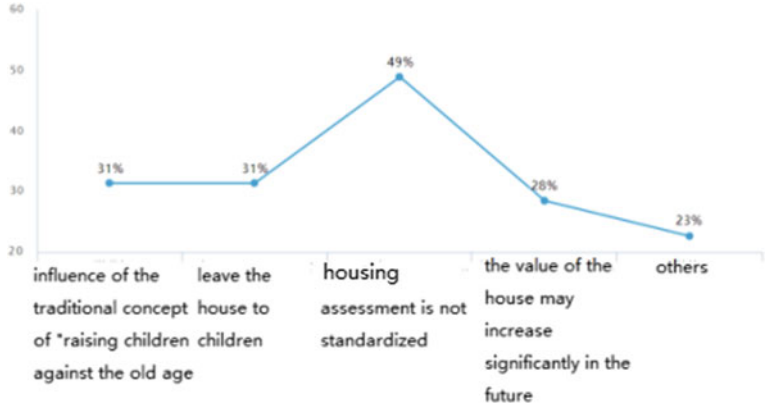


**Fig. 21** Reasons for not accepting house-for-pension (from the perspective of children)

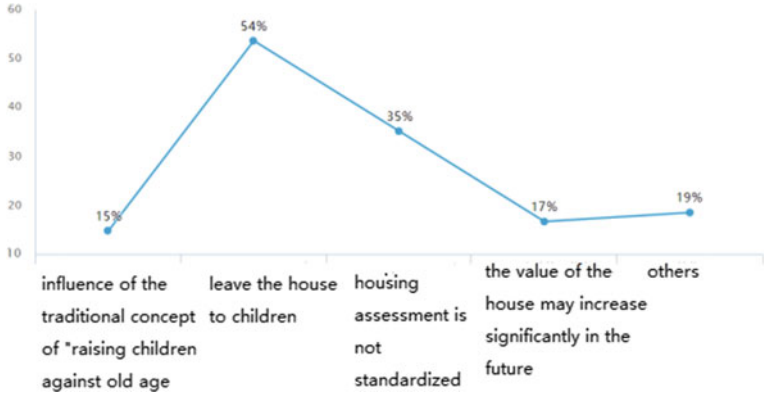


**Fig. 22** Reasons for not accepting house-for-pension (from the perspective of the elderly)

## 4 Conclusions of the Options of Pension Modes

Based on the current demographic structure and pension status of China, the current pension system is facing severe tests. Therefore, it is necessary to innovate the pension system. Family pension and institution pensions are more traditional modes, while community pension and house-for-pension are relatively new modes. This research is mainly based on the data collected from the questionnaire to explore the preferences of people at different ages.

Through a preliminary analysis of the results of the questionnaire, 64.6% of people will still give priority to family pension, which matches China's actuality.

In a short time span, family pension mode will still be the mainstream option. Although there is a lack of accurate support from quantitative regression data, when we conducted field interviews, we still clearly felt that the elderly are more inclined to choose family support, and this willingness is positively correlated with the number of children, negatively correlated with health, and education, and other variables have no obvious relationship with the willingness. These factors are the most important for the elderly to choose family pension mode, and the traditional cultural reasons and public opinion reasons summarized above also affect their options.

### *4.1 Suggestions on Family Pension*

It is too difficult for the elderly to change their options and accept emerging modes, instead, it is better to think about how to improve family pension mode; the survey results of young and middle-aged people also show that family mode has the highest degree of acceptance. However, this mode is largely affected by the real situation of the elderly themselves and their children. To truly enable the elderly to be provided in their old age, this article puts forward the following suggestions.

First, improve the pension system and build a multilevel security system. Improve relevant laws and regulations at the national level, moderately increase the level of social pension, and provide the elderly with the most stable and reliable source of income.

Second, promote the integration of family pension and community pension and comprehensively utilize various old care resources. Through socialization, the cost of providing for the elderly is shared by society and individuals, reducing financial pressure and the burden of individual families. In addition, relying on the community can greatly improve the quality of life of the elderly.

Third, build a community service system that integrates medical services and elderly care and build a large-scale comprehensive hospital with elderly care functions. Relying on hospitals, we will carry out elderly care services and form a organization that undertakes medical services and elderly care so that the elderly can obtain professional elderly care and medical services without leaving the community. At

the same time, it will extend medical services and elderly care into the family and provide family doctor and family pension services.

Fourth, attention should be given to the emotional comfort of the elderly. China is a country with strong attachment on family relations, emotional comfort from children is the most important thing for the elderly. Elderly people who choose to take care of families value the emotional need the most, and their children should pay enough attention.

## *4.2 Suggestions on Institution Pension*

The institution pension, as a kind of pension mode that is more common in foreign countries but is less accepted in China, has its own advantages and characteristics. In our survey and research, the preferred degree of institution pension for the elderly is ranked third, only higher than the emerging house-for-pension mode, which is 9.5%, and significantly lower than our expected ratio. However, when asked whether it is acceptable to go to nursing homes to spend their old age, approximately 37% of the respondents said they accepted, and more than 60% of the elderly said they accepted. Based on the above data, it is not difficult to see that although institution pension is not the first option, the general public is not very disgusted with this pension mode. With the change of concepts, it is expected that in the future, there will be a higher degree of acceptance for institution pension. The willingness to choose institution pension is negatively related to the number of children, negatively related to health, positively related to education level, and positively related to income.

When analyzing the survey data, we noticed the different options between generations. Most young people do not accept sending the elderly to nursing homes, while the elderly prefer to go to nursing homes. This phenomenon is the common result of many factors, namely, young people want to take better care of the elderly, while the elderly do not want to affect the lives of young people. Therefore, in the future, it is very likely that elderly people want to live in nursing homes, but their children don't want and care for the elderly at home. We cannot comment on the pros and cons of these different generational options, but only provide some suggestions for the perfection or the insufficiency of institution pension.

First, the service quality of nursing homes should be improved, and the supervision system should be strengthened. It is necessary to strengthen the training of employees, strengthen professionalism and institutionalization, provide reliable services to meet the different needs of the elderly, truly serve the elderly, and severely penalize behavior such as violation of the code and abuse of the elderly.

Second, the government should fully implement regulations and policies that support the development of the elderly care institutions and solve the current difficulties of fund shortages, incomplete facilities, and incomplete equipment faced by elderly care institutions. At the same time, it is necessary to establish a qualification evaluation system, strengthen the management of elderly care service agencies, set

industry access standards, and strengthen the management of the industry from the beginint.

Third, people should change concepts and correct the misunderstandings, discard the traditional concept of "raising children for support", and choose a pension mode that suits you and your parents so that everyone can enjoy their life. This is the ultimate goal of pension care.

### *4.3 Suggestions on Community Pension*

As an emerging pension mode, community pension may have a low degree of preference in our expectation, but the preferred degree in the data are 19.3%, which is second only to family pension. After synthesis, approximately 27% of the people in the questionnaire understand this type of pension mode, and we can conclude that most of the respondents who have understood prefer community pension. It has the core of family pension and the function of the community, which is advantageous over family pension and institution pension. The willingness to choose the community pension is negatively correlated with the number of children, positively correlated with the level of health, and has no obvious relationship with education level, source of income, etc.

Currently, community pension in China is just in its infancy, and its various functions are not yet perfect. The main problems are: lack of funds, single source channels, imperfect community service facilities, and low degree of professionalization of service personnel. In our survey, people generally believe that the most important aspect of community pension is the service. As an "advanced" option for family pension, people choose it because they value the diversification of community functions. In view of this situation, this article proposes the following suggestions.

First, the construction of community service facilities for the elderly should be strengthened. Prompt most neighborhoods to build a comprehensive community service center and continuously improve the service level. Efforts will be made to promote the opening of various life services and cultural and sports facilities in the streets and communities for the elderly to meet their needs.

Second, senior service organizations and teams should be actively cultivated. The community should have a relatively stable service team, including social workers at the organizational and management levels and service personnel at the front line. At the same time, they must all have professional qualities, including good professional ideas, professional knowledge, and professional methods and skills. In this way, the development of elderly care services, the continuous expansion of service areas, and the continuous improvement of service quality will be achieved.

Third, distinctive multilevel community elderly care services should be built. It should be carried out according to the degree of aging in various regions and the different physical conditions and physiological needs of the elderly. For the elderly and those who are unable to take care of themselves, family pension is the main

choice; for the middle-aged and elderly who can take care of themselves, services can be provided in the form of day care centers and rehabilitation stations.

### *4.4 Suggestions on House-For-Pension*

As a pension mode that has always been controversial, the development of housing pension in China is very slow and even can be said to be difficult. From the data, only 5.6% of the respondents think they know enough about house-for-pension, 27.5% have never heard of it, and 60% would not choose any form of it. Generally, most respondents who can accept it have higher income, higher education level and better health. These three indicators have a positive impact on the option. During the investigation, we also received emotional reasons, such as the house being the home. These factors also greatly affect people's options.

From the pointview of policy, there are more than 30 forms of house-for-pension. In our survey, we selected four forms that are easier to understand, but they are not in line with our expectations. The acceptance of each form is less than 50%, and even the acceptance of renting out house alone is less than 40%. This phenomenon shows that there is still a large misunderstanding about house-for-pension. Many interviewees would retreat the moment they hear the term house-for-pension. This requires the government to strengthen propaganda work to resolve people's misunderstandings and rectify the name of house-for-pension. At the same time, the main reasons for not accepting it are the improper evaluation of the house and the concept of leaving the property to children. It can be roughly classified into two categories: economic factors and emotional factors. The interaction of the two types of factors makes it difficult for people to accept this form. To promote the resolution of the pension dilemma, this article proposes the following suggestions.

First, the impact mechanism of elderly care should be considered. In the context of the gradual liberalization of family planning policies, the government should focus on improving social welfare and medical security, which will increase life expectancy of the elderly and their willingness to accept house-for-pension.

Second, continue to promote the process of urbanization and increase the disposable income of residents to promote the prosperity of the real estate market, increase the actual housing area of residents, improve the quality of housing, and increase the capital of residents to retire with house.

Third, raise the level of education, and increase the proportion of the population with higher degree of education, which will popularize the concept of house-for-pension and increase residents' awareness.

Fourth, keep advancing the construction of the legal system, promote the innovation of the financial system, provide a soft system environment for the development of a variety of house-based pension modes, improve the evaluation system of real estate quality, and promote the formalization of evaluation procedures.

### *4.5 Vigorously Promote the Construction of the "Internet + Community Pension" Mode*

Based on the data analysis of the four pension modes in Beijing and the development of the information industry and the experience of some cities, this article believes that in the future, Beijing can vigorously promote the "Internet + community pension" mode. On the one hand, it can effectively use the Internet to actively create a large community elderly care environment, and "Internet+ " to build a smart community with combination of family resources. By dialing the hotline, logging on to the website, using mobile app, WeChat, etc., people can enjoy the convenient services brought by the Internet without leaving home; By the integration of the "12,349" elderly care service hotline, seamless connection with 120, 110, and 119 will be linked, forming a unified family pension information service platform. On the other hand, the Internet can be used as a means to establish an all-day-long, real-time online community pension care service interaction system and build community pension care service centers through various Internet devices, such as the Internet, mobile phones, telephones, wearable devices, vital sign monitors, etc. The family, the elderly and the elderly care service providers can communicate in a timely manner regarding the health and support for the elderly. At the same time, Internet communication tools can also be used to regularly organize various recreational and learning activities for the elderly to enrich the amateur cultural life and emotional life.

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# Main Countermeasures of the German Social Security System Coping with Population Aging


**Feichi Han and Bo Guan**

Population aging is a major problem currently faced by countries around the world. Germany entered the aging society in the 1980s and became one of the most aging countries in the world. It is also one of the first countries in the world to start systematically dealing with the aging problem. The aging population poses huge challenges to all areas of the German economy and society, among which the pressure of the social security system is the most prominent. In recent years, with the decline of the young population and the increase in the elderly population, the pressure on the revenue and expenditure of the German social security system has rapidly risen. To deal with the financial crisis caused by aging in the social security system, the German government has adopted a series of countermeasures and has effectively controlled the risks of the social security system posed by the changes in the population's age structure.

## 1 The Overall Situation of the German Economy and the Social Security System

Since 2010, Germany has steadily overcome the negative impact of the European debt crisis, and its economy has continued to maintain strong growth, accelerating year after year. In 2017, Germany achieved a GDP of €3.2 trillion. The annual growth was 2.2%, up 0.5 and 0.3 percentage points from 2015 and 2016, respectively, setting the highest record in six years and maintaining growth for the eighth consecutive year. The main economic indicators continued to improve. First, the price level is

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_23

generally stable. The consumer price index for the full year of 2017 was 1.8%, which was below the 2% inflation control target. Second, the scale of the industry continued to expand. The Purchasing Managers Index has been above the line of prosperity for 9 consecutive years and has continued to rise; it rose to 61% in the third quarter of 2017, which is the highest value since the European debt crisis. Third, there is an obvious competitive advantage in foreign trade. The real effective exchange rate of the German Eurozone depreciated to 90% of the base period in 2017, which was 5% lower than the EU average. Fourth, the federal budget continues to be in surplus. In 2017, federal finance maintained a budget surplus for four consecutive years. The budget surplus is 38.4 billion euros, accounting for 1.2% of GDP, reaching a historical high level. The increases in investment, consumption, public expenditure, and exports are 3.5%, 2%, 1.4% and 4.7%, respectively. Fifth, the employment situation is steadily progressing. The total number of employees is approximately 44.3 million, with an increase of 0.15% year-on-year; the unemployment rate is 5.7%, a year-on-year decrease of 0.4 percentage points; and the number of unemployed people is approximately 1.7 million, a year-on-year decrease of 4.5%.

In the field of social security, with social assistance and the Hartz unemployment pension system as the strong foundation, the social insurance system, including basic pension insurance, statutory health insurance, unemployment insurance, and long-term care insurance as the main body, occupational pension, the Riester Pension, and supplementary health insurance as the supplement, the multilevel security system has been continuously improved. The social security coverage rate has reached more than 90%, basically achieving "full coverage".

**First, there is solid support for the disadvantaged groups.** The bottom-up guarantee system of Germany is based on social assistance and the Hartz unemployment benefit system. The former focuses on people with difficulties in employment, such as disabled people and breastfeeding women. The latter provides policy support for people in long-term unemployment based on social assistance. The two systems are completely funded by financial subsidies, shared by federal and state finances at a rate of 80% and 20%, respectively, with the proper amount enough to meet the basic living standards, including the necessary costs of housing and heating, for the individuals and families. At present, the standard for single adults is 409 euros per month.

**Second, the employed people have been fully covered.** Basic social insurance is the main system of German social security, including five insurance items, basic pension, basic medical care, unemployment, industrial accidents and long-term care (see Table 1). Overall, the German basic social insurance system has the following characteristics: **Pay-as-you-go financing.** The insurance fees are paid by employers and employees at a certain percentage, and the current total rate is approximately 39%, of which basic pension insurance is approximately 18.6%, basic medical insurance is approximately 15%, unemployment insurance is approximately 3%, and care insurance is approximately 2.55%. **Statutory participation.** All formal employees and some eligible flexible employees are obliged to pay for social insurance, of which the basic pension and basic medical insurance have covered 74% and 90% of various employees, respectively. **Reasonably determined standard.** The replacement rate

of basic pension insurance is approximately 67%, and the average pension level is approximately €1396.35, accounting for more than 70% of the elderly group's pension income. The unemployment insurance replacement rate is stable at 60%, and the medical insurance personal pay ratio is approximately 1.8%, both at a moderate level in high-income countries. **Adherence to income linkage**. Adhered to the principles of income correlation and "pay longer, gain more" in the basic insurance system. The amount of basic pension insurance is based on the payment period and the wage bases, and the treatment of unemployment insurance and employment injury insurance is directly related to the income of the payment period. To regulate the reverse redistribution effect of the income linkage, a lower limit of the payment base has been set in the basic pension insurance. The current monthly upper limits for western and eastern regions are €6,350 and €5,700, respectively.

**Third, the multi-pillar security system has been fully formed.** Since the beginning of this century, Germany has attached great importance to the construction of a multi-pillar security system and has increased its support for supplementary pension security through tax incentives, direct subsidies, and expanding investment channels. According to experts from the German Ministry of Labor and Social Affairs, 70% of employees in Germany are currently covered by occupational annuities and personal voluntary pension savings plans, of which occupational annuities coverage is 57.0% and personal voluntary pension savings Liszt plan coverage is 33.8%. With the support of the second and third pillars, the replacement rate of retirees' comprehensive pension insurance exceeds 80%.

**Table 1** The main basic insurance system of Germany

| Types of insurance | Basic pension insurance | Basic medical insurance | Unemployment insurance | Employment injury insurance | Long-term care insurance |
|---|---|---|---|---|---|
| Establishment time | 1889 | 1883 | 1927 | 1884 | 1995 |
| Rate | approximately 18.6% | approximately 15% | approximately 3% | approximately 2.4% | approximately 2.55% |
| Contributing body | Employers and employees | Employers and employees | Employers | Employers | Employers and employees |
| Benefit level | The replacement rate is approximately 67% | The personal pay ratio in the catalog is approximately 1.8% | The replacement rate during the payment period is approximately 60% | The replacement rate during the payment period is 90% | The monthly payment is €125 to €2005 according to the level of disability and care |

## 2 Population Aging in Germany

With the prolonged life expectancy and the declining birth rate, the age structure of the German population is rapidly aging. According to international standards, when the population aged 60 and above accounts for 10% of the total population or the population aged 65 and above accounts for 7% of the total population in a country or region, the country or region has entered the stage of population aging. When the population aged 65 and above accounts for 14%, the country or region has entered a hyperaged society. Since the 1980s, Germany has entered an aging society. Statistics show that the average age of Germans in 1980 was 37.1 years old, with an increase of 2.2 years from 1970 (a growth rate of 6.3%). The average age of 34.9 years in 1970 was almost unchanged from the average age of 34.8 years in 1960. In 1990, it was 1.7 years more than in 1980 (a growth rate of 4.6%), and in 2000, it was 1.4 years more than in 1990. The reason for the relatively slow increase in the average age from 1980 to 2000 was the external population and the reunification of East and West Germany. After digesting these two factors, in 2010, there was a sharp increase of 2.6 years from 2000. The average life expectancy of Germans reached 79.80 years, of which men and women were 77.70 and 82.74 years, respectively.

At the same time, the number of births in Germany has remained at an average of nearly 1.5 children per mother in recent years, which is far below the level of 2.1 children required to maintain the population size. In comparison to the fertility rates in 2015, Germany's data are also lower than half of those of EU countries. In a generation, the proportion of German couples who are unwilling to have children has nearly doubled. Only 11% of women born in 1937 were unwilling to have children, while the proportion of women unwilling to have children born in 1967 reached 21%. For a long time, the annual natural population growth rate in Germany has been negative; that is, the number of births is less than the number of deaths. According to statistics, even if the number of new immigrants is included, the total population of Germany has been declining in the past ten years. At present, the population aged 65 and above in Germany accounts for 34.1% of the total population, making it one of the most aging countries in the world. It is predicted that the proportion of people aged 65 and above in the total population will climb to 41% in 2025 and will reach more than 56% in 2050.

The impact of population aging on the economy and social life of Germany continues to deepen. On the one hand, aging has weakened the potential for economic growth, increased the burden of public finances, and led to the expanding urban–rural gap, rising unemployment, and other psychosocial problems. The rising proportion of the elderly has led to a shortage of labor resources and an increase in labor prices. Meanwhile, the high tax burden of the German welfare system has become even heavier with the aging of the population, which increases the production costs of enterprises and damages economic development. Some large taxpayers choose to relocate or invest abroad to avoid taxation. On the other hand, the increase in the elderly poses higher demands on social services. In 2009, the number of people in need of care was 2.3 million, and this number will increase to nearly 3.3 million by

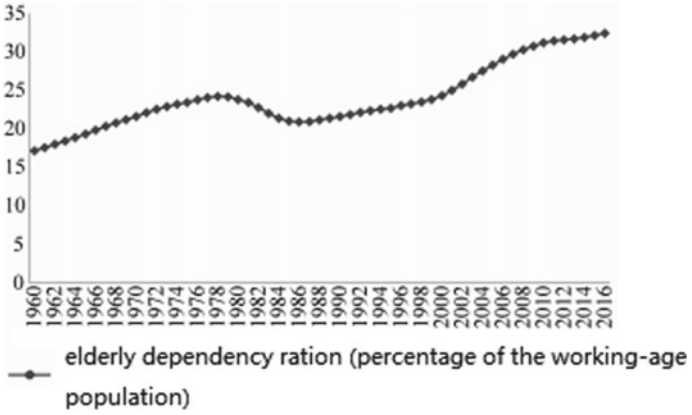


**Fig. 1** Elderly dependency ratio in Germany. Data source World Bank

2030. Currently, the social pension modes in Germany mainly include family pension and institution pension. Family pension refer to the way that the elderly stay at home and society provides care services. Institution pension refers to the way that elderly people stay in specialized care institutions where professional care and medical care are provided. Both pension methods require German society to provide supporting public services (Fig. 1).

## 3 The Financial Risks of the German Social Security System Brought by Population Aging

Population aging has directly shaken the foundation of the pay-as-you-go system of social security. Various basic insurance systems are facing the risk of financial imbalance.

First, the expenditure scale of various basic insurance systems has increased rapidly. According to the German Pension Association, the number of years for male and female retirees receiving basic pension insurance increased from 13.8 and 18.9 years, respectively, in 2001 to 17.5 and 21.7 years, respectively, in 2015. The payment liability to retirees has increased significantly. Data from the Federal Statistical Office show that by 2021, German basic pension insurance, basic medical insurance and long-term care insurance expenditures will increase by 15.1%, 15.4% and 9.9%, respectively.

Second, the deteriorating institutional support structures bring challenges to stable financing. The dependency ratio of the German basic pension insurance system has rapidly dropped from 4.2:1 in 1972 to 2.0:1 in 2014. According to the German Employers' Association, if structural reforms are not carried out in time, the total

legal social insurance premium rate in Germany will increase to 48% by 2040, which will seriously weaken the international competitiveness of German companies.

## 4 Main Countermeasures of Social Security Coping with Population Aging

To cope with the pressure of expenditures exceeding the income of social security, Germany has introduced a series of policies, such as encouraging the elderly to find jobs, postponing the retirement age, and improving the social insurance system, to consolidate the foundation of social security and increase the benefit level.

### *4.1 Promote the Employment of the Elderly and Improve Social Support Structures*

**First, obstacles to the employment of older labor resources should be removed.** Legislate eliminates age discrimination in employment, making it clear that except for special occupations such as pilots, age cannot be used as a reference basis for employment qualifications. In companies with more than 10 employees, older workers enjoy priority from being dismissed. Relax the restrictions on labor contracts for older workers. The labor contract law formulated in 2007 stipulates that workers over the age of 52 can unconditionally sign fixed-term contracts, which creates convenient conditions for employers to employ older workers.

**Second, the employability of the elderly should be vigorously improved.** Start re-employment projects for the elderly. Develop differentiated vocational skill training programs. We focus on helping seniors update new digital employment-related skills in senior university education. Support seniors working in positions that adapt to personal knowledge, skills and physical endurance. According to estimates by the Federal Bureau of Statistics, there are 35 senior workers aged 65 and above out of every 100 employed, and by 2020, it will reach 49.

### *4.2 Strengthen and Improve Employment and Social Security Information Management to Provide an Efficient and Reliable Basis for Decision-Making*

**First, we improve the information management of labor and employment and provide a reliable reference for researching and judging the level and structures of employment**. Germany has established an independent and mature information

management system, including employment statistics and employment and unemployment registration. On the one hand, all unemployed people need to register with the Federal Labor Office and use this as a prerequisite for unemployment insurance benefits and other protection claims. The unemployment rate index is formed based on full sample registration. Meanwhile, the Federal Bureau of Statistics independently conducts employment statistics in accordance with the law based on scientific sampling, commissioned surveys, questionnaires and other forms to assess the overall situation of the job market and form an adjusted unemployment rate. At present, the difference between the unemployment rate before and after the survey is stable and fluctuates in the same direction, indicating good reliability. In addition, the Federal Labor Office regularly provides feedback to workers and employers on the number of job vacancies, demand structures, and information on unemployed personnel based on employment and unemployment registration data. To a certain extent, the system has solved the problems of inaccurate employment management information, unstandardized employment decision-making mechanisms and opaque job supply and demand information and has provided a scientific basis for employment guidance, enterprise recruitment, and job hunting.

**Second, basic pension insurance assessments should be regularly carried out to accurately judge the safety of system operation**. According to the introduction of the Federal Ministry of Labor and Social Affairs and relevant laws and regulations, the German government is obliged to regularly integrate information on the financial balance of basic pension insurance, the level of sufficiency of pensions for the elderly, the feasibility and the social recogonition of pension reform policies, and issue a report to help the Federal Parliament accurately assess the scale of pension fund payment responsibilities and the operating status and provide a reference for decision-making when promulgating a pension reform bill. At present, the information reports submitted regularly include the following three items: a pension financial actuarial report, an elderly living condition report and a delayed retirement reform report (see Table 2).

### *4.3 Actively Promote the Reform of Social Security Parameters and Enhance the Sustainability of Basic Insurance*

**First, the retirement age should be gradually delayed, and the basic pension insurance payment responsibility should be reduced**. In the 2007 Pension Reform Act, it is clear that from 2012 onward, the legal retirement age of new retirees will be delayed in a gradual manner by one month each year. At the same time, formulate and implement a flexible retirement policy, giving employees who apply for early retirement a "penalty" of an 0.003 annual pension calculation base and a reward of 0.005 per year on the pension calculation base for workers who voluntarily postpone retirement as encouragement. At present, the actual retirement age of German men

**Table 2** German government's information report on basic pension insurance

| Report name | Report frequency | Report content | Main function |
|---|---|---|---|
| Annual Actuarial Report of Pension Insurance | Every year on November 30th | To actuary basic pension insurance payment scale of next year, and to estimate the impact of the economic and employment situation on the system's income | To provide the main basis for determining the system rate adjustment and the scale of financial subsidy funds |
| The Pension Security Report (Elderly Living Condition Report) | Every four years | To assess the living conditions and quality of the elderly over 65 years old | To determine whether the German basic pension insurance, occupational pension, Liszt pension and other pension security systems are adequate and appropriate |
| Report on the Reform of the Delayed Retirement Age | Every four years | To assess the degree of social acceptance of delayed retirement age reform policies | To fine-tune the extent, frequency, and population of delayed retirement policies in a timely manner |

and women has increased from 63.2 and 63.1 years old in 2005 to 63.9 and 64.2 years old in 2017, respectively.

**Second, implement actuarial balance and establish a pension and medical risk adjustment mechanism.** On the one hand, the actuarial balance factor is introduced in the calculation of the basic pension insurance payment base, and the cash value of the treatment base is determined according to factors such as the contribution rate, fund income and expenditure, and institutional support structures. At the same time, a basic medical insurance risk leveling mechanism was established. The Federal Ministry of Health coordinated the extraction of basic medical insurance premiums and distributed them according to the actuarial results of fund payment demand to balance the differences in population age structure and disease risk distribution of different basic medical insurance institutions.

**Third, the assessment of care services should be optimized, and the payment of long-term care funds should be standardized.** In response to the problem of fund wasting under the three-tier service system of long-term care insurance, Germany re-enacted the care service grading mechanism in 2015 based on 88 standards in 8 areas, such as mobility, cognitive ability, communication ability and psychological aspects. Five-level grading management reduces the standard of payment for people with mild to moderate disability, standardizes the payment for disability allowance, and unifies the institution pension personal payment to 580 euros to suppress the motivation of low-level disabled people to overreceive institution pension (see Table 3).

**Table 3** German long-term care insurance payment standards (Unit: Euro)

| Level of care | First | Second | Third | Fourth | Fifth |
|---|---|---|---|---|---|
| Nursing allowance | – | 316 | 545 | 728 | 901 |
| Outpatient care | 125 | 689 | 1289 | 1612 | 1995 |
| Nursing institutions | 125 | 770 | 1262 | 1775 | 2005 |
| Individual payment | | Approximately 580 | Approximately 580 | Approximately 580 | Approximately 580 |

## *4.4 According to the Principle of Multiparty Sharing, the Government and the Family Should Be Reasonably Strengthened to Deal with the Aging Responsibility*

**First, give play to the role of the financial "final insurer" and dynamically underwrite the basic insurance system.** The Federal Ministry of Labor and Social Welfare assesses the operation of basic pension insurance in the previous fiscal year, determines the financial status of the system in a timely manner, and adjusts the rate. When the fund is settled and there is a shortage at the end of the fiscal year, the government makes up the difference with the full amount. At the same time, the government provides direct subsidies for the payment of premiums for pregnant women, children, unemployed persons and other incapable groups to ensure that the goal of guarantee should be fulfilled. At present, the proportion of government subsidies for basic pension insurance is stable at approximately 24%.

**Second, we determine the upper limit of the payment level of enterprises and individuals to distribute the aging risk to multiple parties.** According to the 2002 Basic Pension Insurance Sustainable Development Act, it is clear that the insurance premium rate will be stable within 20% by 2020, and the premium rate will not exceed 22% by 2030. At a given rate level, the new payment demand due to the aging of the population is resolved by government financial subsidies, forming a pattern in which the government, enterprises and individuals share the risk of aging.

**Third, establish a direct financial subsidy mechanism to encourage the development of personal savings for the elderly.** In view of the lagging development of the third pillar of pensions and the excessive financial responsibility of basic pension insurance, Germany launched the Liszt pension reform in 2001, which was subsidized by the federal finances for employees who established Liszt's personal account at a level of not less than 175 euros. For low-income and middle-income people, the subsidy funds accounted for 89% of the total savings, forming a progressive redistribution effect. Under the guidance of federal subsidy funds, social voluntary savings and pension needs are fully released. The number of Liszt policies has rapidly increased from less than 2 million in 2001 to approximately 16 million in 2017, covering 33.8% of the employed population.

**Fourth, establish a family allowance mechanism for long-term care insurance to encourage mutual assistance within the family.** The aging of the population is accompanied by the miniaturization of family structure, and the traditional German extended family system tends to collapse. To encourage different generations of family members to live together, the government restores the internal mutual assistance mechanism and moderately reduces the pressure on social care institutions. Germany has set up a family allowance payment method in the determination of long-term care insurance benefits, which is aimed at caring for family members of disabled senior citizens above level 2. The amount of subsidy ranges from 316 to 901 euros.

## 5 Policy Recommendations

Although China and Germany are at different stages of development, they face similar risks and challenges in terms of the age structure of the population. In 2017, China's elderly over 60 years old reached 240.9 million, accounting for 17.3% of the total population. The contradiction of "getting rich but aging faster" is prominent, which brings about the imbalance of the maintenance ratio of the main social security system, the expanding pressure on fund payment, the increasing care demand of the elderly with disability, and puts forward higher requirements for the sustainable development of the social security system.

At present, socialism in China has entered a new era. The main social contradictions in China have been transformed into the contradiction between the people's increasing need for a better life and uneven and inadequate development. People's demand for a better life is becoming increasingly extensive, and the task of social security policies to improve people's livelihood is even more arduous. Social security is an important part of social policy. At present and for a period of time to come, under the guidance of Xi Jinping's socialist ideology with Chinese characteristics in the new era, we must fully implement the spirit of the 19th National Congress of the Party and the spirit of the Second and Third Plenary Sessions of the 19th Central Committee and focus on the two centenary goals. In accordance with the requirements of high-quality development, drawing on the advanced experience of Germany and other countries, we should accelerate the equalization of basic public services. According to the requirements of covering bottom lines, dense networks and constructing mechanisms, we will comprehensively build a multilevel social security system covering all people, integrating urban and rural areas, clarifying rights and responsibilities, and providing appropriate and sustainable security. We should do everything in our power and act according to our ability to make people feel more substantial, more guaranteed and more sustainable in their sense of gain, happiness and security.

## 5.1 Develop Human Resources for the Elderly and Reduce the Pressure of Social Security System Support

**First,** the elderly reemployment market should be established and improved. Vigorously develop the senior talent market, build a senior human resources network consulting service data center, provide market information for senior human resources, help meet supply and demand, sign labor contracts and other services, improve the use and flow of senior human resources, and standardize reemployment channels. **Second,** create a harmonious and fair employment environment for the elderly. Accelerate the promulgation of laws and regulations to provide legal protection for the continued employment of the elderly and ensure their reasonable working hours and wage levels, guide enterprises to change their concepts, eliminate discrimination, and employ qualified elderly people fairly, encourage employers to formulate flexible employment systems based on their own characteristics to attract qualified seniors. **Third,** continuing education for the elderly should be strengthened. Vigorously develop a re-education platform for the elderly, carry out lifelong learning, and guide the elderly to make full use of the various resources such as senior universities, online courses, and senior training courses, increase their own knowledge and enhance their ability to return to society.

## 5.2 Put Effort into Building a Multilevel Social Security System

**First,** we expand the coverage of the enterprise annuity and occupational annuity. Accelerate the establishment of an occupational pension system in government and government-sponsored institutions according to law, implement preferential tax policies, and pilot an automatic participation mechanism to encourage more capable enterprises to establish annuity plans. Furthermore, the annuity market should be liberalized to effectively improve fund management efficiency, product management quality, guarantee capacity and the efficiency of the annuity system. **Second,** we give full play to the role of supplementary security in meeting the needs beyond basic medical insurance. Timely increase the preferential tax proportion of supplementary medical insurance, establish unified guidelines for supplementary medical products, allow supplementary medical insurance to reimburse special outpatient expenses appropriately, strengthen the value-added guarantee of supplementary medical insurance in terms of convenient registration, accompanying medical treatment, assisting care, etc., to improve the medical experience. **Third,** we enrich the supply of multilevel guarantee products. Introduce a personal tax deferred pension insurance system as soon as possible, optimize tax premium health insurance participation and payment methods further, and support commercial insurance institutions to develop more types of commercial pension insurance and commercial health insurance products that link with basic pension and basic medical insurance to fulfill the demands of individuals

and families in terms of risk protection, wealth management, and supplementary protection.

### *5.3 Improve Risk Prevention Measures in the Field of Social Insurance*

**First,** promote the national pooling of basic pension insurance for employees. Formulate and implement the central allocation scheme, gradually increase the extraction proportion of transfer funds, share the risk of aging nationwide, and balance the burden of security between regions. **Second,** the treatment determination and adjustment mechanism should be improved. Standardize the adjustment method of basic pension insurance benefits for employees and comprehensively consider financial affordability, system income and past contributions to determine the adjustment rate of benefits. **Third,** the medical insurance payment system should be improved. Adhere to the total budget management, focus on promoting payment by disease type, expand the range of trial on payment by disease diagnosis group and the point method, establish a multi-compound medical insurance payment method, regulate excessive medical behavior, link to the reform of the medical and health service system, and effectively reduce the medical pressure of urban and rural residents. **Fourth,** the formation of an operable care insurance system framework should be accelerated. Summarize the experience of long-term care insurance pilots in a timely manner, draw lessons from the construction of care insurance systems from the leading nations, reasonably determine funding standards, standardize the scope of guarantee objects and payment methods, establish a more scientific disability rating assessment and nursing cost compensation mechanism, improve funding payment efficiency, and avoid "unprecedented" welfare traps.

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# Analysis of the Application of the PPP Mode in the Pension Industry Under the Background of Population Aging in China


**Kui Dai**

## 1 Pension Problems Brought by Population Aging

According to the latest statistics of the National Bureau of Statistics, as of the end of 2017, the total population aged 60 and above in China was 240.9 million, accounting for 17.3% of the total population, the total population aged 65 and above was 158.31 million, accounting for 11.4% of the total population. It far exceeds the recognized standards of 10% and 7%. China has not only entered the sequence of countries with an aging population, but the aging population has exceeded the standard. According to the estimates of the National Office on Aging, the number of elderly people in China will reach a peak of 487 million approximately by 2050, accounting for 34.9% of the total population. The increasing degree of population aging has become an inevitable trend. How to solve the problem of providing for one-third of the elderly has become an unavoidable issue in the future.

As far as the current situation is concerned, elderly care in China is mainly divided into family pension, community pension, and institution pension. Family pension refers to the elderly living in their own or relatives' families and providing care services for other family members; institution pension refers to the elderly live in special elderly care institutions where professional medical and elderly care services are provided. Community pension refers to the elderly living in their own homes, and society provides commercial elderly care services. In a familiar environment, you can get proper care, and children are welcome to visit at any time. Affected by traditional Chinese culture, the willingness to choose institution pension has been weak for a long time. According to incomplete statistics, the proportions of the elderly in China for family pension, institution pension and community pension are 96%, 3% and 1%, respectively. It can be seen that the vast majority of the elderly have chosen family pension. However, as the aging continues and the large number of only child born during the period of the implementation of family planning policy, the demand for

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_24

support for family pension continues to increase, but the source of support continues to decrease. There is a serious deviation between supply and demand, and family pension is unsustainable. In the future, it will be an inevitable trend for the elderly to change their pension mode from family pension to social pension.

Social pension includes community pension and institution pension. As a country of getting old before getting rich, the per capita income of China is only US$1,000 when the population is aging, while the per capita income of the United States has exceeded US$5,000 when the population is aging. China is currently in a period of economic transformation and development, and the government does not have the ability to provide community pension and build institution pension on a large scale, therefore, the supply of both pensions are seriously inadequate, and the low quality of services and facilities have become common problems in social pension. Taking institution pension as an example, with the continuous improvement of people's living standards and the increase in education, the acceptance of institution pension by the elderly, especially those newly entering elderly stage, has also been increasing. According to relevant sample surveys and analysis, the proportion of China's elderly population willing to adopt institution pension has shown an increasing trend. The proportions in three northeastern provinces and the whole nation with the widest sampling range is approximately 8%,[1] excluding the increase in the proportion of people who are willing to choose institution pension in three years from 2014 to 2017. According to the national elderly population of 240.9 million in 2017, the demand for institution pension beds was 19.27 million. According to the statistics of the Civil Affairs Bureau in early 2018, the institutions have approximately 7.3 million beds, and the contradiction between supply and demand in institution pension is very prominent.

Generally, although China has initially established a family-based, community-probed, and institution-supported pension system, as the aging of the population continues to deepen and people's living standards continue to improve, the pension mode will transform from family pension to social pension. However, restricted by the level of economical development, government's investment in social pension is relatively limited, and the imbalance between the supply and demand of social pension is serious.

## 2 The Connection Between the PPP Mode and the Elderly Care Service Industry

The PPP mode is widely used in the construction of public services and infrastructure. The elderly care service industry is a type of public service, including the construction of elderly care facilities, medical services, life services, entertainment services, and

[1] See Wang Jingling and Hualong, "Research on the Necessity of Applying PPP Mechanism to the Construction of the Elderly Care Institutions", *Economic Research Reference*, Issue 52, 2014, pp. 57–61.

the development of related elderly care products. The externalities of the elderly care service industry makes its connection with PPP mode possible.

## *2.1 PPP Mode*

PPP (public–private partnership), that is, the cooperation between government and private capital, is a project operation mode in public infrastructures. In this mode, private enterprises and private capital are encouraged to cooperate with the government and participate in the construction of public infrastructures. By introducing private capital to participate in public utilities, the PPP mode effectively relieves the government's financial burden and reduces the overall cost of the project. On the other hand, it promotes the transformation of the government's role from the direct provider of public services to the regulator, thereby effectively improving public services quality. Simultaneously, private capital can complement the government's advantages, share risks, form a mutually beneficial long-term goal, and provide the public with high-quality services at the most effective cost. The PPP mode is originated from the United Kingdom and is widely used in public infrastructures such as hospitals, schools, airports, and railways in European countries and America.

## *2.2 The Feasibility of the Application of the PPP Mode to the Elderly Service Industry*

(1) Consistent with national policy orientation

For a long time, China has encouraged private capital to participate in elderly care, and has intensively introduced a series of policies and measures in the past five years. Notice of The Ministry of Finance on the Issues of the Promotion of Cooperation Mode Between Government and Private Capital (Caijin [2014] No. 76) on September 23rd, 2014 clearly affirmed that "elderly care service facilities" belong to the scope of suitable PPP mode, and then The Notice of the Guiding Opinions on Promotion of Cooperation Mode between Government and Private Capital in the Public Service Field (Guobanfa [2015] No. 42) forwarded by General Office of the State Council from Ministry of Finance, National Development and Reform Commission and People's Bank of China on May 19, 2015 stipulated that the elder care sector is encouraged to adopt the PPP mode, which further expands the depth and breadth of private capital participation in the elderly care services and greatly increases government support. Specifically, it mainly includes the following aspects:

Clarify the areas where private capital can be invested in pensions. In addition to the above mentioned documents, a series of regulations subsequently issued basically establish the areas of elderly care that private capital can participate in, covering home

and community pension, institution pension, the elderly care industry, medical care integration, etc.

Clarify the specific methods of cooperation between the pension sector and private capital. In Minfa [2015] No. 33 and other documents, private capital is encouraged to participate in the construction of medical and elderly care facilities and the reform of public institutions through methods such as sole proprietorship, joint ventures, cooperation, joint ventures, equity participation, and leasing.

As for the investment and financing policies, in Guofa [2015] No. 35 and other documents, the following investment and financing support measures are proposed: the government supports the credit needs of the elderly service industry through financial discounts, subsidized investment, risk compensation, and small loans. The scope of collateral for credit mortgages is broadened and the fixed assets such as land use rights and clear property rights acquired with compensation to handle mortgage loans for the private elderly care institutions are allowed, and the real estate registration agencies must handle mortgage registration procedures.

In terms of land supply policy, Guobanfa [2017] No. 21 and other documents include land use in the elderly care sector in the overall land use plan, urban and rural planning, and annual land use plan. The allocation of agricultural land conversion indicators and new land use indicators should be appropriately tilted. Those that meet the list of allocated land can be supplied in accordance with the law and the allocation method. For projects that can use the allocated land, on the premise of the land user's willingness, encourage the supply of land in the form of transfer or lease, supporting the municipal and county governments to provide land with the state-owned construction land as capital or equity, and jointly invest with private capital construction.

As for the price management and preferential tax and fee policies, in documents such as the Price of Development and Reform [2015] No. 129, it is stipulated that the electricity, water, gas, and heat consumption of elderly care institutions shall be implemented at the price of residents' living. Except for the basic services provided by public medical and elderly care institutions in accordance with the price policy prescribed by the government, other services are subject to independent pricing by the operators. The maintenance services are exempted from business tax, the property and land used by nonprofit elderly care institutions are exempt from real estate tax and urban land use tax, and eligible nonprofit elderly care institutions are exempted from corporate income tax according to regulations.

In general, China not only provides access policies for the application of the PPP mode to the elderly service industry but also provides a full range of policy support for investment and financing, land use, taxation and pricing. It is in line with national policy orientation toapply the PPP mode to the elderly service industry.

(B) Coupling of business characteristics

The elderly care service industry and the PPP mode have strong coupling in business characteristics, which determines the applicability of the PPP mode in the elderly care service industry. First, the PPP mode is mainly used in the fields of public services and infrastructure construction, while the elderly care service industry belongs to

the field of public services with obvious externalities. Second, the projects carried out by the PPP mode have long periods, large investments, slow returns, while the elderly care service industry also shares large early-stage investment and long return periods, therefore, the two have a certain foundation for docking. Finally, private capital participating in PPP projects under the protection of the government can obtain long-term stable returns. This income is not necessarily huge but very stable. Similarly, the pension service industry is a quasi-business industry in which once a reasonable return mechanism with the government is established, the private capital can obtain long-term stable income. The two also have a natural coupling in return.

### *2.3 Participants learn from each other*

The implementation of the PPP mode in the elderly care service industry enables the government and private capital to give full play to their respective advantages, complement each other, and achieve mutual benefit and win–win results. It is embodied in the following aspects: first, with the deepening of China's aging degree, the demand for elderly care services has grown rapidly, the contradiction between the supply and demand of elderly care services is prominent, and the government is under huge financial pressure At the same time, as China's economic development has entered the new normal as well as the continuous deepening of supply-side reforms, there is a large amount of social stock capital. Under the guidance of policies, this part of stock capital has been introduced into the elderly care service industry through the PPP mode, which not only relieves financial pressure but also enables social capital to obtain stable income; this is a win–win situation. Second, although China's elderly care service market has huge potential, it has the characteristics of large investment, long cycle and high risk, making many private capital afraid to enter alone. The PPP mode, through the participation of the government, is supported by the government and effectively solves the risk of capital entry. Third, private capital not only provides capital in the process of participating in the project but also brings more economical and scientific management and operation mode and technical personnel, which can effectively reduce project costs and improve service quality.

In general, the application of the PPP mode to the elderly care service industry in China not only conforms to the national policy orientation but also has natural coupling in business characteristics, which can effectively relieve financial pressure, improve the efficiency and quality of the elderly care service supply. It is of great significance to the elderly care service industry and the aging population of China.

## 3 The Status Quo and Problems of the PPP Mode in China's Elderly Care Service Industry

The development of the PPP mode and the elderly care service industry in China started late. They are all in infancy in terms of number and scale of the projects. There

are still many problems in the process of applying the PPP mode in the elderly care service industry, despite their rapid development with strong government support in recent years.

## *3.1 The Status of the PPP Mode in the Elderly Service Industry*

According to the data from the PPP project library of the Ministry of Finance, in the past five years, the PPP mode projects of China's elderly care service industry have experienced rapid growth. The cumulative number of projects has increased from 3 in 2012 to 322 in 2017, with Shandong, Guizhou and Henan province have the most projects, 46, 43 and 31 respectively, which exceeds one-third of the total number of projects. In terms of initiators, the government is the initiator of most projects, accounting for 91% of the total number of projects, and the remaining 9% are initiated by social capital. In terms of the return mechanism, the payment mechanism is mainly adopted, accounting for 70% of the total number, while the government payment method accounting for only 3%, and the remaining 27% is the feasibility gap subsidy. In terms of project scale, the investment scale is mainly concentrated between ¥100 million and ¥1 billion, 58% projects are of this range, 24% below ¥100 million, and the rest is above ¥1 billion, accounting for 18%. From the perspective of investment time, it is mainly concentrated in the 20–30 year interval, 62.1% projects are of this interval, 6.9% within 10 years, 25.9% in 10–20 years, and 5.2% in 30 years or more. In terms of operation mode, the BOT is the main mode, accounting for 55% of the total, the BOO mode accounts for 28%, the TOT mode accounts for 5%, and the rest accounts for 12%. The current PPP mode of the elderly care service industry in China is unevenly distributed. The mode is relatively fixed and single. Most initiators are government. The return mechanism mainly relies on user payments. The investment scale and duration are concentrated from ¥100 to 1 billion and 20 to 30 years, respectively. The operation mode mainly adopts the BOT mode.[2]

In addition, judging from the progress of existing projects, PPP projects are mainly divided into the identification phase, preparation phase, procurement phase, execution phase and handover phase. The task of the identification stage is to select projects that are suitable for the PPP mode; the preparation stage includes management structure establishment, implementation plan preparation, and implementation plan review; the procurement stage includes qualification review, procurement document preparation, response document review, negotiation and contract signing; the implementation stage includes project company establishment, financing management, performance monitoring and payment, and midterm evaluation; and the handover stage includes handover preparation, performance testing, asset delivery and performance evaluation. Under normal circumstances, we believe that the PPP project

[2] http://www.cpppc.org:8086/pppcentral/map/toPPPList.do.

completes the procurement stage and enters the implementation stage before it is truly implemented. As of the end of 2017, the total number of implemented PPP projects in China's elderly care service industry was 74, reaching ¥58.743 billion, accounting for approximately 10%, identification phase projects accounting for approximately 61%, preparation phase projects accounting for approximately 19%, procurement phase accounting approximately 10%, and no projects entering the handover phase. It can be seen that the proportion of PPP projects in the elderly service industry is relatively low, and most of the projects are still in the project identification stage.

## *3.2 Problems with the PPP Mode in the Elderly Care Service Industry*

(1) Obvious regional gaps and uneven distribution

The return mechanism of PPP mode project of the elderly care service industry in China is mainly user payment, while the income gap between the elderly in different regions, cities and rural areas in China is large. This has caused the PPP mode become economically developed and densely populated, concentrated on urban areas with higher incomes. In addition, the return mechanism of opportunity user payments has led to a widening gap in the quality of elderly care services in different regions. The ratio of carers to the elderly in developed areas is many-to-one, while in underdeveloped areas, it is one-to-many.

(B) Single return mechanism of the operation mode

The BOT and BOO modes in the PPP mode of China's elderly care service industry account for 83% of the total number of projects. These two modes require a large amount of capital investment in the early stage, with high interest rates and risks. However, they are widely used. The economic development of different regions in China is different, as well as the consumption habits, living habits, health status and retirement needs of the elderly population. Simple copying of the BOT and BOO modes has caused unclear responsibilities and rights, making the capital broken, the projects unacceptable and stranding occasionally. On the other hand, at present, the return mechanism of PPP mode projects in China's elderly care service industry has only three types: user payment, government payment, and feasibility gap subsidy, among which user payment is the main one. This is contrary to the lack of payment ability of the elderly and restricts the way for pension institutions to obtain benefits.

(C) Lack of performance appraisal indicators makes pricing difficult

The application of the PPP mode to the elderly care service industry can not only relieve pressure on financial funds but also, more importantly, use the flexibility and efficiency of private capital to improve the efficiency and quality of elderly care supply. However, many PPP projects for elderly care services pay too much attention to the per capita housing area, entertainment venues, restaurants and other

hardware facilities while ignoring software facilities. The main reason for this is the lack of comprehensive and reasonable evaluation of indicators and the failure to take into account soft indicators such as the richness of the spiritual life of the elderly and the degree of satisfaction with services provided. In addition, with regard to the pricing, on the one hand, due to the diversified and differentiated demand, the charging standards also differ. On the other hand, the income of the elderly is limited. To ensure that the elderly are provided and supported, it is necessary for the government to intervene in the price to be neither fully market-oriented nor fully specified by the government.

(D) Governmental functions need to be improved

The government's ability to operate PPP projects needs to be improved.

Both the development of the PPP project mode and the elderly care service industry in China started late. The current operating mode is relatively simple. The relevant government departments have insufficient capacity to identify, prepare, execute and supervise PPP projects and lack the ability to adapt and use them flexibly.

The government's procurement of services lacks scientific budget system.

On the one hand, the government's purchase responsibility is not clear, and the procurement benchmarks, service performance evaluation system, monitoring and supervision standards, government funding responsibilities and compensation methods for purchasing services are still to be improved. On the other hand, the one-time compensation of the PPP mode based on beds lacks comprehensive institutional arrangements for land, real estate, service supply and effective management systems.

The government has not yet established a dedicated PPP project management department, and lacks long-term planning for the formulation of PPP policies. PPP projects still use the general government investment project approval process, which is mostly one decision for one matter, and lacks overall planning. In addition, different standards are regulated in different levels of governments, which produce obstacles for its promotion.

(E) Vague legal definition

The prerequisite for the smooth implementation of PPP projects is that the rights and interests of all parties be protected by laws and regulations. In particular, private capital as a disadvantaged party needs to be protected. However, the definition of PPP projects in China is still vague in terms of laws and regulations. First, there is no clear definition of whether the procurement of PPP projects is applicable to government procurement law or bidding law. Second, whether the government-private capital agreement at the core of the PPP project is a civil contract or an administrative agreement is still under dispute.

# 4 International Reference

## *4.1 American Experience*

As a developed market economy, the United States applied the PPP mode to the elderly care service industry as early as the 1960s. After decades of development, the PPP mode of the American elderly care service industry has become very mature.

The current American pension mode mainly includes an apartment-type pension, community-type pension, and nursing-type pension. The apartment-type pension mode is similar to institution pension, which provides high-quality and high-standard services for the elderly, with higher fees. The community pension mode is very common and can meet the needs of most American elderly. The nursing care is similar to the integrated medical care mode, mainly for the elderly who need medical services. The three pension modes basically cover all types of elderly needs. In terms of the PPP mode, the United States pension service industry currently mainly adopts the following three modes: the first is social capital investment, public sector operation and management; the second is government investment, social group operation and management; and the third is government-social group, and private joint investment, operated and managed by social groups or private individuals. The United States government, social organizations, and private individuals are able to reach a good cooperative relationship and produce high comprehensive social benefits in any modes. The main reasons are the following:

(1) Sound legal system and perfect policy design

The United States has a sound legal system for the PPP mode of the elderly care service industry. As early as the 1960s, the government promulgated laws and regulations such as the Elderly Law and the Multi-Target Elderly Center Program to ensure that the elderly enjoy their the rights and interests on the one hand, and encourage social capital to enter the elderly service industry on the other hand.[3] In addition, the government has given certain tax preferential policies and financial subsidies to the social capital entering the elderly service industry through the PPP mode, which effectively promotes the application of the PPP mode in the elderly service industry.

(B) Reasonable management structures and leading role of the government

The government attaches great importance to the management and service of the elderly and has set up special departments in governments at all levels to specifically take charge of work related to the elderly. At the federal government level, there is the Ministry of Health and Public Services, the state government has a special public service department, there are agencies for the elderly, and there are elderly

[3] See Xu Bailing, "Exploring the path of public–private partnership (PPP) mode to promote the development of China's elderly care", *World Agriculture*, Vol. 6, 2017, pp. 168–172.

service centers in all communities across the country, building a service network across the country. The government plays a leading role in PPP projects. It is the arranger and provider of the project. On the one hand, it clarifies the rights and obligations of the government and social capital through the contract management mode, introduces market mechanisms into the elderly care service industry, and improves the supply efficiency of elderly care services and quality; on the other hand, it has long encouraged, cultivated and guided large-scale elderly care companies such as NCP, which effectively solves the problem of the balance between the supply and demand of American elderly care services.

(C) Reasonable evaluation system

The government has an extremely strict supervision and inspection system for pension projects, and has strict standards for the operating standards and quality levels of pension projects. Correspondingly, there is also a strict evaluation and implementation system for PPP projects in the elderly care service industry, which not only considers hardware indicators such as facilities but also pays more attention to the spirit and happiness indicators of the elderly. This is conducive to elderly care companies continuously improving their own service levels and summarizing their experience, and at the same time, cash funds can be reinvested in research and development or improving service quality, thus forming a virtuous circle.

## *4.2 Singapore Experience*

Singapore is a rare high-welfare country in Asia and one of the Asian countries that applied the PPP mode to the elderly service industry earlier. It has rich experience which is worthy of our reference. The Singapore government applies the PPP mode to the elderly care service industry, effectively integrating central fiscal funds and social capital and promoting the rapid development of the elderly care service industry. The specific characteristics are as follows:

(1) Diversified financing channels

The Singapore government uses fiscal funds as a basis to establish a large number of local pension industry funds. Pension industry funds attract private capital, banks, insurance companies, and other financial capital to enter. The rights and debt agreements between the government and various social financial capital are under the framework of pension industry funds, which is conducive to the rapid promotion of PPP pension projects. In addition, in terms of infrastructure construction for the elderly, the pension industry fund leverage more social and financial capital into the elderly service industry through the establishment of PPP project companies and equity investment.

(B) Guidance, support and strict supervision of the government

First, the government attaches great importance to the promotion of the PPP mode in the elderly service industry and has established a special population aging research committee to carry out research and guidance. Second, the government has formulated multiple preferential policies to provide financial subsidies to social and financial capital in the PPP mode. At the same time, it implements the tax preferential policy of the double tax rebate, and allows such pension institutions to provide financing to society. While vigorously promoting the PPP mode of the elderly care service industry, the government has also designed a strict supervision mechanism to supervise PPP projects of elderly care services from many aspects. For example, the Elderly Homes Act strictly regulates the construction and management standards of elderly care institutions. The regulations stipulate the rights and obligations of both elderly care institutions and services for the elderly.

It can be seen that whether it is the PPP mode of the elderly care service industry in the United States or Singapore, it is inseparable from a sound and complete legal and regulatory protection system, a reasonable management system, taxation and fiscal policies, and a clear government leading role.

# 5 Suggestions for the Development of the PPP Mode in the Elderly Care Service Industry

## *5.1 The Capacity Improvement and Function Transformation of the Government*

First, through the above analysis, the long-term development of PPP mode of the elderly care service industry depends largely on the government's functional positioning and role. The prerequisite for the clear and accurate positioning of government functions is that the government has strong professional capabilities in PPP projects, especially in the field of PPP in the elderly service industry. Only when the government has strong professional capabilities can it design guiding policies and PPP projects that conform to regional economic and humanistic characteristics and are in line with practice. This requires the government to lead the introduction of scientific research institutions such as universities and social capital to participate, establish a long-term mechanism for research, and build a market-oriented research platform to publicize the concept and operation of the PPP mode of the elderly care service industry so that all parties, especially government officials, have a deeper understanding of the mode, help the government improve professional capabilities, design and optimize project modes, formulate relevant policies, and promote government function change.

Second, the supervision system should be established and improved. In the PPP project of the elderly care service industry, the government has changed from a direct

service provider to a guide and regulator. How can the government effectively supervise social capital at all stages of the project and at the same time give social capital a certain amount of space? Giving full play to its flexible advantages is the key to the smooth promotion of PPP projects in the elderly care service industry. The supervision of PPP projects in the elderly service industry mainly involves two specific issues: the establishment of an evaluation index system and the establishment of a pricing mode. In the construction of the evaluation index system, comprehensiveness should be emphasized, including not only hardware indicators such as facility conditions but also soft indicators such as satisfaction and happiness index of the elderly. The establishment of a comprehensive index evaluation system will help improve the quality of elderly care services and also help the government effectively supervise and evaluate PPP projects in the elderly service industry. In terms of the pricing mode, the collection of fees for pension institutions mainly includes operating costs and investment income. The operating costs are relatively single and fixed, which is more cost-effective. The difficulty lies in the determination of investment income, which is also the key to the pension service PPP project. An excessively high rate of return on investment will not only disrupt the order of the industrial market but also increase financial burdens due to over-allocation, while an excessively low rate of return on investment will undermine the enthusiasm for social capital and increase project financing difficulties. A more reasonable method is to entrust a professional third-party audit agency to use the weighted average cost of capital (WACC) to estimate the return on investment of the project and obtain a relatively realistic and feasible return on investment, then two parties use this as a basis to determine the return on investment according to the specific situation.

Finally, the management system should be smoothed and the coordination mechanism between government departments should be strengthened. We should clarify the division of responsibilities of the Ministry of Finance, the National Development and Reform Commission, the Ministry of Civil Affairs and relevant government management agencies in the elderly service PPP project, establish a standardized implementation process for the elderly service PPP project from the project identification stage to the project handover stage, and clarify the various stages and processes of the government departments' responsibilities. In addition, we should establish a communication and coordination mechanism between government departments and between government and social capital to provide the necessary guarantee for the smooth implementation of the project.

## *5.2 Diversified Financing Modes*

PPP projects for elderly care services are open, transparent, and standardized, which is conducive to the adoption of diversified financing methods. From a horizontal perspective, the diversified financing of pension service PPP projects is that the government venture capital investment guide fund or pension industry fund attract

social capital through staged equity participation and follow-up investment. In addition, it can also widely absorb financial capital investment. The second is the method of trust. On the one hand, trust serves as an indirect financing platform. Financial institutions can use the trust platform to distribute funds to pension projects in the form of wealth management products. On the other hand, they can set up SPVs to conduct structures and financing to raise funds for pension projects. The third is the issuance of pension bonds. Pension service PPP project companies can issue corporate bonds to society for the construction of pension facilities, the provision of pension services, and the purchase of existing pension facilities. The fourth is Internet financial financing. On the one hand, P2P uses fixed-income financial products to achieve the combination of P2P and PPP to obtain efficient and low-cost debt financing. On the other hand, it uses the combination of crowdfunding and PPPs to raise funds. Many investors have a small single investment, which has characteristics of low investment risk and convenient investment channels. The elderly care service PPP project demonstrates its own advantages and quality through the Internet and can obtain low-cost and fast financial support through crowdfunding.

From a vertical perspective, the diversified financing of PPP projects for elderly care services has different capital requirements, risk-taking and cash flow conditions at different stages of the project and therefore different requirements for capital structures and debt structures. In the process of project implementation, different financing methods should be adopted according to the stage of the project. For example, equity financing can be used in the project initiation stage; financing tools such as syndicated loans, mezzanines, trust, and securities should be used more in the project construction stage; and asset securitization, IPO, equity transfer, and long-term holding by professional investment funds can be adopted in the operation stage.

## *5.3 Improve Laws and Regulations*

Countries that apply the PPP mode to the elderly service industry and have achieved excellent results all have a sound legal system, detailed regulations, and clear responsibilities and powers in terms of the property rights of the government and social capital in the elderly service PPP project. A sound legal and regulatory system is an important foundation for the development of the PPP mode. This requires us to review the existing relevant laws and regulations combined with the characteristics of China's economy and culture, sum up the experience, and formulate unified laws and regulations to regulate the operation of PPP projects in the elderly service industry. In addition, it is recommended to position the legislation of the PPP mode in civil and commercial law, taking into account both substantive law and procedural law, and highlighting the equal and cooperative relationship between the government and social capital.

# Revelations of the British Pension Mode and the Exploration of the Diversified Pension Mode of China


**Pei Sun, Gareth Myles, and Zuoxiang Zhao**

The report of the World Health Organization pointed out that population aging in China has become increasingly prominent according to changes in population structure (Fig. 1). The acceleration of population aging has resulted in a continuous increase in demand for elderly care services.

It is estimated that by 2020, the number of elderly people over 60 in China will increase to approximately 255 million, accounting for approximately 17.8% of the total population, while the number of advanced aged people will increase to approximately 29 million; the number of elderly people living alone and empty-nest will increase to approximately 118 million. Figure 2 shows that by 2050, the number of people over 60 who need elderly care services in China will account for 59.7% of the total population, an increase of 26% points from 33.2% in 2010.

As the demand for elderly care services increases, laws and policies on the protection of the rights and interests of the elderly and the development of the elderly service industry have been continuously improved; the coverage of basic elderly care and basic medical security has continued to expand, and the level of protection has increased year by year. The goals and tasks defined in the 12th Five-Year Plan for the Development of China's Elderly Career and the Plan for the Construction of the Social Elderly Service System (2011–2015) have also been completed. It can be said that China's aging development and the construction of the pension system have made significant progress. However, judging from the current situation, China's aging and pension system still face many challenges. The 13th Five-Year National Plan for the Development of the Elderly Career and the Construction of the Elderly Care System pointed out some shortcomings of the elderly care industry. For example,

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_25

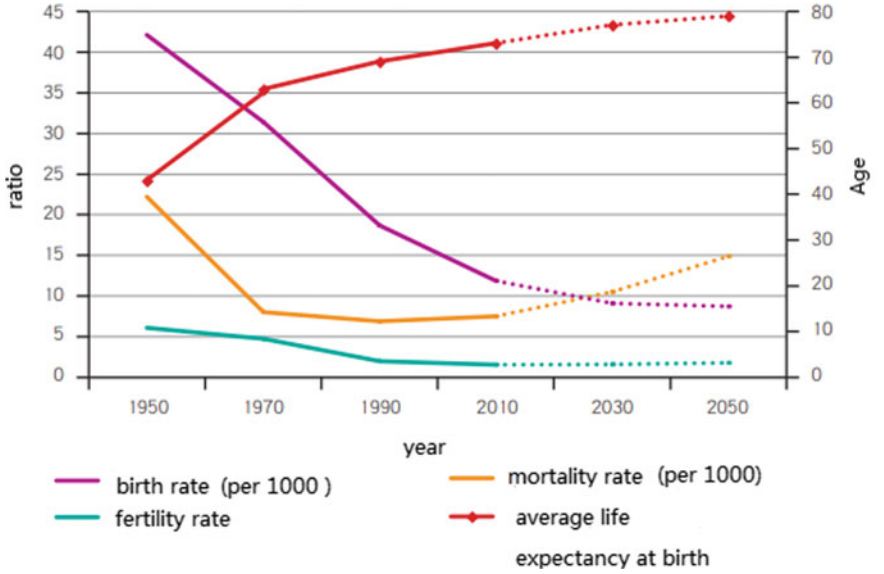


**Fig. 1** Characteristics of population changes in China from 1950 to 2050. *Data source* UN DESA (2013) and World Health Organization (2016)

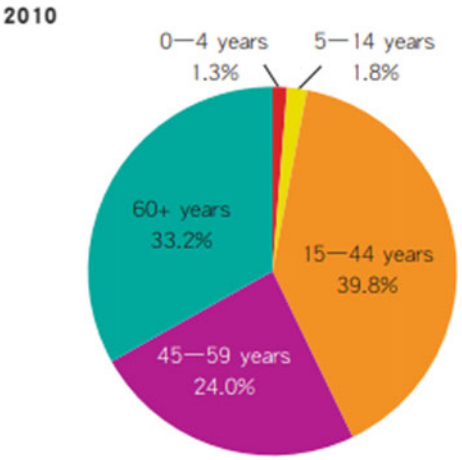


**Fig. 2** The proportion of the number of people in need of care in the total population of different age groups in 2010 and 2050. *Data source* World Health Organization (2016)

the system, coordination, pertinence, and feasibility of laws and policies need to be enhanced; the imbalance of urban–rural and regional development and construction; the insufficiency and low-quality of elderly services, and talent shortage; the prominent contradiction between supply and demand in the market for elderly products;

the unsound system and mechanism for working for the elderly; insufficient social participation; and the relatively weak grassroots foundation. Therefore, it is particularly important to continue to build a sustainable pension system. This article will take the British pension mode as a reference to explore and discuss possible problems and countermeasures in the process of building a diversified pension mode with Chinese people.

## 1 The Current Pension Mode and Problems

The current pension mode in China is a diversified one based on family pension, supported by community pension and supplemented by institution pension. There are four main reasons for this formation. First, the multilevel and multi-type structures of the aging population have led to an increase in the degree of differentiation of different elderly consumer groups for elderly care needs, and the diversified supply can maximize the efficiency of elderly care resources. Second, the government has played a guiding role in improving the planning and allocation of public pension resources, and strong support of the policies has also promoted the development of diversified pension mode. Third, the evolution of family structure and functions has promoted the formation of a multifaceted elderly mode with the development of the economy and society. With the gradual changes in residents' consumption and personal lifestyles, traditional family pension have been continuously weakened. The emergence of diversified pension mode has supplemented and replaced traditional family mode. In recent years, the emergence of empty-nest and left-behind elders in the process of urbanization has also resulted in mutual assistance institutions in some rural areas. In addition, the innovation of elderly care products and service technology has also to a certain extent stimulated new market demand for the elderly care industry and provided new impetus for the development of diversified pension mode.

Although a diversified pension mode has initially taken shape in China, from the proportion of the pension care forms implemented in most areas, a relative imbalance exists: family pension rate reaches 90%, occupying the dominant position; community pension and institution pension rates are 7% and 3%, respectively. Specifically, family pension is mainly achieved through self-care, care from family members and socialized home services; it can make full use of the family's housing resources and provide comfort and spiritual satisfaction for the elderly. However, for most small-scale families in China, when the elderly are declining or losing the ability of self-care, it is a large financial burden to hire long-term caregivers. For families that cannot afford long-term caregivers, family members will do the job, which will inevitably influence the career and life of family members. Institution pension mode can solve the problem, as it is committed to providing professional, standardized and personalized services so that elderly people with different health conditions can receive care and nursing. Meanwhile, the elderly have the opportunity to participate

in rich cultural and collective activities to maintain a certain degree of social interaction. However, relying on institutions to provide long-term care for the elderly will impose a great economic burden on individuals and families. Elderly people face the challenge of re-adapting and rebuilding social relationships. On the other hand, the current development of elderly care institutions in China is not mature. There are restrictions on the accommodation of disabled or chronic-diseased elderly, and not all elderly people are accepted or needs met. Community pension allows the elderly to be taken care of in their own homes, enjoying time with families, and enables the elderly with poor health to enjoy targeted nursing services. However, the quality and variety of services provided by community pension institutions are still limited because of the lack of professional nursing staff and working space. In addition, community pension centers are generally set near the community, which will bring challenges to different families, as the privacy and family information of the elderly are relatively transparent.

Therefore, the different pension modes of China have not yet fully formed a complete system that complements and supports each other, especially community pension, with great development potential, is still in its infancy. In addition, there has not been a unified management system, service standards, charging standards, support standards and supervision systems for a large number of private elderly care institutions. Therefore, the development of a diversified pension system with Chinese characteristics requires the coordination of the active interaction of the three modes so that individuals, communities, enterprises, and the government can clarify their respective roles and jointly uphold good beliefs to assume responsibility. In this regard, Western developed countries, such as the United States and the UK, formed a relatively mature social mode as they entered the aging society earlier than China. Therefore, it is of great facilitating and promoting effect to refer to the experience of Western developed countries with the combination of the actual conditions of China in the construction of pension system.

## 2 Characteristics of the Pension Mode in the UK

The pension mode in the UK has become a relatively mature system led by the government and extensively participated in by social institutions and the public. The UK introduced the National Health Insurance System (NHS) in 1948 to allow residents to use most medical services or medical care services for free. However, in terms of pension services, full coverage cannot be achieved. Statistics show that approximately 85% of elderly people with varying degrees of behavioral inconveniences are still cared for by their family members or relatives at home. For empty-nest elderly or elderly people with more serious problems and lower income, the government also has relatively complete measures. On the national level, elderly people, who are severely disabled and unable of self-care and meet eligibility requirements, can apply for disability living allowance and nursing tolerance. Local governments also set up special funds to carry out community pension projects. However, the elderly who

want to enjoy free elderly care services must go through a strict income test; that is, the government conducts investigations into the property and economic conditions of the elderly. At this stage, only residents with a total property of less than £14,250 can get pension services; residents with a total property of £14,250 and £23,250 can get part of the required pension services for free; residents with a total property above £23,250 will need to pay for the elderly care services themselves.

Community pension mode in the UK is rather outstanding. With its complete evaluation, management and supervision system, diversification and comprehensiveness in service content, and active social participation, it can provide good experience in the development of community pension mode of China.

## *2.1 The Legal Foundation, Supervision and Management System of the UK Government*

The public pension service system in the UK has a good legal foundation. In 1990, the British government promulgated the National Medical Services and Community Pension Act to institutionalize and legalize elderly care responsibilities, systematically integrate health institutions and government agencies, and determine the structure and framework of community elderly care. A benign community pension system was initially formed. This act stipulated the direct responsibilities of the national social security department, established that the local government plays a leading role, and preserved and highlighted the role of the market, and shifted the focus from "what kind of service the institution can provide" to "what kind of service the residents need". The government assesses community elderly care services, investigates elderly needs, makes overall plans, funds public elderly care projects, and commissions specialized agencies to provide services. This part of the funds comes partly from the central government's appropriations, and the other part comes from local taxes. In the specific implementation process, the government adopts a project management mode for professional institutions that wish to obtain special funds and has detailed steps and procedures for project declaration, review, execution and supervision. What needs to be emphasized is that when reviewing and selecting appropriate professional institutions to undertake projects, the government ensures that all institutions participate in competition and selection together.

For institutions that have already provided community elderly care services, the follow-up supervision of the government mainly focuses on the training of professionals, the facility configuration, service standards and service prices. The supervision of quality is trusted to the British Nursing Quality Committee established in 2008, which merges some of the functions of the Social Service Supervisory Committee and Health Care Committee, aiming to fully regulate the British nursing supervision system and improve the quality of nursing services. The registration and review of new professional nursing institutions is also carried out by this committee. Subsequently, the British government promulgated the National Minimum Standards

for Nursing Services, which specifically detailed the service standards for nursing institutions, and gradually formed a system for evaluating nursing services based on nursing results to provide a reliable basis on service level testing and performance evaluation to the nursing quality committee. The specific evaluation basis includes (1) interviews with employees of professional nursing institutions; (2) regular reports of professional institutions or service providers to management institutions; (3) questionnaires of service users; (4) family members of service users and other related parties' information provided by professionals related to this service; (5) critical inspections of professional institutions and service providers without notice; and (6) historical information of professional institutions and service providers. Ultimately, the British Nursing Council will give star ratings to professional institutions and service providers based on the assessment results.

The British government also has its own operating procedures to provide people with personalized elderly care services. The social security department of the local government is responsible for assessing the elderly with elderly care needs, matching needs with the service items that can be provided, and adhering to the principle of "helping those most in need". The elderly can choose to accept or refuse the service or part of the service. After the assessment, the elderly who are eligible for the service need to undergo an income audit to determine whether the service is free.

## *2.2 The Community Pension System of the UK*

To optimize family pension mode and improve community pension mode, the British government has actively carried out the construction of elderly apartments and introduced a commercial and welfare housing security policy. The elderly can choose to rent or buy an apartment with price below the market value. Generally, only people over 55 or 60 are allowed to own and live in this kind of apartment. The elderly can apply to the government to enter the waiting list to be eligible to stay in apartments for free, and choose to buy or rent. The project manager is responsible for the staff and property management of the apartment. Generally, the elderly apartments are equipped with staff on duty to provide some assistance, and there is an alarm system in rooms to provide for the elderly the emergency services. The elderly apartments also have public activity areas and gardens, some also provide open residential care for the elderly so that they can obtain support and services in a familiar environment.

In addition to apartments for the elderly, the British government's improvements to community elderly care include the establishment of day activity center, which is a community service organization with comprehensive functions established by a nonprofit organization funded by the British local government or supported by the government, aiming to provide a place for entertainment and socializing. It is worth mentioning that, under the supervision and encouragement of the government, many community elderly care institutions in the UK have also derived day care services and respite services; that is, if the elderly want to temporarily improve their living environment, they can also choose this service.

Regarding service content, British community services are comprehensive, diverse and multilevel, including life care and personal care. Life care mainly refers to the care of daily life, such as cleaning, housework, shopping and cooking. Personal care refers to dressing, changing clothes, and bathing for the elderly. In addition, community services also provide material support for the elderly, including food, crutches and wheelchairs and convenient facilities. More importantly, the community elderly care services focus on supporting other aspects of the elderly's lives, including specialized personnel to provide consulting services for the elderly. For example, The Housing Improvement Agency, a nonprofit organization supported by the British government, will provide advice, support and help for the elderly, especially those with disabilities. The staff of the housing improvement agency will conduct door-to-door visits and provide some relevant information, suggestions and support, including property issues, housing selection issues, legal rights, and other feasible service support. They will also give the elderly some advice on financial management options and substantial financial assistance, including advice on obtaining independent financial rights, charitable funds, information on insurance claims and savings deposits, etc. In addition, the British local government will also give elderly people advice on fully enjoying life and guide them to develop their hobbies. Such services not only fully mobilize the efficiency of social resource use but also improve the quality of elderly care services.

In addition to the elderly care community, there are also a large number of commercial developers and private elderly care organizations in the UK to compensate for the lack of public elderly care services. In addition, a large number of nonprofit charitable organizations have fully mobilized ordinary people's attention to social pension issues by encouraging donations, establishing charity stores, organizing and doing volunteer activities, etc. Therefore, these commercial nursing homes and nonprofit organizations have also played an important role in the stable development of the British pension industry. Table 1 shows the ownership of nursing homes in the UK. The percentage of privately owned enterprises is as high as 73.6%, with large established chain enterprises taking the lead.

The government has played a supporting role in family pension. For family members who need to take care of the elderly, they have the opportunity to apply

**Table 1** Percentage of nursing homes with different property rights in the UK

| Ownership | Percentage of total nursing homes (%) |
|---|---|
| Privately owned | 73.6 |
| Local government | 6.1 |
| Volunteer organization | 18 |
| British National Medical Service System | 0.9 |
| Other | 1.4 |

*Data source* British Social Security Report (2009), British Social Service Supervision Commission

for the "caregiver allowance" provided by the government if they meet the corresponding conditions, such as low income and long caring time. In addition, some "day nurseries" mentioned in the community pension service or some nonprofit institutions also have corresponding support policies. For example, caregivers should be organized to communicate with each other and provide targeted professional family pension advice.

It can be seen that, in addition to the mature development of the combination of family pension and community pension, the British government has also given full play to the role of the market in institution pension. They fully complement each other and promote the coordination of the government, nonprofit institutions, profit-making institutions, and personal care so that the diversified care mode could be developed in a healthy and organic way.

## 3 The Revelations of the British Pension Mode to the Pension Industry of China

The gradual improvement of the British pension mode and the continuous refinement and deepening of pension services benefit from its mature market economy system and continuously developing health industry technology. In addition, the leading role played by the government is the key in guiding and promoting the development of the elderly care market, establishing and improving relevant laws and regulations, deepening the management system, and establishing a community pension mode. Specifically, there are some revelations:

### *3.1 Attach Importance to and Improve Laws and Regulations on Elderly Care Services*

In 1990, the British government introduced the National Medical Services and Community pension Act to incorporate the responsibility of community pension into the law, laying the foundation for the British community's elderly care services. With the development of elder care services, the British government began to implement the Health and Social Security Act in 2001 to plan and adjust the system of medical elder care services. The act concentrated on the management resources of the elderly care service and promoted the development of the elderly care industry and improved social resource efficiency. In addition, the Care Act introduced by the British government in 2014 strengthened the government's supervision of elderly care services and promoted more comprehensive services. With these acts, the UK's laws on the pension system have almost been complete. For example, as mentioned above, to obtain free elderly care services from the local government, the assets of the care recipient must be less than £14,250. At the same time, the law also stipulates

that if the recipient of the care grants real estate or property to children or relatives to obtain this benefit, it will be regarded as an act of deliberately reducing the property, in which cases, punishment is also possible. The Brithish government continued to refine the responsibilities of local governments and various professional organizations through laws. For example, the 2014 Care Act stipulated that the physical and mental health of caregivers in the family should be the responsibility of the government, and it has continuously improved at the legal level, which provides timely direction and fills loopholes for the development of the entire industry.

China is in urgent needs to introduce laws related to elderly care services such as the Elderly Care Law, to promote the rapid development of China's elderly care industry, the rapid establishment of the elderly care system, the improvement of policy design at all levels, and the standardization of management of all parties, as well as to clarify the responsibilities of individuals, society, professional institutions and the government to form a complete pension system. On this basis, specific laws such as industry entry permits, service types, business regulations, administrative management, financial support and supervision systems will be regulated to gradually solve the problems of inconsistent internal service standards, uneven service types, and different charging standards in the elderly care industry and gradually coordinate the establishment of a unified pension system in different regions, levels of government and relevant departments in China. At the same time, we must also promote the formation of an organic unity of family, society and government and the gradual improvement of laws and regulations, ensuring that there are laws to follow, laws must be followed, and strict enforcement of the law.

## *3.2 Give Full Play to the Leading Role of the Government*

The development of elderly community services in the UK is inseparable from the government. The leading role of the government is reflected not only in the formulation of laws and regulations, the top-level design and planning of the pension system, and the continuous supervision and evaluation of pension services, but also in the strong support of financial and material resources. The leading role of the government can fully mobilize resources in pension industry and promote the rapid formation of the pension system and the rapid development of the pension industry. In addition, the British government has played an important role in establishing a good pension care industry environment, protecting the legal rights of the elderly, protecting the legal rights of nursing workers and caregivers in the family, and building a safe and sustainable social security system.

The Chinese government should continue to play the leading role and strengthen the macro guidance in the construction of the pension system, strengthen the integration and utilization of various resources, increase financial expenditure, give the central role of neighborhood committees, neighborhood offices, community management centers and other grassroots organizations in community elderly care services, and establish a sustainable pension system. It is worth pointing out that the role

played by the British government in the development of the elderly care system is not to directly intervene but to formulate relevant policies to design the elderly care industry as an intermediary between providers and recipients of elderly care services. The government should supervise and regulate the development of the entire system and create a good environment for the development of elderly care services. At the same time, the government should also pay attention to protect the legal rights and interests of the elderly, to protect their personal and property safety, to safeguard the self-esteem, autonomy and independence of the elderly, and to encourage the elderly to have a rich and colorful life in their older years.

### *3.3 Attention Given to the Training of Professional Talent*

Compared with British community pension services, Chinese community pension started late with a low starting point, facing problems such as weak infrastructure, serious shortage of professionals engaged in community elderly services. At present, most Chinese community service staff have low professional quality without any professional training, and solve problems only based on experience. Therefore, to improve the community's comprehensive service level for the elderly, China must establish a professional social worker team as soon as possible. On the one hand, it is necessary to establish and improve a scientific and reasonable social work talent training system, an evaluation system, a perfect talent mechanism, and an effective incentive mechanism as soon as possible; on the other hand, for established social work positions, professional standards and qualification standards should be set up, and continuing education standards should expand. In addition, the original nonprofessional community workers should be trained to ensure that all elderly community service providers have the necessary geriatric and professional social work knowledge.

### *3.4 Enhance Support for Family Pension*

Family is also an element that cannot be ignored for elderly care. Community pension services can take the family of the elderly as a whole and maintain the family's care ability by providing a full range of services to achieve the purpose of caring for the elderly. As the main members who take care of the elderly, the caregivers are under heavy financial burden and mental pressure. The various measures taken by the British government can be used as a good reference. In China, due to the influence of traditional culture and the concept of family affection, the family plays an irreplaceable function in caring for the elderly. However, the economic development level is still backward compared with developed countries, therefore, it is unrealistic to put the elderly completely out of the family and be provided by society. The reform of community pension services does not mean that families can evade their

responsibilities. In contrast, family members should be more encouraged to actively participate in care services for the elderly, such as providing home help services, day care, respite services, and caregiver support groups through community pension institutions. The combination of community pension and family pension will achieve the goal of better caring for the elderly.

### *3.5 Mobilize and Develop Social Participation*

The development level of nonprofit organizations in the UK is very high. These nonprofit organizations, formed spontaneously by the private sector, have assumed important responsibilities in the UK pension system. Although their development benefited from the support of the government, they mainly adopted the method of coordinating social funds and mobilizing volunteers to operate and develop. The professional nonprofit organizations formed in the UK also conduct a large number of social surveys and studies, initiate management and service innovations, and provide the elderly with public welfare services based on their needs. They can also mobilize a large number of nongovernmental volunteers, mobilize the love and charity spirit of the public, and coordinate the power of society to provide considerable manpower and material resources for the development of elderly care services. This can not only optimize social values, improve the level of elderly care services and promote the improvement and development of the elderly care system, but also reduce financial burdens.

However, China generally does not pay enough attention to the role of nongovernmental organizations, and there is a lack of integration of social resources at this stage. The lack of trust and coordination among government departments, between government and enterprises, between government and nongovernmental organizations, and between nongovernmental organizations and the public has led to the slow development of nonprofit organizations. Therefore, on the one hand, the government can strengthen its policy preference for nonprofit organizations and cultivate their channels and mechanisms for entering the public domain; on the other hand, it should increase supervision, establish unified management standards for nonprofit organizations, improve their internal management mechanism, and establish a scientific and standardized management system. At the same time, it is necessary to establish a financing incentive mechanism to guide the reasonable flow of private financial resources to nonprofit organizations, make full use of the power and advantages of social welfare organizations, cultivate the public's sense of trust, promote the importance of individual participation in elderly care services and basic nursing knowledge, and fully mobilize the optimal allocation of social resources for the elderly.

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# Private Equity Funds and Population Aging


**Chengming Li and Song Huang**

Finance is the crown of the economy, and private equity funds are noted as the jewel in the crown. The private equity market is an important part of the multi-level capital market system, and private equity funds are an important promoter of improving corporate efficiency and boosting industrial upgrading. In the new era of the economic transition from rapid development to high-quality development, vigorously developing private equity funds is also an inherent requirement under the innovation-driven development strategy.

China is in the initial stage of population aging at present, and the impact of population aging on the labor force, consumption, savings and pensions has already emerged. The aging problem has become a practical issue worthy of attention. In the context of population aging, the private equity industry faces new opportunities, as well as challenges brought about by industrial structure adjustment, consumption upgrades, social security system improvement, financial system changes, etc. In light of this context, we must, on the one hand, accurately evaluate the pressure that the aging population will bring; on the other hand, find effective countermeasures, changing the negative to the positive, grasping the opportunities provided by the aging population.[1]

This article first sorts out the development history and status quo of private equity funds in China to understand its development stages and industry characteristics and then analyses the mechanism of the aging population on private equity funds, elaborates the opportunities and challenges, and puts forward policy recommendations.

[1] See the "Preface" of this book written by Li Lining.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_26

# 1 The History of Private Equity Funds in China

Private equity refers to non-publicly issued and traded equity. Private equity funds are similar to securities investment funds, and the main investment direction is private equity. Private equity funds in their narrow sense refer to M&A funds or leveraged buyout funds; in its broad sense, they include venture capital funds. The private equity fund mentioned in this article is a broad concept. Because of the changes in the policy environment and investment situation, private equity funds in China have roughly gone through four stages:

## *1.1 The Initial Stage (1985–1996)*

The Central Committee of the Communist Party of China first introduced the term "venture investment" in 1985.[2] In September of the same year, the State Council formally approved the establishment of China Venture Capital Corporation (CVIC), marking the birth of venture capital companies. In the following 10 years, the State Council successively issued policies and regulations aimed at exploring the development path of venture capital funds in China.

At this stage, because of a lack of experience, many administrative interventions in the management and policies introduced by the government are not pertinent and feasible. Additionally, economic instability discourages foreign investment. Therefore, the overall development was quite slow in the exploratory stage.

## *1.2 Early Stage (1997–2004)*

Since 1997, international venture capital institutions have become active; explosive growth of information technology has made Internet companies the main targets of investment; Overseas listings of AsiaInfo and Sohu have stimulated the development of the industry. However, beginning in 2001, the rapidly growing venture capital industry fell into a trough because of the burst of the Internet bubble. Zhongchuang failed during this period, and the government began to attach importance to the combination of theory and practice, which laid the foundation for the subsequent introduction of relevant laws and regulations.

At this stage, some unsound institutional weaknesses were exposed. The government's new system and positive attitude during this period had a positive impact on the venture capital industry that was at a trough after the Internet bubble.

[2] See Decision on the Reform of the Science and Technology System.

### *1.3 Rapid Development Stage (2004–2011)*

With the recovery of overseas capital markets such as the United States and Hong Kong, Chinese companies have set off an upsurge of overseas listings and financing since 2004, and the private equity fund has re-entered the fast lane. The Interim Measures for the Management of Venture Capital Enterprises promulgated in 2005 recognized the domestic exit channels of private equity funds by law. The Partnership Law revised in 2007 clearly recognized the partnership form of private equity investment and solved the problem of double taxation. The newly revised Securities Investment Fund Law in 2012 means that the legal status of private equity funds has been established and that they have become a regular part of the financial market to be included in supervision. In 2014, the Private Investment Fund Manager Registration and Fund Filing Measures (for Trial Implementation) were issued, and the private equity fund filing system was launched. In June of the same year, the China Securities Regulatory Commission reviewed and approved the Interim Measures for the Supervision and Administration of Private Investment Funds. In 2018, the four departments jointly issued the Guiding Opinions on Regulating the Asset Management Business of Financial Institutions. The official draft clarified that private equity funds are also included in the scope of supervision.

At this stage, the government introduced a series of formal systems, and the formulation of these systems continuously improved the private equity market mechanism. At present, China's private equity market is still in its infancy, and there is still ample room for development in the future. It will be a general trend to continue to introduce targeted laws and regulations to promote the healthy development of the private equity market.

## 2 The Status Quo of the Private Equity Market of China

Private equity funds have developed rapidly in the past decade or so. Especially in recent years, through a series of measures such as regulatory reform and registration and filing, China's private equity market has made great progress in fund-raising, investment, management and exit mechanisms.

### *2.1 Overall Market Overview*[3]

As of December 2017, there were more than 13,000 private equity investments in China. Market activities have increased year by year, and competition among institutions has intensified. Calculated by scale, the total capital under the management

[3] Data from Zero2IPO Research Center "Review and Prospect of China's Equity Investment Market in 2017".

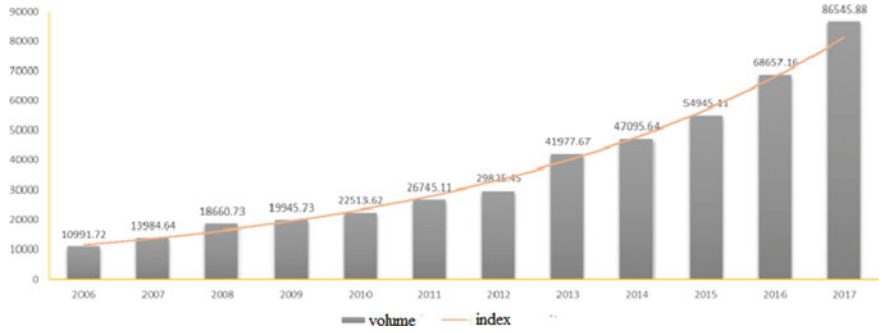


**Fig. 1** Capital management volume of China's equity investment market

of private equity investment in Mainland China exceeds 8.7 trillion yuan, and the number of registered private equity fund managers has reached 238,300, of which the number of registered employees of private equity venture capital and equity investment fund managers is approximately 137,000 people. China has become the world's second largest equity investment market (Fig. 1).[4]

## *2.2 Annual Changes*

In 2017, 3574 new funds were raised in China's stock investment market, and nearly 1.8 trillion yuan was raised, a year-on-year increase of 30.5% and 46.6%, respectively. In terms of investment, the total number of stock investment markets in China in 2017 was 10,144, with a total investment of 1.2 trillion yuan, an increase of 11.2% and 62.6% year-on-year, respectively. With the expansion of China's private equity investment market in recent years, the proportion of its total investment in China's GDP has continued to rise, and its supporting role in the real economy is gradually emerging. In 2017, the total investment in China's stock investment market accounted for 1.5% of China's GDP, an increase of 0.5% over 2016, creating the highest record. In terms of exit, in 2017, the number of exit cases of Chinese equity investment funds reached 3,409, of which 1069 were IPO exit cases, accounting for 31.4% of the total. Affected by the accelerated IPO review this year, the total number of IPOs in the private equity market increased by 94.0% year-on-year (Table 1).

## *2.3 Distribution of Investment Types*

In terms of investment types, China's private equity market is dominated by growth funds, accounting for 59% of the total, followed by venture capital funds, accounting

[4] Data comes from the Fund Industry Association.

**Table 1** Status of equity investment scale in 2017

| Overview | Number of funds | Total amount of funds raised | Number of investments | Total amount of investments |
|---|---|---|---|---|
| Data | 3574 | 1.8 trillion | >10,144 | 1.2 trillion |
| Year-on-year increase | 30.5% | 46.6% | 11.2% | 62.6% |

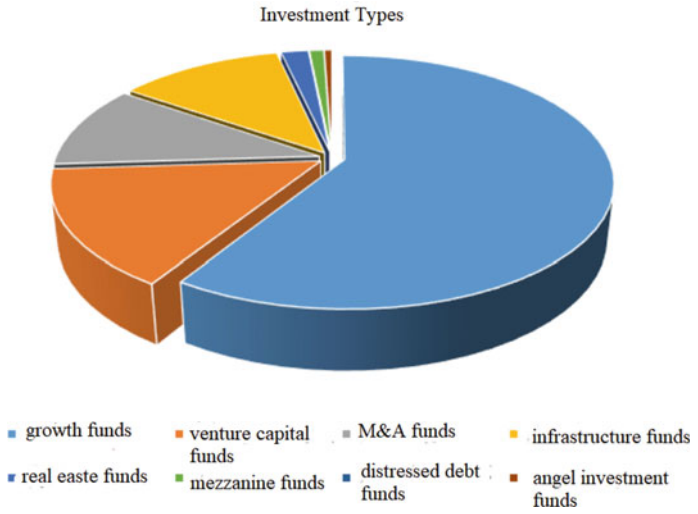


**Fig. 2** Proportion of investment types

for 15% of the total, infrastructure funds and M&A funds accounting for more than 10%, followed by real estate funds, mezzanine funds, distressed debt funds and angel investment funds (Fig. 2).

## *2.4 Development Trends*

Since the stock market crash in 2015, the overall A-share market has been in a downturn. The bond market's gradual accumulation and exposure of credit risks has made investment institutions in some markets more cautious. At the same time, although there have been some investment opportunities in the future market, it has also been due to drastic fluctuations in market prices. Increased investment difficulty and risks. Under such circumstances, some investors have begun to turn to private equity investment funds, returning the advantages of private equity investment funds, and obtaining a relatively stable return on capital through long-term investment. Due to the explosive growth in the scale of private equity funds, it has become an important

force in the asset management industry, and with the tightening of supervision, the industry will be governed by chaos and will continue to embark on a standardized development path. In terms of scale and development speed, private equity funds are higher than securities private equity funds and will play a pillar role in the development of China's capital market in the future.

The capital market is a booster for the transformation and upgrading of China's economy. Whether in terms of regional economic transformation, industrial structure upgrading, supply-side reform, etc., or from the perspective of deleveraging in the financial industry, the capital market has played an irreplaceable role. With the deepening of the aging of the population, in the new stage of the capital market, the role of private equity investment is very positive and friendly.

## 3 Analysis of the Mechanism of Population Aging in the Private Equity Market

The IMF has pointed out that population aging is reflected not only in the slowdown of the overall population growth rate but also in the negative growth of labor force growth and the sharp increase in the share of aging labor. Especially for China, in the short term, the speed of China's aging population will tend to accelerate, the time between turning points will be shortened, and the burden will increase. Population aging will have a profound impact on all aspects of the economy and society.

This article describes the mechanism of population aging in the development of the private equity market. The path is mainly achieved by changing the pattern of the financial market and increasing industrial investment opportunities. The details are as follows: population aging will reduce household savings, produce capital spillover effects, expand consumption power, and drive the development of related industries; the improvement of investment opportunities boosts the development of the private equity market; the aging population forces companies to respond to rising labor costs through technological advancement, and technological advancement improves unit labor output, promotes the upgrading of industrial structure, and releases investment opportunities in the industry; population aging changes the existing financial structures, reduces bank savings, increases the investment of funds, and further expands the proportion of equity investment, which brings new opportunities to the private equity market; it will also change the existing economic environment and change existing macroeconomic policies and release reform dividends (Fig. 3).

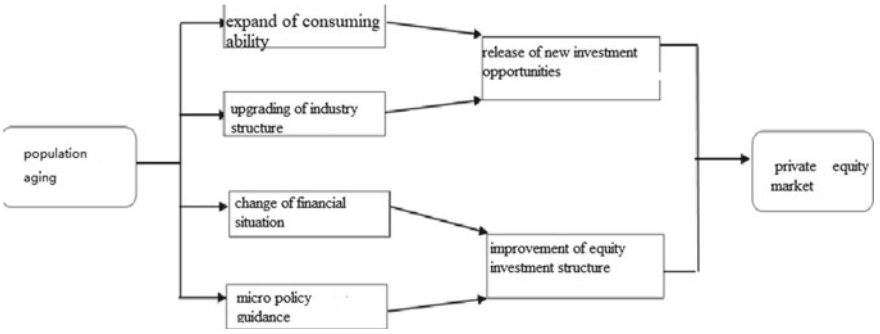


**Fig. 3** The mechanism of population aging affecting the private equity market

## *3.1 Population Aging and Household Savings, Expanding Consumption Capacity*

The age structure of the population is one of the important factors affecting the savings rate. Generally, young people tend to save, and elderly people tend to withdraw. Chen Yanbin et al. (2014) find that in the future, the aging population will be the most important factor driving down China's national savings rate. Jian Yongjun et al. (2011) find that capital flows from areas with a rapidly aging population to areas with a relatively slow aging rate, which means that rapid aging has made China a major "capital exporter". With the arrival of the demographic dividend turning point, the aging population will significantly reduce China's savings rate and lead to a decrease in capital exports. On the topic of whether delayed retirement policies will bring secondary demographic dividend, Geng Zhixiang and Sun Qixiang (2017) find that the impact of delayed retirement on total output depends on the savings effect and the advantages and disadvantages of increased labor supply to enlarge output caused by rational people's reduction in savings. From the perspective of the life cycle, the consumption structure of the elderly is reflected in the increase in expenditures on medical expenses, public goods and other consumer goods and the decrease in consumer demand for real estate, transportation, and communications. In the past, China's financial industry is producer finance that has always served its producers. In the future, as the savings rate drops and the consumption rate rises, it should serve consumers and turn to consumer finance.

## *3.2 Population Aging and Industrial Structure Adjustment, Pharmaceutical and Other Growth Industries*

China is currently facing the challenges of increasing population aging and industrial structure transformation and upgrading. Wang Wei et al. (2015) find that population

aging not only promotes the optimization of China's inter-industry structure but also promotes the optimization of the internal technical structure of the secondary and tertiary industries. The net effect of population aging on the upgrading of industrial structure is positive, and it is suggested that China should make full use of the aging population to guide industrial restructuring and promote advanced industrial structure. Liu Yufei and Peng Dongdong (2016) empirically survey the relationship between population aging and industrial structure transformation from the perspective of supply and demand by using China's provincial panel data from 1993 to 2013 and conclude that China's industrial structure transformation shows a strong positive spatial correlation with population aging, and aging can promote the transformation of the industrial structure to a higher level, but the impact of the upgrading of the industrial structure on population aging varies greatly in different regions.

### *3.3 The Aging Population and the Pattern of Financial Institutions, the Proportion of Equity Investment Has Increased*

China's financial system has always been dominated by banks, but in the future, it will become a trend that banks and institutional investors will jointly dominate. Taking insurance investment as an example, from the end of 2006 to October 2016, bank deposits in China's insurance investment structures fell from 30.32% to 18.00%. Bond investment rose from 18.46% to 33.66%; stock and fund investment rose from 9.26% to 14.42%; and other investments currently accounted for 33.93%. Insurance institutions are playing an increasingly important role in the global private equity market due to their large capital volume and long investment cycle. China's original financial system mainly serves young people, but as the elderly increases, financial products for the elderly, such as pension insurance, will rapidly increase.

### *3.4 Population Aging and Macroeconomic Policies, Changing the Original Policy Direction*

With the deepening of China's population aging, aging will inevitably affect the implementation of macroeconomic policies and become an important factor in financial innovation. In terms of monetary policy, Liu Xiao et al. (2014) find that China's population aging is effective for the credit transmission mechanism of monetary policy through empirical analysis. China's monetary policy credit transmission mechanism is an important channel for monetary policy transmission. In terms of fiscal policy, the pension gap under the current pension system continues to widen. The process of aging means that the government deficit is rising, and it also means that the fiscal system must be changed. In terms of economic development, Lin Shanjun

and Sun Qixiang (2015) explain the impact of population aging on China's crossing of the middle-income trap from the perspective of the economic effects of the pay-as-you-go system. The higher the degree of population aging is, the greater the negative impact of the characteristic pension insurance system on the economy, which will increase the risk of China falling into the "middle income trap". Wang Zhibao et al. (2013) conclude that population aging did not hinder economic development through the evolution process of population aging in various provinces and regions and its correlation with economic development, which is in line with the general law of global population aging evolution.

## 4 Opportunities and Challenges of the Private Equity Industry in the Context of an Aging Population

### *4.1 The New Era Provides New Opportunities for Private Equity*

The consumption upgrade in the Chinese market is the next major investment theme. In the health-care sector, the issue of population aging is very urgent. The market's optimism about the future development of health-care companies makes these companies have higher valuations when they exit. The world's top 500 Chinese medicine companies account for more than 40% of the total. United States pharmaceutical consumption accounts for an average of 17% of GDP, and China accounts for less than 7%. At present, there are more than 100 times more medicines in China than abroad in the same period. The medical and health-care industries have their own industrial peculiarities. It takes a relatively long time from R&D to technology commercialization and waiting for better exit opportunities. At the same time, technological advantages usually bring high barriers to competition and provide a good level of profit. In the context of the aging population and the implementation of new medical reform policies, China will continue to introduce policy support and guidance and cash, technology, talent and equipment, all of which will further promote the continuous and rapid growth of the biotechnology and medical industries. This improves the industry's return on investment. More importantly, China is deleveraging and deepening its structural reforms. The next 10 years will usher in the golden period of equity investment.

### *4.2 New Challenges for Private Equity Fund*

China's private equity market is still in its infancy. The entire industry has insufficient preparations in terms of investor structures, exit channels, and talent cultivation. The private equity regulatory mechanism needs to be further improved. From

the perspective of funding sources, investors in China's private equity market have always been dominated by financial institutions and private capital. The participation of social security funds and pension funds is very limited. In developed countries such as the United States, institutional investors are the main players, especially public pension funds. In terms of the exit mechanism, the smoothness and perfection of the mechanism directly determines the degree of investment activity in private equity. At present, the exit channels for China's private equity market are still relatively narrow. The transfer mechanism between the markets has not yet been formed, and the attractiveness of the NEEQ market needs to be further improved. The M&A market is another important exit channel for private equity funds to withdraw and is in need of breaking local protectionism, improving the efficiency of M&A reviews, and improving the institutional guarantee system. There is still room for improvement in terms of enriching M&A financing. In terms of talent team and management, compared with foreign private equity institutions, there is still a long way to go in aspects of corporate governance, management experience and international reputation. The explosive growth of the private equity market calls for qualified investment management and talent teams.

## 5 Conclusions and Policy Recommendations

The problem of population aging is essentially a financial problem. In its response to its challenge, China has to prepare more in the understanding, material foundation, institutional arrangements, and financial aspects. The private equity market will certainly play an important role. Hence, the following policy recommendations are put forward to better promote the development of the private equity market.

### *5.1 Optimize the Mechanism and Broaden Fund-Raising Channels*

Private equity funds are characterized by long investment cycles. Pension funds and social security funds also have the characteristic of pursuing long-term returns, and the scale of funds is huge, especially in the context of an aging population. Its capital volume will further increase. However, the existing system has severe restrictions on social security funds and pension funds investing in the private equity market. In the future, relevant departments should formulate rules for their respective funds, further streamline administration and delegate powers, reduce mechanism constraints, and broaden the funding channels for private equity funds.

## 5.2 Improve the Construction of a Multilevel Capital Market System

There is still a long way to go in the construction of China's multilevel capital market system, and there is still room for optimization in the construction of the market structures and the improvement of the basic sector system. At present, the market capacity and activity of the "New Third Board" and regional equity markets need to be improved. It is recommended to build a reasonable upgrade channel, make full use of the transfer system to connect and coordinate the orderly development of markets at all levels, and stimulate the vitality of markets at all levels. At the same time, we will increase the development of the secondary market for private equity funds to reduce risks and improve liquidity.

## 5.3 Further Improve the Supervision Mechanism of the Private Equity Market

With regard to the legal basis for protecting the development of private equity funds, China has now initially formed a system. However, the corresponding implementation rules and specific clauses of the law need to be optimized, supplemented and perfected. It is recommended to further strengthen the prevention of systemic risks and the protection of investor interests and expand the scope of supervision to more links such as fund information disclosure, asset custody, and investment operations on the basis of appropriate supervision methods, focusing on information disclosure. Reduce supervision costs. At the same time, it is recommended to improve the protection of intellectual property rights to further stimulate innovation and provide a better economic environment for the operation of private equity funds.

## 5.4 Scientific Incentives to Attract and Cultivate Talent

Excellent investment institutions and fund management teams are important software to achieve the best development of the private equity market, but the development of China's financial system is generally lagging behind, and it is urgent to solve the problem of scarcity of talent. It is recommended to introduce a competition mechanism, establish a scientific incentive mechanism and restraint mechanism, strictly regulate the employment standards and assessment systems of practitioners, improve investment fund evaluation methods and project evaluation standards, etc., while attracting foreign high-quality talent to return and drive industry standardization and internationalization.

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# Population Aging and Economic Transformation and Development in Resource-Based Cities Take Shanxi Datong as an Example


**Zeyu Li, Zhifeng Mao, and Jifu Zhang**

Resource-based cities (or regions) refer to cities whose leading industries are the mining and processing of natural resources such as minerals and forests; their main function is to provide society with resource-based products such as minerals and processed products. The National Sustainable Development Plan for Resource-Based Cities (2013–2020) issued by the NDRC (National Development and Reform Commission) delimited 262 resource-based cities, including 126 prefecture-level administrative regions (prefecture-level cities, regions, autonomous prefectures and leagues, etc.), 62 county-level cities, 58 counties (autonomous counties, forest areas, etc.), and 16 municipal districts (development zones, management areas). According to the types of mineral resources, they can be roughly divided into petroleum cities and coal cities. Daqing in Heilongjiang is a typical petroleum city, and Datong in Shanxi is a typical coal city. The development of resource-based cities will inevitably face the problem of economic transformation and development; successful transformation will bring new life to the city and help it move toward sustainable development; unsuccessful transformation will eventually lead to "exhaustion of the mine and decline of the city". Taking Datong in Shanxi Province as an example, this article analyzes the problems of economic transformation faced by resource-based cities against the background of population aging and proposes corresponding policy recommendations.

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Y. Li et al. (eds.), *China's Road and Aging Population*,
https://doi.org/10.1007/978-981-19-8891-2_27

# 1 Population Aging: Status Quo and Characteristics

## *1.1 Status Quo*

Aging refers to the trend that the proportion of young people in the total population is decreasing while the proportion of the elderly is increasing. It is generally believed internationally that when the population aged 60 and above accounts for 10% or the population aged 65 and above accounts for 7% of the total population, this officially means that this country or region enters an aging society. According to the sixth national census published in 2011, "the population aged 60 and above accounted for 13.26%, an increase of 2.93 percentage points from 2000, of which the population aged 65 and above accounted for 8.87%." China has stepped into an aging society. The aging of the population has a major impact on social and economic development. The report of the 19th National Congress of the Communist Party of China clearly asserted the claim that we should "actively respond to the aging of the population, build a policy system and social environment of support the elderly, filial piety, and respect the elderly, promote the integration of medical care, and accelerate the development of the aging cause and industry."

The population sample survey data of Shanxi Province showed that the population of 60 years and above reached 5.3 million in 2015, accounting for 14.45% of the total population, an increase of 0.66 percentage points from 2014; the population of 65 and above reached 3.33 million, accounting for 9.1% of the total population, an increase of 0.42 percentage points from 2014. Shanxi entered an aging society in 2003 and has accelerated the aging process since then. The absolute size of the elderly increased by approximately 0.96 million in the 12 years from 2003 to 2015. Meanwhile, the population born in the 1950s and 1960s has successively reached their old age; Shanxi will usher in the fastest growing period of the elderly in the next 25 years.

Datong has developed rapidly since the founding of the People's Republic of China, along with rapid growth in the elderly population. In the early period of the People's Republic of China, the non-agricultural population of Datong was only 0.1117 million. As a large number of factories and mines were put into operation during the "First Five-Year Plan" and "Second Five-Year Plan" periods, hundreds of thousands of industrial workers and their families came to Datong, producing a double newborn population. By the end of the 1960s, the urban population had grown to 0.4044 million. As these people aged 60 after 2010, the proportion and speed of population aging in Datong has exceeded the national level. According to the sixth national census of Shanxi Province, the total population of Datong was 3.38 million, of which nearly 0.44 million were elderly people aged 60 and above, accounting for 13%. It can be seen that Datong has entered an aging society ahead of time, with more prominent momentum. It is estimated that the elderly in Datong will exceed one million by 2040, and one in three will be an elderly person. In other words, the elderly may become the mainstream population of the city.

## *1.2 Characteristics*

The first characteristic is the absolute aging of the population. Population aging includes two strands: the longevity of the elderly and the aging of the young population, referred to as the "top aging" in demography according to the changes in the age structure. The former means that the elderly live longer currently, it is not uncommon for 90-year-old, while 70 was rare in the past. The latter means that the number of population entering old age keeps increasing year by year, as the subsequent effect of the past birth peaks (including the superposition of the cohort effect and the period effect of population growth), which has become the current peak of the elderly growth. Assuming that 60 is the starting age of old age, the new population entering old age in 2013 was born before 1953; it is expected that the large number of newborns in the early 1960s will gradually evolve into the peak growth of the elderly in the next few years. The main body of the absolute aging population was born 60 years ago, irrelevant to the family planning policy that started in 1973 and the one-child mandatory policy after 1980. The curb and weakening effect of family planning on the absolute aging of the population will be manifested through the relative decrease in the elderly in 2033, especially after 2044.

The second characteristic is the relative aging of the population. In other words, the aging of the total population. The aging of the population with fewer children, only child in the situation of rapid demographic transition, is related to family planning, which is called "bottom aging" in demography. Family planning has resulted in hundreds of millions of fewer births in China in the past 30 years; the total population that was originally used as the denominator would have been 100 million people now the denominator has decreased, while the numerator, the elderly population, was born 60 years ago. Therefore, family planning increased the proportion and degree of population aging and the overall burden of support and care of the young population for the elderly population. It is an indisputable fact that family planning amplifies the economic pressure of "macro-aging" and pension pressure. At the micro level, with the aging of fewer births, only child are inseparable from family planning, of which the aging of only child and being childless is the most challenging because the risks and costs of both aging are obvious, considering the millions of families who lost their soles and empty-nest lonely families. Apparently, aging in both cases will face the problem of insufficient human support, which is related to the one-child policy under the background of family planning and the continuous low birth rate coming after. When strict population control and declining birthrates have reached a certain point, advantages will become disadvantages, and development will go the opposite way to our good wishes.

The two characteristics mentioned above are applicable nationwide. A typical resource-based city such as Datong has its own characteristic: emigration population aging. Assuming that the population in this region is open, it can be called "waist aging" according to the changes in the population age pyramid. Emigration population aging is population aging resulting from emigration, inter-generational dispersal and aging due to the outflow of young people and the left behind of the elderly. This

is also related to family planning. China has experienced rapid, sustained and large-scale aging of fewer births and only child since the 1980s, with the number of children who can accompany their parents dropping sharply. It is conceivable that in most families with one or two children, their parents will become empty-nest elders once the children go out, which will seriously affect care and support for the elderly of the empty-nest parents, who are likely to be reduced to "the most vulnerable group", with nobody and nothing to depend on and no good ending. The ancient motto, "when parents are alive, no traveling far away", has strong practical significance, but doing so may also sacrifice the future of young people. This is a dilemma in the era of family planning.

## *1.3 The History of the Economic Development of Datong: Success of the Coal Mine and Failure of the Coal Mine*

Datong is located in the Loess Plateau of northern Shanxi, between the inner and outer Great Wall, with a total area of 14,127 square kilometers, a population of 3.38 million, and four districts and six counties under its jurisdiction. It is an important coal mining city with a superior geographical location: it is the central city of northern Shanxi; the border area of Shanxi, Hebei, Shaanxi and Mongolia; an important transportation hub in North China, the intersection of the Beijing-Baotou Railway and Tongpu Railway connecting two international lines and the starting point of the Da (tong) Qin (Huangdao) line. Because of its special geographical location, Datong was the "War Capital", "Buddha Capital" and "Business Capital" in history and has become a world-famous "Coal Capital" in modern times because of its rich coal resources; it is one of the 24 first announced historical and cultural cities for its rich and various historical sites.

Abundant coal resources are the greatest advantage of the economic development of Datong. The Datong coalfield has a total area of 1827 square kilometers, lined with two coal measures, Jurassic and Carboniferous Permian, with a total coal resource of 71.8 billion tons. Among them, the coal-bearing area is 632 square kilometers, the coal resources are 45.15 billion tons, and the explored and controlled reserves are 375.7 tons, accounting for 83% of Datong's coal resources. The proven coal reserves are 16.394 billion tons, accounting for 36.3%; the retained reserves are 15.167 billion tons, accounting for 40.4%. Among them, Jurassic coal is known as "Datong coal" and has the characteristics of low ash, low sulfur, and high calorific value. It is a high-quality thermal coal with a proven reserve of 65 billion tons.

In the first two decades of reform and opening up, with the overall revitalization of the economy, many industries have sprung up in Datong; Datong led the surrounding cities in the industrial scale and product quality. The industrial sectors have developed to 32 kinds, in addition to coal and electricity, of which machinery, metallurgy, chemicals, food, building materials, medicine and other industries have been listed as key industries. Pig iron, steel, locomotives, diesel engines, ferrosilicon, picks,

bearings, gearboxes, power cables, calcium carbide, graphite electrodes, synthetic rubber, gas, caustic soda, fertilizers, chemical medicine, wine, sugar, meat products, cement, sanitary ceramics, art ceramics, art ceramics, etc., have formed a considerable scale of production capacity. Many industrial products have won the titles of national, ministerial, and provincial excellence. Products such as wine and medicine have also won international gold awards. There have been 49 premium enterprises and 23 large industrial enterprises with profits and taxes exceeding ¥10 million. Its industrial foundation is quite solid.

However, since the mid-to-late 1990s, Datong, which has been the second largest in the province in terms of total economic output, began to decline in economy. The economy of China entered a period of prosperity approximately 2000, and the demand for coal soared. With the rise of coal prices, Shanxi ushered in the golden decade of coal development, and the economic structures of "coal domination" began to take shape. When the economic structures of "coal domination" gradually took shape, less attention was given to other non-coal industries. Even if the government encouraged coal bosses who had completed the original accumulation to diversify, it would not help. The coal industry, full of huge profits, firmly attracted manpower and resources, and other industries were ignored, causing unbalanced industrial development and lagging urban construction.

In the process of reform and development, famous brands in Datong, such as machinery manufacturing, building materials, textiles, medicine and food, have gradually disappeared; the Agricultural and Animal Husbandry Machinery Factory, Cement Factory, Carbon Factory, Yungang Porcelain Factory, Chemical Fiber Textile Factory, Sugar Factory, Meat Products Factory, wineries and resin factories, which have created famous brand products in the province and even across the country, have also gone bankrupt or closed down or have been merged and acquired. They have become a past that people will remember, while a few new high-quality brands have been established. The Datong Coal Mining Machinery, with advanced technology closely integrated with coal mines and more than 200 varieties of products, is still in its infancy in terms of production and sales because it relies too much on the Datong coal market and has insufficient accumulation of technology, market and talent; therefore, it is unable to create industry-leading brands. Although the production capacity has met the planning requirements, the subsidiaries still have enough production and sales. Datong Locomotive Works was merged into the CRRC Group. Although it is still the main production base of high-power electric locomotives in China, locomotive manufacturing is no longer dominant and has lost its glory. The urban light rail and three-dimensional parking projects that the company plans to develop are not competitive in the industry. Shanchai Company holds the brand of military industry enterprise, "alive is enough, not to be better", and cannot actively integrate into local economic development. It has not taken a new path of military-civilian integration of enterprise products, and it is impossible to create a good civilian brand. The pharmaceutical industry is currently developing well, but the problem of "live in the past" still exists. In recent years, few new brand drugs have been developed and created, and the products are mostly concentrated on primary products such as raw materials.

## 2 Population Aging: Opportunities and Challenges Coexist

Regarding the discussion of how population aging affects economic transformation and development and industrial upgrading, domestic and foreign research is mainly divided into two views: one view is that population aging hinders the upgrading of industrial structure; for the upgrading of industrial structure requires an appropriate population structure, high-quality, high-skilled labor is an important source of driving force for the upgrading. However, the reality in China is that, on the one hand, the working-age population is aging; on the other hand, the human capital and skill of the existing labor force are incompetent to adapt to the needs of upgrading. The other opinion is that population aging promotes industrial structure upgrading. With the loss of low labor costs, the aging of the population will prompt companies to increase their competitiveness through more R&D investment (Chen Yanbin, 2014); the shortage of capital supply brought about by the aging of the population is conducive to the entry of limited savings into advantageous industries, thus eliminating backward production capacity (Wang Wei and Ai Chunrong, 2015); population aging will stimulate the development of the tertiary industry that meets the needs of the elderly, which is conducive to the upgrading of industrial structure (Yang Zhongxin, 2005).

Resource-based cities are prosperous for resources; with resources, a large number of young people from outside will be gathered in a short time, which will drive regional economic development. Resource-based cities will also decline for resources; without resources, a large outflow of young people and a large-scale loss of high-end talent will come after, aggravating the problem of urban population aging, hindering the economic transformation and development and the upgrading of the industrial structure in the short term, and forcing the economic transformation and development and the upgrading of the industrial structure in the long term, if reasonable measures can be taken.

Datong was prosperous because of coal. After the founding of the People's Republic of China, a large number of workers gathered in Datong. By the early 1980s, the industrial economy of Datong developed by leaps and bounds. The overall structures of Datong showed a prosperous situation in which all industries were thriving. It has become an energy center and an important industrial city in Shanxi Province and has played a pivotal role in driving regional development and supporting the construction of the national economy. The average annual economic growth of Datong from 1952 to 1960 was 72.4%; the total industrial output value reached ¥1.46 billion in 1960, accounting for 0.88% of the output value of China (¥165 billion) and 29.3% of Shanxi Province (¥4.989 billion). During the period of ten years of turmoil and before the reform and opening up, Datong entered a period of adjustment. The growth rate has fallen, but the scale and composition of the industrial economy have not changed. In the early stage of reform and opening up, it experienced recovery growth, especially in the coal industry, outshining others. The annual industrial output value reached ¥10.96 billion in 1993, an average annual increase of 8.7%, of which the output value of coal reached ¥4.8 billion and the output of raw coal reached 83

million tons, ranking first among coal-producing cities, accounting for one-fourth of the province and one-sixteenth of the nation. The annual export volume reached 65 million tons, supplying more than 3,000 large and medium-sized enterprises in 27 provinces, cities, and autonomous regions and exporting to more than 20 countries and regions in Europe, Asia, and the United States. The power industry, which is also the pillar of the energy industry, also highlights its advantages. Power production has become an important basis in North China. The output is 7.89 billion kWh, accounting for 18.9% of the province and 0.9% of the nation's total. The annual electricity transmission exceeds 7 billion kWh. The strong industrial economy provides strong support for the ranking of cities. As a result, Datong became one of the first batches of thirteen larger cities announced by the State Council in 1984 and ranked second in Shanxi Province.

The economy developed rapidly in the early stages of reform and opening-up. Coal, as an irreplaceable one-time energy source, is faced with a prominent contradiction between supply and demand. In 1983, the State Council approved and forwarded the "Report on Eight Measures for Accelerating the Development of Small Coal Mines" issued by the Ministry of Coal Industry. Local coal mines in Datong have blossomed everywhere, and the overall layout of the industry has begun to fall apart impacted by the "rapid flow of water" of the coal industry; the false prosperity driven by the high profits of the coal industry completely concealed the sorrow fact that the local industrial system was about to collapse and the hidden dangers of extensive and single industry. Oversupply of coal began in the mid-1990s; however, the over-reliance on the coal industry for more than a decade has been hard to rectify; today, the coal industry is still the barometer of the economy of Datong and has become the main problem that has plagued the transformation and development for a long time.

The economic development mode of over-reliance on coal resources and the unreasonable industrial structure of "coal domination" in the later period led to the large-scale outflow of high-end talent and emigration of large numbers of young people to economically developed eastern coastal areas, which exacerbated the problem of population aging. The decrease in the proportion of the working-age labor force as the intensification of aging will have a negative impact on economic growth. The proportion of people who create wealth is decreasing, while the proportion of people who consume social wealth is increasing, which increases the burden on the social security system and hinders economic transformation and development and industrial structure upgrading.

The status quo of resources, population and economic development in Datong is a challenge as well as an opportunity. With the efforts of the new leadership of Datong, holding high the banners of "opening up" and "energy revolution", and establishing the strategic thinking of "industry builds a city, talents build a strong city", the regional GDP of Datong reached ¥112.18 billion in 2017, an increase of 6.5%, rising from the bottom to the seventh in the province. The added value of large-scale industries was ¥28.59 billion, an increase of 5.7%, rising from the bottom to the seventh in the province. The optimized industrial structure have focused on the noncoal industry and the emerging industries and high-tech industries, and the real economy has been vigorously developed; 66 new large-scale enterprises have

been established, of which 41 are strategic emerging enterprises. The added value of the non-coal industry for the year was ¥157.1 million, a year-on-year increase of 14.5%, accounting for 54.9% of the added value of large-scale industries in Datong, driving industrial economic growth by 9%. With great efforts to promote economic transformation and development and the transfer of key industries, the added value of strategic emerging industries was ¥2.78 billion, an increase of 18.4% year-on-year, and the proportion increased by 9.7 percentage points. The added value of the high-tech industry was ¥1.95 billion, an increase of 1.3% year-on-year, and its proportion increased by 6.8 percentage points.

## 3 Development Strategies and Practices

### *3.1 Vigorously Implement the Talent Development Strategy*

Datong implemented the strategy of strengthening the city with talent in all aspects. To continue standing out in regional competition, Datong must vigorously implement the strategy of strengthening the city with talent and creating a talent highland for the rise of resource-based cities.

First, be far-sighted and formulate a strategic plan for talent. The Datong Municipal Party Committee has made drastic reforms, established a new system and introduced the "Phoenix Talents" three-year development plan and a series of preferential policies, such as delegating power to the grassroots, loosening talent, giving benefits to science and technology, and vigorously implementing ten major talent projects, including the revitalization of local talent. Taking the introduction of 100 students with Ph.D. degrees as a breakthrough point, 300 students with Ph.D. degrees will be introduced to enterprises and institutions in the city within three years to optimize the professional structures of the cadre team and alleviate development problems such as the shortage of high-level talent in various industries and the lack of innovation drive.

Second, adapt to production conditions to achieve the common growth of industry and talent. Taking platform construction as the starting point, focuse on attracting, retaining, and serving talent. The industry is prosperous due to talent, and talent is outstanding in accordance with the industry, thus achieving a benign interaction between industrial development and the improvement of talent skills.

### *3.2 Actively Adjust the Industrial Structure*

First, follow the changing trend of the age structure of the population, vigorously develop the aging industry, increase the consumption power of the elderly, and promote the upgrading of the industrial structure. The aging of the population can

give birth to a "silver economy" and promote the upgrading of industrial structure. In the coming 20 to 30 years, China will enter a period of in-depth development of aging, and the size of the aging population will rise sharply. The large elderly population will form a potential consumer market with increasing growth, providing a broad market for the development and innovation of the aging industry. The consumption demand effect of the aging industry upgrade needs the support of elderly groups with spending power and a sound social security system, which is exactly what China lacks. Therefore, resource-based cities should seize the opportunity to upgrade the industrial structure brought about by aging and the vigorously developing aging industry. In response to the aging population and combined with the superior environmental resources of Datong, it should vigorously develop the health care industry. Datong instructed that the "health preservation (or general health) industry should be regarded as an important industry and included in the important content of the 13th Five-Year Plan. In 2017, the Datong Health Care Industrial Park was included in the 13th Five-Year Plan for Elderly Care Service Industry Development in Shanxi Province and was used as an industrial development "1310" project (that is, by 2030, cultivate a provincial health care demonstration park (Datong), 3 provincial health care parks (Jinzhong, Jincheng, Xinzhou), and 10 special health care towns).

Second, make full use of the economic advantages of China as a major country and the regional gradient of the population age structure to promote the regional transfer and upgrading of industries. The effects of industrial upgrading on population aging are different across regions in China; the central and western regions are stronger than the eastern regions, which means that population aging helps the central and western regions catch up with the pace of industrial upgrading in the eastern regions. The characteristics of a large country economy of China make the capital, labor and other production factors have a larger transfer and optimization space between regions and industries. The adjustment, optimization and upgrading of regional industrial structure need to be based on their respective comparative advantages on the one hand, and on the other hand, they also need to fully consider the existing status of population aging in each region, future development trends, and the comprehensive impact of population migration across regions. When formulating industrial development policies, we should adapt measures to local conditions to form a comparative advantage in line with regional characteristics and an industrial gradient adapted to the population structure.

Third, speed up the promotion of innovation-driven development strategies, improve regional innovation capabilities, and "lever" the effect of the industrial structure upgrade of an aging population. Research shows that the leverage effect of regional innovation is significant. Improving innovation capabilities can weaken the negative impact of population aging on industrial structure and promote the aging of the population to play the role of industrial structure upgrading. Therefore, as population aging is intensifying, it is necessary to further expand to the outside world and actively introduce advanced technology and management experience through investment promotion and other methods. In addition, local governments should provide necessary policy guarantees for innovation entities, improve system supply, optimize the innovation environment, continue to increase investment in innovation,

increase subsidies for R&D personnel in universities and scientific research institutions, establish scientific research award funds, and encourage scientific researchers to engage in technological innovation activities to encourage enterprises to carry out R&D activities through tax reduction or exemption or increasing R&D subsidies. At the same time, it should also be noted that for resource-based cities, the leverage of innovation is nonlinear. Excessive investment in innovation and a focus on innovation may even have a certain crowding out effect on the consumer service industry, which is not conducive to population aging. Promote the upgrading of industrial structure by driving the consumer service industry. Therefore, for resource-based cities, it is necessary to implement policy combinations according to local conditions. It is necessary to enhance self-innovation capabilities by expanding opening up, optimizing the innovation environment, and increasing innovation investment. It is necessary to pay full attention to the driving effect of aging on the consumer service industry, create a good development environment for the elderly industry, and maximize the leverage of innovation.

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