# The Effect of Population Aging on the Fiscal Burden of Local Governments

## ——An Empirical Analysis Based on Provincial Panel Data in China

Kaijie Liang*

Faculty of social sciences,University of Macau,Macau,999078,China

*Corresponding Author's Email:mc15268@umac.mo

**Abstract.** China's rapid and deep population aging has brought great effect and challenges to local governments fiscal. In the context of China's national pooling of basic state pension has entered the implementation stage and the demographic changes of the 7th census. This paper explores the effect of population aging on fiscal burden based on provincial panel data from 2007 to 2019. The results show that at the national level, population aging disrupts the balance between local governments fiscal revenues and expenditures and increases the local fiscal burden. At the regional level, the effect of population aging on the fiscal burden of local governments is more significant in non-eastern regions compared to eastern regions. Therefore, the government should improve the current situation of population aging in China and promote the sustainable development of local governments fiscal from three perspectives: establish a comprehensive pension system, focus on the balance between fiscal expenditures and revenues, and establish a comprehensive fertility system.

**Keywords:** population aging, fiscal burden, pension system

# 1 Introduction

## 1.1 The Aging Status and the Future Trends of Chinese Population

China has entered the aging society in 2000. The latest data from the 7th National Census (2020) shows that the proportion of people aged 65 and over in China's total population has already reached 13.50%, far exceeding the world average. It is thus clear that the phenomenon of the rapid and deep aging of the Chinese population has become one of the most important issues for the country to consider at present and for quite long time to come.



P. Dou and K. Zhang (eds.), *Proceedings of the 2023 International Conference on Economic Management, Financial Innovation and Public Service (EMFIPS 2023)*, Advances in Economics, Business and Management Research 287,
https://doi.org/10.2991/978-94-6463-441-9_18

### 1.2 The Fiscal Situation of China

After the Reform of Tax Sharing System in 1994, China's fiscal system has undergone fundamental changes. After the financial crisis in 2008, local governments adopted a massive deficit fiscal policy, leading to a climb in total local governments debt. Afterwards, in 2014, the economic development of China entered a new normal era. With the focus point moving from quantity to quality, the GDP growth became slow, and fiscal revenue growth also slowed at the same time. What is more serious is that the COVID-19 continues to worsen after 2020, and the economic growth of China further slows down in general. In contrast, the Chinese government expenditure continues to increase, and the imbalance between the general public budget revenue and expenditure also increases. Aging will continue to deepen in the foreseeable future, and further increase fiscal burden.

## 2 Literature Review

### 2.1 The Effects of Population Aging on the Industrial Structure

The aging population changes the age structure. Many laborers withdraw from the labor market, which forces enterprises to make adjustments to accommodate the changes in the labor force.

Some scholars think that population aging is detrimental to the optimization and upgrading of the industrial structure by worsening the quality and quantity of labor force supply [1]. Firstly, a reduction of the absolute quantity of labor force. It is difficult to upgrade and optimize the industrial structure without sufficient human resources. On the one hand, population aging implies an increase in the proportion of elderly people and a decrease in the number of the age-appropriate labor force. The lack of labor force supply will raise the average wage in labor market. On the other hand, the aging population increases pension spending. As for person, the population aging will disadvantage to invest personal human capital. As for enterprises, the population aging will disadvantage to investment in high technology [2]. Secondly, population aging affects the transformation of the industrial structure by reducing labor productivity. The age peak of labor productivity is between 40 and 49 years old, after which the individual labor productivity will decline [3]. At the same time, as people got older, their physical and mental capacity for work will also decline, and their work motivation and innovation ability will become less as well [4]. All these changes make it difficult for the old generation to adapt to the needs of the advanced development of the industrial structure.

However, other scholars propose that population aging can be helpful for the upgrading of industrial structures. The increase in labor costs of enterprises will make them increase investment in research and human capital, to maintain market competitiveness by improving their productivity. [5]. At the same time, the population aging promotes the development of the elderly care industry by changing the demand structure. The elderly need health care and nursing services more than the young

people [6], thus promoting the development of a series of emerging service industries such as the medical service industry [7].

## 2.2 The Effects of Population Aging on Consumption

The population aging will cause changes in consumption mainly by affecting the household savings rate. The existing studies have not drawn consistent conclusions on the relationship between population aging and consumption. Existing research mainly focuses on the following two directions:

### 2.2.1.Population Aging is Detrimental to Consumption Growth.

For the savings side, Chinese people tend to start saving at a younger age to avoid a cash-strapped living after getting old [8]. With the life expectancy increases, on the one hand, people realize that old people face more uncertainty and require abundant private savings to cope with medical contingencies. On the other hand, Chinese residents are relatively more concerned about the cultivation of their children. The future schooling and marriage of their children will require significant expenditures. The motivation of "saving for a rainy day" may force people's tendency to save more and consume less [9].

For the consumption side, most older people are losing their physiological functions and labor capacity, thus having to rely on the support money provided by their children, manifesting a decrease in consumption expenditures. Moreover, the thrifty consumption habits of the elderly may inhibit their consumer demand, which in turn hinders the increase of consumption levels [10].

### 2.2.2.Population Aging is Good for Consumption Growth.

According to the logic of life cycle theory [11], when society-wide aging deepens, rational consumers will save less positively at working age than the older population will save negatively after retirement. In other words, in a high-degree aging society, total social savings will be smaller than total social consumption, from which it can be deduced that population aging is good for consumption growth [12].

On the one hand, as people grow older, their physiological functions decline and the demand for healthcare consumption increases significantly. On the other hand, due to the improvement of economic development and social civilization in China, more and more older people are pursuing high-quality life, and the demand for recreational consumption is also increasing. The son or daughter also take better care of the elderly and will actively provide better living conditions in terms of clothing, food, housing, transportation, and so on [13]. Both ways will ultimately increase the consumption level of the whole society.

## 2.3 The Effects of Population Aging on Economic Sustainability

With Chinese demographic transition enters a new phase, future economic development is closely related to population aging. The existing research suggests

that population aging affects sustainable economic development through two main paths: increasing investment in human capital and widening the government fiscal gap.

### 2.3.1 Increase the Investment in Human Capital.

At present, China's demographic dividend has gradually disappeared. With the context of population aging, sustainable future economic development will rely mainly on the human capital accumulation and the exploitation of the second demographic dividend [14]. Human capital can be further subdivided into educational human capital and healthy human capital.

In terms of educational human capital, for individuals, the increase in life expectancy increases the benefits of education, and old people can also continue to accumulate their educational human capital and may achieve secondary employment by attending university courses provided for the elderly [15]. For families, with the idea of "raising children for old age", parents tend to spend more on their children's education in order to get a better return from their children in old age.

In terms of healthy human capital, as life expectancy increases, to maintain competitiveness in the labor market, people are increasingly willing to invest more in personal healthcare to remain productive and creative for higher salaries. The higher investment in individual healthcare will create more positive effects of healthy human capital on China's economic growth than the negative effect of aging. It promotes economic growth [16].

### 2.3.2 Widening the Gap Between Government Revenues and Expenditures.

Population aging affects fiscal sustainability mainly through the two main channels: fiscal revenue and fiscal expenditure.

The effect of the population aging on fiscal revenue can further be discussed from two aspects: personal income tax and corporate income tax. In terms of personal income tax, the deepening population aging is causing a continued labor force withdrawal from the labor market, resulting in a shrinking source of personal income tax [17]. In terms of corporate income tax, the reduction in labor force supply will also lead to an increase in labor cost and an increase in production costs for enterprises. The reduction of profits and the decline in outputs may fail enterprises in the market, which eventually will cause a reduction of both tax targets and the amount of tax revenue from corporate income tax [18].

On the fiscal expenditure side, social security resources will not be adequate with deepening population aging. The government will have to spend more on pensions and healthcare in order to solve the problem of aging [19]. In addition, the increase in the dependency ratio in China will lead to an increase in the per capita burden of the labor force, adding pressure to the pension funds. When the number of people receiving pension benefits in the pension system gradually exceeds the number of people who contribute to the system. The imbalance between the financial income and expenditure of the pension system will put a heavy burden on the national finance, which may cause fiscal risks [20].

In summary, the existing studies have mainly examined the effect of population aging on industrial structure, consumption, and sustainable economic development. In the field of fiscal expenditure, current research has mainly focused on the use of local governments fiscal to cover pension deficits. However, existing studies have not explored further how this subsidy effect would affect local governments. The contribution of this paper is to explore the effect of population aging on fiscal burden under the context that China's national pooling of basic state pension has entered the implementation stage and the demographic changes of the 7th census.

## 3 Theoretical Logic

The population aging leads to the increase of government expenditure and the reduction of revenue, and retirees will require more pensions due to long life expectancy. It is foreseeable that the balance between fiscal revenues and expenditures will be broken in the future, and the fiscal burden on local governments will increase.

Expenditure side: The continuous operation of China's pension system still requires government fiscal subsidies as a guarantee. With the deepening of population aging, it will directly increase the fiscal burden of local governments. On the one hand, as for elderly, the demand of the medical services is relatively concentrated. The increase of the elderly population requires the government to increase the fiscal expenditure related to healthcare. On the other hand, the aging of China's population is characterized by "aging before getting rich.". Chinese local governments need to invest more in the construction of elderly infrastructure and facilities, which increases government expenditure on social security and social welfare.

For revenue, the deepening aging of the population undermines the stability of economic development, leading to a decline in fiscal revenues. Regarding the tax, the population aging means that more people are dropping out of the labor market. The rising dependency ratio puts more pressure on working-age workers to care for the elderly while working, thus reducing their labor force participation rate. The decline in both the quantity and quality of the labor force has led to a decrease in the portion of tax revenue that comes from personal income taxes. Secondly, for companies, as more employees retire, the amount of pensions they need to pay will increase. This will crowd out the enterprise's funds for research and development, training, etc., which will be detrimental to the enterprise's technological progress and accumulation of human capital. At the same time, the rise in labor costs caused by population aging will further squeeze the profit margins of enterprises, leading to a reduction in corporate income tax revenue. Moreover, according to the life cycle theory, the propensity to consume decreases with age, which means population aging can dampen the demand of total social consumption. The consumption desire of the elderly tends to be lower compared to that of the young, further reducing consumption demand. It is not beneficial for the government to obtain taxes such as VAT and consumption tax, and shrinks the government's revenue.

Therefore, this paper proposes the hypothesis that population aging will increase the fiscal burden of local governments.

# 4 Empirical Analysis

## 4.1 Model Design

In this paper, we use a two-way fixed effects model. The specific model is set as:

$$deficitct = \alpha 0 + \delta oldct + Xct\beta + \alpha c + \gamma t + \varepsilon ct \quad (1)$$

In this formula, c denotes region and t denotes time. The sample includes 30 provinces. The selected period is from 2007 to 2019. deficit denotes the fiscal burden of each province and old denotes the degree of population aging in each province. Xct are a set of control variables that are correlated with province and time. αc and γt indicate the province and year fixed effect.

## 4.2 Variable Description

### 4.2.1 Dependent Variables.

The dependent variables selected in this paper is fiscal burden. That is, the difference between the general public budget expenditure and general public budget revenue of each province as a proportion of its GDP is used to express the fiscal pressure situation.

### 4.2.2 Independent Variables.

The independent variables selected in this paper is population aging. That is, the population aging in each province is expressed as the proportion of the population aged 65 and above to the total population in each province.

### 4.2.3 Control Variables.

Based on theoretical analysis and the approach of existing studies. In this paper, GDP per capita, disposable income per capita, resident population, urbanization rate, transfer payments, etc. are included in the control variables. The variables and data sources are shown in Table 1.

**Table 1.** variables names and data sources

| Properties | Name | Symbols | Meaning | Data source |
|---|---|---|---|---|
| Dependent variables | Fiscal burden | deficit | The difference between the general public budget expenditure and general public budget revenue of each province as a percentage of its GDP | CHINA STATISTICAL YEARBOOK |

| | | | | |
|---|---|---|---|---|
| Independent variables | Aging rate | old | Number of people aged 65 and over in each province as a percentage of their total population | |
| | GDP per capita | gdpper | Ratio of regional GDP to its resident population by province | |
| | Fixed Investments | fdi | Provinces in a certain period the workload of the construction and acquisition of fixed assets throughout society, and the sum of the costs associated with this | |
| | Unemployment rate | unemployment | The proportion of registered unemployed persons in each province to the sum of employed persons, inactive workers, private owners, self-employed persons, private enterprises and self-employed persons, and registered unemployed persons in each province | |
| Control variables | Disposable income per capita | income | The sum of final consumption expenditure and savings available to residents | |
| | Resident population | pop | The total number of living individuals at a certain point in time and within a certain area | |
| | Urbanization rate | urban | Proportion of the total resident population living within the urban area to its resident population by province | |
| | Transfer payments | transfer | Central subsidy income of each province | FINANCE YEARBOOK OF CHINA |

### 4.3 Sample Selection and Data Sources

In this paper, the empirical analysis selects panel data of 30 provinces from 2007 to 2019 as the data base. Because the data of Tibet has more missing data, as well as the political system of Hong Kong, Macao and Taiwan differs from that of mainland China. So, the data exclude Tibet as well as Hong Kong, Macao, and Taiwan. Since the government budget revenue and expenditure classifications were adjusted from 2006 to 2007, 2007 is chosen as the base period for this paper to avoid the effect caused by inconsistency in uniform caliber. Since the current Financial Yearbook of China is only updated until 2019, the period selected for this paper is 2007~2019. The data in this paper are all obtained from the China Statistical Yearbook and the Financial Yearbook of China.

# 5 Results

## 5.1 Analysis of Fixed Effects Results

Firstly, fixed effects are done on the effect of population aging on the fiscal burden of local governments. The final regression results are shown in Table 2. The Model 1 shows that the original hypothesis is rejected at the 1% level of significance and the coefficient estimates are always significantly positive. That is, population aging shows a positive effect on local fiscal burden. This indicates that the deeper the regional population aging is, the higher the government fiscal burden is. Subsequently, based on Model 1, adding economic control variables into Model 2, adding social control variables into Model 3, adding fiscal control variables into Model 4, and Model 5 include all control variables selected in this paper. The regression results show that the coefficient estimates of the core independent variable population aging are always significantly positive. This implies that population aging does break the balance between local governments fiscal revenues and expenditures. Population aging directly increases local governments fiscal expenditures, as well as indirectly leads to a decrease in local governments fiscal revenues by affecting the smoothness of socioeconomic development, which gradually increases the fiscal burden of local governments under the combined effect of direct and indirect effects.

**Table 2.** Fixed effects results of population aging on local fiscal burden

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| | Local governments fiscal burden | | | | |
| old | 3.092*** | 2.929*** | 3.970*** | 3.096*** | 3.958*** |
| | (1.075) | (0.992) | (1.028) | (1.077) | (0.952) |
| lngdpper | | -0.724*** | | | -0.673*** |
| | | (0.097) | | | (0.097) |
| lnfdi | | 0.101** | | | 0.049 |
| | | (0.047) | | | (0.045) |
| unemployment | | 4.005 | | | 2.657 |
| | | (3.013) | | | (2.838) |
| lnincome | | 0.274** | | | 0.298** |
| | | (0.122) | | | (0.136) |
| pop | | | 2.184*** | | 2.464*** |
| | | | (0.573) | | (0.554) |
| urban | | | -2.272*** | | -1.230** |
| | | | (0.407) | | (0.500) |
| lntransfer | | | | 0.013 | 0.667*** |
| | | | | (0.097) | (0.098) |
| Constant | -1.989*** | 6.658*** | -1.924*** | -2.072*** | 2.115 |
| | (0.103) | (1.282) | (0.379) | (0.616) | (1.477) |
| N | 390 | 390 | 390 | 390 | 390 |
| $R^2$ | 0.570 | 0.663 | 0.632 | 0.570 | 0.712 |

Note: * indicates p-value <0.1, ** indicates p-value <0.05, *** indicates p-value <0.01.

## 5.2 Robustness Test

### 5.2.1 Replace the Dependent Variables.

To test the robustness of the empirical results, this paper uses social security and employment expenditures as a substitute variable for the fiscal burden of the independent variable. As the population aging deepens, local governments' expenditures on health and health care increase significantly. Therefore, social security and employment expenditures can also be an indicator of whether the fiscal burden of local governments has changed.

The results in Table 3 show that population aging has a significant positive effect on social security and employment expenditures. That is, the deeper the population aging, the more local governments spend on social security and employment. This indicates that the robustness test estimation results are almost consistent with the baseline regression results. The results of this paper are robust.

**Table 3.** Robustness test results

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| | Social Security and Employment Expenditures | | | | |
| old | 5,027.860*** | 4,842.982*** | 6,935.903*** | 4,901.348*** | 6,736.605*** |
| | (798.031) | (827.243) | (700.826) | (758.261) | (706.832) |
| lngdppeer | | -33.099 | | | 189.175*** |
| | | (80.897) | | | (72.209) |
| lnfdi | | -6.508 | | | -68.297** |
| | | (38.973) | | | (33.202) |
| unemployment | | 158.432 | | | -4,099.352* |
| | | (2,513.500) | | | (2,106.648) |
| lnincome | | 132.717 | | | 32.035 |
| | | (101.730) | | | (100.904) |
| pop | | | 4,457.131*** | | 4,350.534*** |
| | | | (390.295) | | (411.522) |
| urban | | | 314.120 | | 657.277* |
| | | | (277.599) | | (371.519) |
| lntransfer | | | | -424.190*** | -275.980*** |
| | | | | (68.249) | (72.725) |
| Constant | -295.849*** | 1,284.371 | -2,549.195*** | 2,360.506*** | -1,799.519 |
| | (76.708) | (1,069.726) | (258.465) | (433.550) | (1,096.217) |
| N | 390 | 390 | 390 | 390 | 390 |
| $R^2$ | 0.841 | 0.843 | 0.885 | 0.857 | 0.893 |

Note: * indicates p-value <0.1, ** indicates p-value <0.05, *** indicates p-value <0.01.

### 5.2.2 Regional Samples: Exclude Four Municipalities.

Because of the special political and economic status owned by the four municipalities of Beijing, Tianjin, Shanghai and Chongqing, their administrative levels are not the same as those of prefecture level cities. The four municipalities receive more resources and are significantly better than other provinces in terms of regional development. Therefore, these four municipalities are excluded, and the regressions are re-run. As can be seen from Table 4, except for Model 2, population aging has a significant positive effect on the fiscal burden of local governments. That is, the deeper the population aging is, the higher the fiscal burden of local governments. This indicates that the robustness test estimation results are almost consistent with the baseline regression results. The results of this paper are robust.

**Table 4.** Robustness test results

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| | Local governments fiscal burden | | | | |
| old | 3.252*** | 0.295 | 3.448*** | 2.798** | 1.866* |
| | (1.148) | (0.994) | (1.061) | (1.184) | (1.001) |
| lngdpper | | -0.913*** | | | -0.759*** |
| | | (0.087) | | | (0.091) |
| lnfdi | | 0.119*** | | | 0.074* |
| | | (0.040) | | | (0.039) |
| unemployment | | 6.258** | | | 4.758* |
| | | (2.529) | | | (2.480) |
| lnincome | | 0.191 | | | 0.193 |
| | | (0.133) | | | (0.138) |
| pop | | | 2.575*** | | 2.121*** |
| | | | (0.488) | | (0.470) |
| urban | | | -2.845*** | | -1.095** |
| | | | (0.499) | | (0.505) |
| lntransfer | | | | -0.171 | 0.323*** |
| | | | | (0.112) | (0.101) |
| Constant | -1.944*** | 7.736*** | -1.923*** | -0.827 | 3.979*** |
| | (0.105) | (1.334) | (0.383) | (0.742) | (1.457) |
| N | 338 | 338 | 338 | 338 | 338 |
| $R^2$ | 0.627 | 0.760 | 0.703 | 0.630 | 0.782 |

Note: * indicates p-value <0.1, ** indicates p-value <0.05, *** indicates p-value <0.01.

### 5.2.3 Add Control Variables.

In this paper, we try to add control variables such as per capita GDP, fixed investments, unemployment rate, per capita disposable income, resident population, urbanization rate, and transfer payments. The results show that the direction and significance of the regression coefficients of population aging, and local governments fiscal burden are unchanged. It indicates that the differences in various aspects, such as economic and social, existing in different provinces at the beginning of the sample do not affect the regression results.

### 5.3 Regional Heterogeneity Analysis.

The differences in economic base, demographic structure, and fiscal revenues composition of each region affect the fiscal burden of local governments. In order to study the differential effect of population aging on local governments fiscal in different regions, this paper focuses on the analysis of eastern and non-eastern regions where the differences in economic development are more obvious. The regression results are shown in Table 5. Due to space limitations, the regression results for the eastern region can be requested from the authors. The regression results show that population aging has a significant effect on the fiscal burden of local governments in non-eastern regions, however, it does not have a significant effect in eastern regions.

There may be three main reasons: Firstly, it is related to the level of economic development of the two regions. The economic development of the non-eastern regions started late, and the fiscal revenue is lower than that of the eastern regions; secondly, it is related to the demographic structure of the two regions, industries of the non-eastern region develop slowly, so there is more labor force outflow, which leads to a more serious aging degree compared with the eastern region; thirdly, it is related to the composition of fiscal revenues in the two regions. Local governments in non-eastern regions have relatively weak fiscal resources, making it difficult to maintain the performance of local basic public service functions and relying more on transfer payments from the central government. In summary, we believe that population aging has a more obvious effect on the fiscal burden of local governments in non-eastern regions.

**Table 5.** Regression results of population aging on local fiscal burden in non-eastern regions

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| | Local governments fiscal burden | | | | |
| old | 5.382*** | 3.385*** | 2.030* | 6.850*** | 3.445*** |
| | (1.162) | (0.887) | (1.122) | (1.158) | (0.701) |
| lngdpper | | -0.821*** | | | -0.811*** |
| | | (0.062) | | | (0.051) |
| lnfdi | | 0.050* | | | 0.029 |
| | | (0.028) | | | (0.021) |
| unemployment | | -1.518 | | | -0.131 |
| | | (1.921) | | | (1.434) |
| lnincome | | -0.295*** | | | -0.056 |
| | | (0.099) | | | (0.079) |
| pop | | | -3.439*** | | -2.046*** |
| | | | (0.860) | | (0.508) |
| urban | | | -3.000*** | | -0.401 |
| | | | (0.445) | | (0.331) |
| lntransfer | | | | 0.474*** | 0.734*** |
| | | | | (0.103) | (0.059) |
| Constant | -1.620*** | 3.420*** | 1.337*** | -4.780*** | 1.907** |
| | (0.105) | (0.967) | (0.439) | (0.695) | (0.862) |
| N | 260 | 260 | 260 | 260 | 260 |
| $R^2$ | 0.639 | 0.833 | 0.719 | 0.670 | 0.909 |

Note: * indicates p-value <0.1, ** indicates p-value <0.05, *** indicates p-value <0.01.

## 6 Conclusions

The study finds that population aging breaks the balance between local governments fiscal revenues and expenditures, widens the fiscal gap, and increases the local fiscal burden. The conclusion still holds after testing the hypothesis using substitution of dependent variables as well as regional samples. In addition, at the regional level, the effect of population aging on the fiscal burden of local governments is more obvious in the non-eastern regions compared to the eastern regions.

In order to improve the current situation of China's gradually deepening population aging and to promote the sustainable development of local governments fiscal, this paper puts forward the following three policy recommendations.

Firstly, establish a comprehensive pension system. The government could consider reforming the current pension funding model and promoting the construction of a multi-level and multi-pillar pension insurance system. Secondly, focus on the balance between fiscal expenditures and revenues. Local governments should improve the efficiency of fiscal expenditures in the fields of health protection and medical care, while developing the local economy and stabilizing fiscal revenue. Thirdly, establish a comprehensive fertility system. China needs to use a series of combined policies, including the gradual relaxation of the fertility policy, to cope with the increasingly severe challenge of population aging in the future.

## References

1. Fraumeni B M, He J, Li H, et al. Regional distribution and dynamics of human capital in China 1985–2014[J]. Journal of Comparative Economics, 2019, 47(04): 853-866.
2. WANG Wei, LIU Yu-Fei, PENG Dong-dong. Research on Effects of Population Aging on Industrial Upgrading[J]. China Industrial Economics, 2015(11): 47-61.
3. Feyrer J. Demographics and productivity[J]. The Review of Economics and Statistics, 2007, 89(01): 100-109.
4. Czaja S J, Lee C C. The impact of aging on access to technology[J]. Universal access in the information society, 2007, 5(04): 341-349.
5. Maestas N, Mullen K J, Powell D. The effect of population aging on economic growth, the labor force and productivity[R]. National Bureau of Economic Research, 2016.
6. Siliverstovs B, Kholodilin K A, Thiessen U. Does aging influence structural change? Evidence from panel data[J]. Economic Systems, 2011, 35(02): 244-260.
7. Hashimoto K, Tabata K. Population aging, health care, and growth[J]. Journal of Population Economics, 2010, 23(02): 571-593.
8. Zhang J, Zhang J, Lee R. Rising longevity, education, savings, and growth[J]. Journal of Development Economics, 2003, 70(01): 83-101.
9. Li Chunqi, Zhang Jeping. Dual Economic Structure, Labor Force Reward Differential and Balanced Urban-Rural Development[J]. Chinese Journal of Population Science, 2009(04): 14-22+111.

10. Mao Zhonggen, Sun Wufu, Comparative Analysis on the Relationship between Population Age Structure and Household Consumption in China[J]. Population Research, 2013,37(03): 82-92.
11. Modigliani F, Brumberg R. Utility analysis and the consumption function: An interpretation of cross-section data[J]. Franco Modigliani, 1954, 1(01): 388-436.
12. Wang Wei, Ai Chunrong. Population aging and the dynamic evolution of China's savings rate[J]. Management World, 2015(06): 47-62.
13. Huang Yanfen, Zhang Chao, Tian Shengdan. The Influencing Mechanisms of Population Age Structure and Housing Price on Household Consumption in Urban China[J]. Population Research, 2019,43(04): 17-35.
14. Cai Fang. How to start the second demographic dividend? [J]. International Economic Review, 2020(02): 9-24+4.
15. Liu Chunyang, Ma Hongfan. Conditional Sustained Growth of Demographic Dividend[J]. Public Finance Research, 2021(06): 119-129.
16. WANG Ren, MA Hong-qi. Healthy Human Capital, Aging Expectation and Their Effects on Savings Growth[J]. Contemporary Finance & Economics, 2019(05): 15-26.
17. Gong Feng, Yu Jinliang. Population Aging, Tax Burden and Fiscal Sustainability[J]. Economic Research Journal, 2015,50(08): 16-30.
18. Cao Congling, Xiao Guoan, Xu Shaorui, Zhou Xiaoyu. The Impact of Population Aging on High-quality Economic Development——From the Perspective of Financial Sustainability[J]. The Theory and Practice of Finance and Economics, 2022,43(01): 114-122.
19. Heer B, Scharrer C. The age-specific burdens of short-run fluctuations in government spending[J]. Journal of Economic Dynamics and Control, 2018, 90: 45-75.
20. Yao Jinhai. The Conduction and Resolution of Population Aging, Pension Income Gap and Financial Risk——An Empirical Study of City A[J]. Management Review, 2016, 28(04): 62- 72+122.